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Foreword

The UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON 25, D. C.

MEMO: Personnel of the Medical Services of the United States
Armed Forces

When Chinese Communist forces poured into North Korea during the last part of November and early December, the air evacuation system of our Armed Forces faced its stiffest test. The record is almost amazing: More than 14,000 patients were flown out of Korea to Japan in one eight-day period. This gigantic airlift for the sick and wounded was carried out in an extremely grave tactical situation in the face of overwhelming enemy strength.

The air evacuation policy established in the Department of Defense in September, 1949 provided the Armed Forces with a large scale organization, in being, when South Korea was invaded - an organization geared to match modern military concepts of speed, size and distance. From that time, air evacuation has removed thousands of sick and wounded from forward areas to Japan and the United States in the shortest time and the best condition ever witnessed in any American military operation.

For this remarkable record, the nation's thanks go to those many men whose foresight, faith and vision in the field of aeromedicine provided the machinery for this work when it was needed; to the flight surgeons, flight nurses, technicians, the air and ground crews and others who labored around the clock to make it work; and to the patients themselves, whose fortitude frequently was an inspiration to all concerned.

But let us remember, too, that this was a joint medicomilitary enterprise in which the Military Air Transport Service, the Air Force, Navy and Marine Corps fused their men, their planes, helicopters and equipment into a highly coordinated operation. We have seen a demonstration of cooperative teamwork in the best American tradition.

Richard L. Meiling

Richard L. Meiling, M. D.
Chairman, Armed Forces Medical
Policy Council

UNITED STATES ARMED FORCES MEDICAL JOURNAL

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Facial Wounds in Korean Casualties

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IN THIS article, we present some of the first war casualties from the Korean conflict having wounds about the face, mouth, and jaws. These patients illustrate the severity of the lesions sustained and are comparable to that of the deformities treated in World War II. A review of the surgical treatment of this type of lesion from the front line through the Zone of the Interior should be of value and should enable the plastic and maxillofacial surgeon to standardize methods of procedure.

CASE REPORTS

Case 1.—This patient sustained a destructive wound of the lower jaw. There was soft tissue avulsion as well as fragmentation of the mandible with loss of its continuity on the left (fig. 1). The treatment consisted of intermaxillary fixation with rubber-band traction, oral hygiene, and the removal of nonvital teeth. Débridement of a radical nature was contraindicated. In order to remove foreign material which would interfere with healing, the patient will be watched and checked with roentgenograms. As soon as the wounds are completely healed, there will be local revision of the soft tissue and mandibular reconstruction by bone graft.



Figure 1.—Case 1. Deformity of the jaw manifested by soft tissue avulsion, lip distortion, mandibular bone deletion, and labial sulcus destruction.

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Case 2.—On admission to this hospital, 10 days after injury, this patient presented a large wound located in the left cheek (fig. 2).



Figure 2.—Case 2. Soft tissue loss of the cheek with a through-and-through hole into the oral cavity. A portion of the ramus is visible in the center.

sary to improve contour. Facial facial paralysis.

Case 3.—This patient was hit by an enemy rifle bullet on 31 July 1950. The missile entered at the angle of the left mandible, passed through the face, and left beneath the right eye (fig. 3). As a result the patient sustained a compound fracture of the angle of the mandible on the left with associated fracture at the symphysis and a compound comminuted fracture of the right maxilla. He was treated with continuous intermaxillary multiple loop and rubber-band fixation. The concave contour cheek defect resulted from loss of maxillary architecture and soft tissue. The scar was of the multi-

Extensive soft tissue loss was present with a through-and-through hole into the oral cavity. There was an associated compound comminuted fracture of the left maxilla and a fracture of the ramus of the mandible with exposure of the fractured segment. The treatment consisted of through-and-through wound irrigation with continuous wet dressings to the granulating area. As soon as the recipient site is ready, a skin graft will be applied. The nonviable bone of the mandible will be removed and eventually local revision of cheek soft tissues will permit closure. A derma-fat graft may be neces-

transplants will compensate for



Figure 3.—Case 3. Multiple cicatrices with resultant lid and lip deformities.

ple stellate type and extended from the lower eyelid to the lateral commissure on the right. There was splaying out of the nasal bones with an associated destruction of the inner canthal ligament. Our primary objective was to reconstruct the bony architecture. When all reaction in the soft tissue has subsided a modified rhinoplasty will be performed to obtain an airway on the right. Subsequent local soft tissue revision will permit the descent of the upper lip. Following the soft tissue revision, a bone graft to the orbital rim can be performed with an additional soft tissue transplant for reconstruction of cheek contour. A reattachment of the intercanthal ligament will also be attempted as a definitive procedure.

Case 4.—This patient sustained a shell fragment wound of the jaw. The patient apparently had a radical débridement before being returned to the Zone of the Interior (fig. 4). On admission the soft tissue wound was almost completely healed. The roentgenogram revealed a loss of almost all the mandible from the symphysis to the angle. There were also a number of foreign bodies in this area which might explain the two small draining sinuses which were present. This patient had intermaxillary rubber-band fixation of the remaining teeth. This elastic traction permitted some mobility and at the same time kept the left mandible in proper occlusal position. If this splinting had not been done, the floating fragment would eventually have become medially deviated and would have had to be corrected, prior to bone graft, by glide splint and intraoral fixation with bar and acrylic saddle. The short ramus fragment on the right impinged on the occlusal surface of the upper maxillary teeth. Because bone grafting was not to be accomplished for at least 6 months this fragment will not be disturbed. Eventually external traction to the angle will mobilize it into proper place. After this has been accomplished the position will be maintained by an intraoral splint. An alternative plan would be to eliminate external traction on the short right fragment, just before operation, and depend on surgical skill to mobilize this segment at the time of bone grafting.

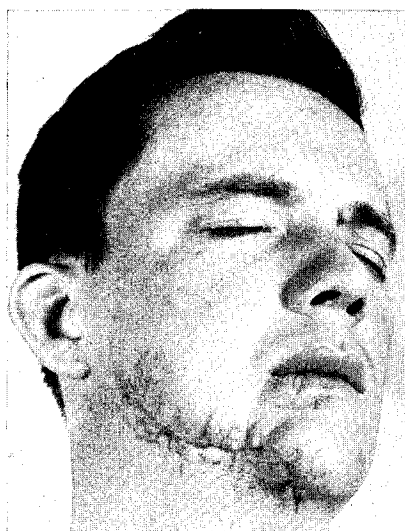


Figure 4.—Case 4. The contour cavity in this patient was caused by loss of intra- and extra-oral soft tissue as well as one-half of the mandible.

One would then rely on fixation of the graft to the fragment to prevent the posterior kick-up tendency. This method, although satisfactory in some patients, offers less stability than is allowed by the addition of the intraoral appliance.

Case 5.—This patient had extensive loss of the right cheek and maxilla (fig. 5). The depressed wound extended posteriorly across the palate to the pterygoid plate. Some filaments of the second division of the trigeminal nerve seemed to be partially exposed in the roof of the antrum. The facial nerve was involved. The anterior wall of the maxilla was completely destroyed. Adequate intranasal drainage for the exposed antral area will be established. After this has been accomplished the soft tissue of the cheek wound can be closed without a pedicle flap. Eventually, fascial transplants from the thigh will balance the oral commissure on the right.



Figure 5.—Case 5. The deep hole in this cheek extended across the palate to the pterygoid plate.



Figure 6.—Case 6. Loss of the lower lip and the lower portion of the upper lip.

Case 6.—This patient sustained a severe injury of the mouth, a result of being struck by fragments of a hand grenade. There was loss of the lower portion of the upper lip and a complete loss of the lower lip including both commissures (fig. 6). Intraorally, the buccal and labial sulci were destroyed with avulsion of a portion of the alveolar process. There was also a fracture of the maxilla and multiple compound fractures of the mandible. This patient also had a compound comminuted fracture of the right radius and left humerus.

JAW AND MOUTH RECONSTRUCTION

A discussion of the methods of surgical reconstruction of the mandible and allied soft tissue is important, not only because of the similarity between the problems of the present and past war, but also because of its continuous applicability to service and civilian traumatic maxillofacial injuries. The reparative procedure in major losses of jaw, mouth, and soft tissue architecture may be divided into four phases: fragment control, bone grafting, intraoral soft tissue restoration, and cosmesis.

In World War II, the early front-line treatment of the fractured mandible, with or without bone loss, fixation by splinting was indicated as soon as the patient's general physical condition had become stabilized. When sufficient teeth were present, all methods of fragment control were contraindicated except intermaxillary fixation by means of ligatures or rubber bands strung between continuous multiple loop fixation wires firmly attached to the teeth. Through-and-through bone wiring for fragment control when performed by inexperienced personnel resulted in rotation distortions, necrosis around the wires, and unnecessary compounding of the bone as seen in the World War II casualty shown in figure 7. The external pin fixation method was also sometimes poorly handled (fig. 8) indicating that it should rarely be attempted except by experts, and then only when insufficient teeth are present. External pins do not always hold securely and cannot be considered practical as front-line procedures. They loosened in the bone



Figure 7.—Front-line treatment such as this is contraindicated.



Figure 8.—The treatment of this World War II casualty showed poor mechanical sense.

permitting undue fragment mobility and unless aseptically inserted caused scar dimpling of the face which sometimes resulted in permanent soft tissue deformity. If the mandible was edentulous, circumferential wiring about a superimposed form-fitting splint, therefore, became the most satisfactory method for general use.

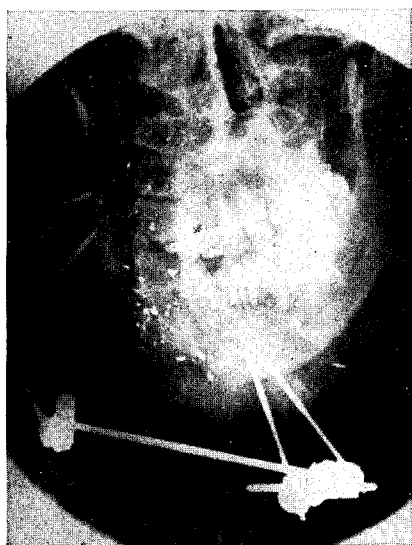


Figure 9.—Roentgenogram of patient shown in figure 8.

In the early care when bone loss occurred near the angle of the mandible with the resultant posterior kick-up, immediate fragment control was a problem. For this reason many front-line surgeons attempted to devise all kinds of apparatus. Many tried in World War II were useless; some caused more harm than good. Simple splinting of jaw to jaw was sufficient. No attempt should be made to control the posterior edentulous fragment when lateral losses necessitating bone graft are present unless a transplant is anticipated within the succeeding 3 months (fig 9). The anterior superior displacement of the ramus fragment does not interfere with the mechanics

of occlusion during the preliminary period, and it can be more advantageously cared for later.

DEFINITIVE FRAGMENT CONTROL FOR BONE GRAFTING

We have had obvious problems in definitive surgical control of edentulous fragments with associated lingual labial and hyperoccluded fixations. To deal with these situations combinations of several technics have been useful. Modified orthodontic principles, using intraoral rubber band traction, together with continuous extraoral support, have been successful. The head cast with contained armature and the parallel posterior side bar, when indicated, are effective in preparing the operative field for the subsequent bone inlay. These technics are replaced by intraoral splinting to maintain the position of the new fragment. Holding the edentulous area in position with the intraoral acrylic or silver saddle has been satisfactory (fig. 10). Untoward ulcerations or necrosis of the alveolus from saddle pressure can be avoided by instituting proper field preparation and using saddles constructed with broad surfaces and rolled edges. An example of this use is found in patients in whom one mandibular side

has teeth and there is a posterior edentulous angle fragment with loss of the mandibular body on the opposite side. In such a situation it would be well first to use a flange glider splint on the occlusal side. Articulation gradually mobilizes the tooth fragments into proper relationships. When this is achieved, the maxillas are fixed by a lockbar metal splint. The edentulous segment is then handled by external traction. The new position is maintained by the attached intraoral saddle block. This method of stabilization prepares the bed for the bone graft. It is superior to external fixation during the transplant period because in this latter method there is a marked tendency to graft joint wobbling and a concomitant nonunion.



Figure 10.—Roentgenogram showing the intraoral appliance used for stabilization during the period following the bone transplant. This is a Zone of the Interior procedure.

The flange saddle has been valuable in maintaining the position of the fragment in patients in whom the anterior symphysis area loss and edentulous lateral body, with its mesial swing resulting in the bird-face deformity, necessitated osteotomy and circumferential wire traction to restore primary arch position. With the problem of an edentulous maxilla and loss of continuity in the body of the mandible with an edentulous posterior fragment, control sufficient for a successful graft can be achieved by a combination of intra- and extra-oral fixation. A metal splint and posterior saddle is constructed for the mandible. A properly fitting denture for the edentulous maxilla is made and held in place by strut wires passed through the cheek to metal armatures incorporated in a plastic head cast. When both mandible and maxilla are treated in this manner, the jaws can be locked together. Stabilization is then sufficient for good results. When the lower jaw is completely edentulous, with loss of continuity and a few teeth remain in the maxilla, combined intra- and extra-oral fixation can again be used. Here external splinting is used for the mandible. The fragment position is maintained by Roger Anderson pins. A bar splint attached to the remaining maxillary teeth allows the upper jaw to be locked, by bar armature, to the Roger Anderson compound. The arrangement has seemed to improve

stability. With both maxilla and mandible edentulous, combinations of these two methods may be considered. If lock pins are to be used, they should be inserted in the denser parts of the bone. This will give maximum grip firmness. In the posterior position of the mandible, for example, they could be fixed in the external oblique line. Here the cortex is dense and the pins would have to penetrate 0.5 cm. or more to get through. In this way unnecessary compounding of cancellous bone may be avoided.

Ordinarily, if external traction does not mobilize and reposition the fragment in 2 or 3 weeks, an operation is indicated to free the adherent area. In some patients, immediate bone graft without de-cortication may be employed. The position is maintained by firm graft wiring alone. Great care in wiring the ramus fragment is imperative to prevent disturbance of graft attachment by tissue motion during the subsequent swallowing processes.

The cap metal splint method has given good results, but these splints have sometimes slipped off the teeth resulting in serious complications. The sectional metal splint is believed to be superior to the complete inclusive cemented type. Failure of the latter to hold results when the cement with its added bulk does not exactly fit the tooth to the splint. The sectional metal splint is in many cases superior since it holds securely and is locked by a simple wiring technic. With this method there is no slipping and there is the added feature of easy removal thus facilitating cleanliness.

TRANSPLANTATION TECHNIC

The choice of anesthesia in bone grafting of the jaws depends on the availability of trained personnel. With two surgical teams the operation can be completed more rapidly and without the use of general anesthesia. One team prepares the recipient site while the other obtains the graft material. In this circumstance, nerve block and spinal anesthesia are adequate. Intratracheal gas-oxygen-ether might be preferred when defects are large or complicated and when one surgeon must perform both operations. Preoperative roentgenograms and clinical examination indicate the size of graft required. Fragment exposure, adequate mobilization, and excision of eburnated bone ends determine the actual amount. Not infrequently what has appeared primarily as a small defect becomes of major proportion when one has finished rongeur-ing away fragment ends to reach good bleeding bone. This is especially true when intermediate attached fragments have been allowed to remain in the jaw. These, even though they attach to one or the other of the fragment ends, may not be sufficiently vascularized throughout to insure union of the graft and may, at operation,

have to be removed. If the prepared graft is a little too short to span the defect, it can be split and the sections slipped enough on each other to fill the gap but still be overlapping. When this is necessary the volume of the transplant may be insufficient. Under such conditions bone chips without cortex should be packed beneath the graft.

Preparation of the soft tissue between the fragment ends is important. Good circulation is essential not only for the graft at its attachments to the mandible but also from the immediate soft tissue contacts. Fibrosis, like eburnation, prohibits proper take and permits graft absorption. Recipient sites freed of fibrotic induration are soft and supple. Such tissue falls into close approximation to the graft. Apposition prohibits serum and blood accumulations and insures a rapid vascularization. If the oral mucosa is penetrated in preparing the soft tissues, the transplant should not be performed because chemotherapy and antibiotics do not always prevent subsequent infection of the graft. It would be better to revise the immediate soft tissues on the medial aspect to increase the bed thickness adjacent to the mucosa and consider the operation a soft-tissue bed preparation. The success of subsequent bone grafting should then be more certain.

Cancellous bone is the preferred graft material. This is obtained from the wing of the ilium. To obtain the transplant an incision is



Figure 11.—Roentgenogram of iliac transplant that has been in place 3 months.



Figure 12.—Roentgenogram of same transplant after 1 year. The angle of the mandibular transplant was formerly the anterior superior spine of the ilium.

made over the border of the iliac crest extending posteriorly from the anterior superior spine. Retracting the soft tissue and muscle exposes the periosteum. This, incised and elevated, completes the bone exposure. The avoidance of marginal periosteal shredding in the process will materially reduce postoperative spur formation. With proper bone exposure crest and wing sections can be removed. The anterior superior spine is sometimes used when there is loss of the angle of the mandible. This transplant is inverted in the recipient site (figs. 11 and 12). The lesser spine may be also incorporated when there is a combined loss of continuity involving body, angle, and ramus shaft. Care should be employed in graft removal. In this process, sometimes, an associated seeding of the adjacent soft tissue occurs. These bone cell deposits, however, may disappear with the passage of time. Wound closure follows fundamental surgical principles.

POSTOPERATIVE SEQUENCE

The postoperative treatment consists of continuous fragment control until union occurs. This is followed by intra- and extra-oral soft tissue revision for completion of the reconstruction. The duration of splint fixation varies with the size and location of the grafted defect. Ordinarily small grafts must be fixed for 8 weeks. When larger transplants have been used this interval may have to be prolonged. Failure may occur if graft immobilization is improperly carried out. Absorption and fracture have been noted in long transplants, located between fragment ends with teeth, when fixation has been removed too soon. Other failures have occurred when the roots of adjacent teeth have become infected because of neglect during early care prior to transplant. These infected roots contaminating a graft end, result in osteomyelitis and sometimes complete loss of the graft. A preoperative roentgenogram of all teeth is necessary not only for this reason, but also because a flare-up in a nongraft area may be confusing and more difficult to treat if it occurs coincident with the early postoperative period.

It cannot be too strongly emphasized that, after splint removal, examination for evidence of clinical mobility must be carried out repeatedly. If areas of functional stress or strain are carefully watched alterations in continuity can be detected in their inception. Splint maintenance may be required up to 6 months, interval unlocking being possible only after 12 weeks.

After mandibular continuity has been established intraoral reconstruction is begun. Soft tissue loss in this area can be compensated by local revision or by soft tissue additions from external sources. If additional surface is required, skin grafts may be used. When buccal and labial sulci have been obliterated extensions can be accomplished

by using dermatome grafts. Bed apposition can be maintained adequately with either of two technics. Dental compound, covered with skin, exactly fitting the recipient site and sutured in place may be sufficient. Intraoral splints with attached silver baskets holding the surrounding dental compound to the contour of the deformity are also effective. The latter technic may be preferred by those who believe graft contraction is best overcome by a postoperative distention acrylic conformer. The square bar sliding principle, in the splint construction for maintenance of the position of the conformer is now believed to be superior to the screw lock method. The slide bar is efficacious, is easily removed for cleaning, and is less apt to get out of order. Splints with screws are more difficult to manage. They are time consuming and thread stripping may occur, putting the apparatus out of function until it can be rebuilt. Stout has shown the sleeve slide principle to be advantageous if a large number of patients are to be treated.

If there are tip or lateral tissue losses of the tongue, free skin grafts can also be used. Their purpose here is to supply adequate surface coverage to the raw area formed after the impeding fibrosis has been dissected away. To insure the skin graft taking, it may be fixed by stent. The usual border sutures tied securely over the summit of a firm, form-fitting material have been sufficient. Intraoral lateral cheek losses have been treated similarly. The skin takes well and the mobilization offered facilitates function.

The tube pedicle used for intraoral reconstruction is applicable in extensive repair of the palate. When the extent of the loss precludes repair by the local rearrangement of tissue, the tube, formed on the external body surface, may be brought into the mouth and grown to the remaining margins of the palate producing a permanent separation between the nasal and oral cavities. The arm is the most feasible source for transplant material. The tube end, to be inserted into the mouth, has its raw surface skin grafted before migration. In situ time for this graft, if prolonged prior to oral attachment, allows maximal adjustment of the free graft. Doming of the transplant caused by contraction of the free graft is less likely to occur after the transplant is in place. Both direct and indirect arm tubes are successful.

The last stage of jaw reconstruction deals with the external appearance of the repaired area. When pedicle transplants have been required to supply a soft-tissue bed for bone graft reception, skin surface replacements of the transplant can be made by a variety of plastic methods used to mobilize adjacent cheek, chin, and neck tissue over the transplanted subcutaneous tissue. Foreign skin as free graft or pedicle rarely matches adjacent face skin; hence, the cutaneous sur-

face of the transplant is largely excised. Its complete removal is advocated. Facial tissue shifts, as migrated flaps, usually are successful. Their use depends on tissue availability and previous scarring. In addition to free skin grafts and pedicle flaps direct transplants of fat and derma have been of value. In the jaw area, if there are no bone losses or if successful continuity repairs have been achieved, the contour can be improved with this method. The abdomen is used as the donor site. The epidermis having been removed by a dermatome, the derma and fat can be lifted out and carried directly to the jaw area. If the adjacent skin of the recipient site is adequate, undermining for mobilization permits its closure without tension over the transplant. Fat absorption when derma is attached and turned inward is less than when fat alone is employed, but, when the transplants are reversed in the recipient site the possibility of subsequent cyst formation in the deeply imbedded derma must be kept in mind. Sometimes one is confronted with an already formed abdominal tube and an associated facial defect reparable by the above means. In this situation, if the tube is of sufficient size, it can be reopened. With adequate border tension the surface epithelium is removed; the remaining derma and fat can then be used. This eliminates the intermediate carrier stage and the subsequent operations incident to this type of repair.



Acute Suppurative Arthritis of the Hip

Report of a Case

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A CAREFUL review of the literature of the last 10 years fails to produce more than a few articles dealing with septic arthritis of the hip joint. This would suggest that this disease is relatively uncommon today and that the probable reason for this is the early use of modern chemotherapeutic measures in infection. Nevertheless, this serious entity still occurs occasionally and the importance of early and adequate treatment cannot be overemphasized.

ETIOLOGY

Badgley and coworkers,² Slowick,³ and Nicholson⁴ have studied large series of cases and have found the causative organism to be either staphylococcus or streptococcus in almost all instances. Occasionally pneumococcus, gonococcus, or some other organism is responsible. Many times a definite predisposing lesion can be demonstrated although Slowick had no explanation for the cause in 13 of his 60 cases. Infections of the upper respiratory tract, superficial lesions, and distant foci of osteomyelitis are the most common sites of origin.

PATHOLOGY

It is probably best to classify the disease either as a primary purulent arthritis or as one in which there is a secondary focus of osteomyelitis.^{3 5} In the first, involvement is centered in the synovium, neck

¹ Station Hospital, Lowry Air Force Base, Denver, Colo.

² BADGLEY, C. E.; YGLESIAS, L.; PERHAM, W. S.; and SNYDER, C. H.: Study of end results in 113 cases of septic hips. *J. Bone & Joint Surg.* 18: 1047-1061, Oct. 1936.

³ SLOWICK, F. A.: Purulent infections of hip joint; analysis of 60 cases. *New England J. Med.* 212: 672-676, Apr. 11, 1935.

⁴ NICHOLSON, J. T.: Septic arthritis of hip; treatment by immobilization. *Pennsylvania M. J.* 43: 950-955, Apr. 1940.

⁵ PREMISTER, D. B.: Pathology and treatment of pyogenic arthritis. *Pennsylvania M. J.* 32: 52-57, Nov. 1928.

of the femur, epiphysis, or innominate bone adjacent to the acetabulum. The surrounding bony structures fail to demonstrate any immediate significant gross changes. Soon destruction of the joint structures occurs with erosion of the cartilage and surrounding bony areas. Radiologically, this is characterized by a narrowing of the joint space, followed eventually by distinct and widespread bony damage leading to dislocation of the head of the femur.⁶ In the secondary type when a focus of osteomyelitis is established, there are early changes characteristic of this disease in the region of the neck of the femur. There does not appear to be any area of true epiphyseal destruction. In Slowick's group of cases, there was not a single instance of streptococcus being involved in the secondary type.

SYMPTOMS AND DIAGNOSIS

Most of these cases occur among the very young age group. As a result, it is expected that the symptoms may vary somewhat with the age. Pain in the hip joint is the first sign and a limp quickly results. These patients have a septic type of temperature often reaching 104° F. This is accompanied by a moderate leukocytosis. A deformity in flexion, adduction, and internal rotation follows. Any attempt to maneuver the leg causes exquisite pain.

It is the general belief that early aspiration of the hip joint is important in diagnosis as well as in the relief of pain caused by the distended capsule.^{3 4 7} The differential diagnosis is difficult only at the acute onset of the disease. Tuberculosis, bursitis, acute poliomyelitis, inguinal adenitis, traumatic synovitis and other injuries, and primary epiphyseal disturbances should be considered.⁸

TREATMENT

Prior to the advent of the sulfonamides and the antibiotics, treatment of acute diseases of the hip was limited to incision and drainage which, with few exceptions, had to be considered imperative. Several approaches for such treatment, both early and late, have been described.^{4 7 9} All of them accomplish the same basic purpose of opening and draining what is essentially an abscess. The generous use of sulfonamides and antibiotics probably makes it possible

⁶ CHONT, L. K.: Roentgen sign of early suppurative arthritis of hip in infancy. *Radiology* 38: 708-714, June 1942.

⁷ GIRDLESTONE, G. R.: Acute pyogenic arthritis of hip; operation giving free access and effective drainage. *Lancet* 1: 419-421, Apr. 3, 1943.

⁸ COLONNA, P. C.: Differential diagnosis of "painful hip" in childhood. *Am. J. Surg.* 54: 609-613, Dec. 1941.

⁹ HARMON, P. H.: Surgical treatment of residual deformity from suppurative arthritis of hip occurring in young children. *J. Bone & Joint Surg.* 24: 57-585, July 1942.

to avoid draining in many cases. Although there is little literature⁹ discussing the use of penicillin and other similar drugs in these cases, there is no doubt as to their indication. The following plan of treatment is therefore suggested: (1) early and repeated aspiration of the joint as necessary with instillation of penicillin solution at each aspiration; (2) administration of large amounts of sulfonamides and other antibiotics; (3) incision and drainage of the joint if the patient fails to make a rapid response to the foregoing measures; (4) absolute rest with the usual symptomatic treatment designed to combat the intense systemic reaction which these patients experience; and (5) immobilization.

There is some question as to whether splint and traction methods are as satisfactory as the use of a plaster spica.^{4,8} Any type of splint or traction is somewhat difficult to maintain, but with adequate nursing care and careful attention, the desired results can probably be achieved. This is more comfortable to the patient than a plaster cast and permits physiotherapy to the leg distal to the hip if indicated.

CASE REPORT

A 36-year-old man was first admitted on 1 May 1949, complaining of severe pain in the right hip joint that had caused him to collapse 2 hours before admission. He had been hospitalized for 13 days at another hospital 7 weeks previously because of a moderately severe upper respiratory infection at which time he had transient discomfort in the hip joint. The systemic review was otherwise negative and all the physical findings were limited to the right hip joint. He maintained the thigh in flexion and adduction with internal rotation. He was acutely ill, and had excruciating pain on all hip motion. There was about 30 percent limitation of motion because of muscular resistance. His temperature was 102° F. The white blood cell count was 20,000; and the sedimentation rate was 39 mm. (Wintrobe). The initial and subsequent blood cultures as well as examination of the urine were negative. Roentgenograms of the pelvis and chest were normal.

He was confined to bed and given supportive treatment in addition to large doses of penicillin and sulfadiazine. Chemotherapy was discontinued after 10 days. During the last 4 days of treatment his temperature was normal. Three aspirations of the joint yielded from 60 to 120 cc. of thick sterile pus. Aspiration of the joint gave much relief from symptoms.

On the fourteenth day he had a low-grade spiking temperature, and chemotherapy was resumed and continued for 2 more weeks; during the last 9 days he was afebrile. At the end of the third week,

because of an increase in his leg deformity, traction was applied with the leg in extension, external rotation, and adduction. This was maintained until the end of the sixth week. Serial roentgenograms were taken throughout the course of hospitalization and demonstrated progressive joint changes starting about the eleventh day. At the end of the sixth week, physical therapy was begun, and the patient was given hot tub baths and allowed mild activity in a wheel chair. In the eighth week, under pentothal sodium anesthesia, the leg was gently manipulated and a full range of motion without restriction was obtained.

At this time an ischial weight-bearing brace was applied and the patient returned to his school. On 15 September he could bear full weight on the leg and had full range of motion and no symptoms. A follow-up 10 months later, demonstrated some joint changes but he had full range of motion and only occasional mild pain in the hip on long standing or walking.



A Combination of Tar and Antihistaminic for Local Use¹

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FOR many years dermatologists have used coal tar or its derivatives in treating various types of dermatoses. It is considered of particular value in chronic, scaling and pruritic conditions and is usually well tolerated. Within the past few years the antihistaminic compounds have been used locally for the relief of pruritus with good results in many instances.^{2,3} There are reports citing examples of sensitivity to antihistaminic compounds ranging from 1.3 to 6 percent.³⁻⁶ In the main, reactions do not appear to be common. Recently we undertook a clinical trial of a compound (histar) containing 5 percent coal tar extract and 2 percent antihistaminic compound (pyranisamine maleate) in a hydrophilic base.

A total of 52 patients was followed. Previous treatment had extended over a period of roughly from 1 to 10 years producing varying periods of relief but without any extended clinical arrest. The character of therapy in cross section was what one might expect for chronic dermatoses associated with pruritus, and ranged from hit-or-miss home or drug store applications to those of a strict regimen of skin hygiene, soothing applications, or stimulation with tars or their equivalent. Previous roentgenotherapy had been used in a minority of the cases. Epstein's⁷ type of table is used in reporting the results because of its simplicity, i. e., by "good" we mean that the dermatosis and pruritus definitely improved, and by "poor" that there was no appreciable change, or that there was an actual increase in symptoms and a flaring up of the condition.

¹ U. S. Naval Hospital, Philadelphia, Pa.

² SULZBERGER, M. B.; BAER, R. L.; and LEVIN, H. B.: Local therapy with pyribenzamine hydrochloride. *J. Invest. Dermat.* 10: 41-42, Feb. 1948.

³ SHELMIER, B.: Topical treatment with thephorin. *Post-grad. Med.* 4: 443-446, Nov. 1948.

⁴ EPSTEIN, E.: Dermatitis due to antihistaminic agents. *J. Invest. Dermat.* 12: 151, Mar. 1949.

⁵ ELLIS, F. A., and BUNDICK, W. R.: Reactions to local use of thephorin. *J. Invest. Dermat.* 13: 25-28, July 1949.

⁶ LEWIS, G. M.; DAVIS, J.; and WALDRIF, G. A.: Antihistamine therapy in dermatology. (Chart.)

⁷ EPSTEIN, S., and MACAULEY, W. L.: Histadyl cream in treatment of pruritic dermatoses. *J. Invest. Dermat.* 12: 145-146, Mar. 1949.

TABLE 1

Diagnosis	Number of patients	Effect on dermatosis				Effect on pruritus			
		Good		Poor		Good		Poor	
		Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent
Atopic dermatitis	3	3	100	0		3	100	0	
Neurodermatitis	13	7	54	6	46	8	62	5	38
Psoriasis	8	5	63	3	37	5	63	3	37
Pruritus ani	3	2	67	1	33	2	67	1	33
Lichen simplex chronicus	1	1		0		1		0	
Senile pruritus	2	1	50	1	50	2	100	0	
Winter skin	1	1		0		1		0	
Eczema (infantile, contact, et cetera)	16	12	75	4	25	12	75	4	25
Recurrent herpes simplex	1	1		0		1		0	
Bacterial ids	1	1		0		1		0	
Impetigo of face	1	1		0		1		0	
Sycosis vulgaris	1	1		0		1		0	
Diaper rash	1	1		0		1		0	
Total	52	37	71	15	29	39	75	13	25

RESULTS

As shown in table 1, 71 percent of the patients showed good results with regard to improvement in their dermatosis and 75 percent good results in relief from their pruritus. This parallelism alone is interesting. Some of those showing no improvement in their dermatoses complained that the ointment was too drying. Two patients with psoriasis were in a state of generalized exfoliative dermatitis and poor results were expected because they were generally sensitive to even the mildest types of medication. One patient with eczema experienced no change in his condition; one cleared about 90 percent within 2 weeks and then relapsed, and 2 were definitely worse after using the ointment for only 24 hours.

Nine of the patients originally treated with the compound under investigation were later given a trial of therapy using the same ointment but without the antihistaminic. The patients with generalized exfoliative dermatitis following psoriasis could not tolerate either compound. One patient with nummular eczema and one with neurodermatitis showed initial improvement with the first compound then relapsed and experienced no relief when tried with the tar ointment only. One patient with neurodermatitis noted no change with the use of either ointment. Two patients with generalized psoriasis, one with atopic dermatitis, and one with senile skin all experienced marked improvement with the antihistamine-tar ointment and from moderate to no improvement with the ointment containing only tar. Three of these patients requested to be put back on the original ointment after 48 hours of using the tar ointment. Examination of patients who could not tolerate the ointment or who experienced poor

results revealed none in whom sensitivity could be considered to have developed. Sensitization or irritation caused by lanolin has been noted in one and by the tar component in another patient.⁸ Patch tests with a combination of tar and antihistaminic were negative.

According to Obermayer and Becker,⁹ coal tar has antipruritic, antiacanthotic, vasoconstrictive, keratoplastic, and antiparasitic effects, with the exact constituents or group of constituents of the tar responsible for the therapeutic effect not being completely determined. Lewis, Davis, and Waldriff⁶ considered the effects of antihistaminics when applied locally to be procainelike in nature. From what we have observed in comparison with the fairly predictable response to be expected from preparations of coal tar alone, the tar and the antihistaminic combination is about 20 percent more effective than the tar alone. No curative value as such is apparent other than that which might be expected to follow from a more prompt relief of the pruritic element.

SUMMARY

Of 52 patients treated with an ointment combining a crude coal tar extract and an antihistaminic compound, 71 percent experienced a good effect with regard to their dermatoses and 75 percent experienced good results in relief of pruritus. None developed sensitivity to this compound, although such a reaction could be expected occasionally in a larger series. No incompatibilities were demonstrated when the combination was used in those conditions in which crude coal tar or its derivatives are considered to be of value. Crude coal tar extract and antihistaminic substances when used locally appear to have a synergistic action, and the combination appears to be more effective than the use of tar alone.

⁸ KILE, R. L.: Personal communication.

⁹ OBERMAYER, M. E., and BECKER, S. W.: Study of crude coal tar and allied substances; preliminary report. *Arch. Dermat. & Syph.* 31: 796-810, June 1935.



Antabuse Therapy in the Army

A Preliminary Report of Fifty Cases¹

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THE soldier in all times has been assailed by enemies far more deadly than those who come merely to test his armor. Among the most deadly of these foes is alcohol. Alcoholism with its manifold implications exists as a barrier to the best effectiveness of any army, and presents a serious obstruction in the care of its veterans. It follows that effective treatment of alcoholism in the Armed Forces is of importance not only to these Forces, but also to the nation which they serve. The new drug, antabuse,³ has been reported enthusiastically in the treatment of alcoholism. Our culture demands that new therapeutic agents be put to use quickly and on a large scale, thus limiting the time for their complete evaluation. It is believed that even in the best hands antabuse presents intrinsic dangers, and that the wide dissemination of preliminary findings concerning its use is indicated. This article concerns initial work in the first 50 patients treated with antabuse at this hospital.

ALCOHOL AND THE SOLDIER

Historical and traditional considerations.—The Surgeon General of the Army, in his discussion of sickness and mortality in the Army of the United States during the 10-year period 1829 to 1838 inclusive, reported: "The dreadful effects induced by inebriation have been shown in the details of each post * * *. Its agency, directly or indirectly, in the causation of phthisis pulmonalis and epidemic cholera, has been abundantly pointed out and its intimate connection with febrile diseases, diarrhea and dysentery, and hepatitis, although not definitely determined is so apparent that it is constantly dwelt upon in the reports of medical officers * * *. These are not, however, the only deaths arising from drunkenness * * *." ⁴

¹ Received for publication June 1950.

² Fitzsimons Army Hospital, Denver, Colo.

³ Antabuse supplied for research purposes through courtesy of Ayerst, McKenna and Harrison.

⁴ ASHBURN, P. M.: A History of the Medical Department of the United States Army. Houghton Mifflin Co., Boston, Mass., 1929.

That alcohol did not escape the attention of those historians compiling the activities of the Medical Department during the Civil War is attested by the statement under a section of their work entitled "Alcoholism": "Under this term may be included the statistics of inebriation, delirium tremens, and chronic alcoholism." They have also included a statistical graph showing such incidences among white and Negro troops. The Army of the Potomac, during the year ending 30 June 1862, three-fourths of which was spent in the immediate vicinity of Washington, recorded an admission rate of 5.3 cases per 1,000. During its years of active service, ending 30 June 1863, 1864, and 1865, the admission rates for alcoholism were 1.5, 1.8, and 0.8 respectively, for 1,000 troops. It is significant that they refer to the conditions of alcoholism as a "sickness."⁵

Following the last Indian War, and the Battle of Wounded Knee in 1890, a medical officer wrote to General Southerland from Fort Riley: "The post surgeon is skeptical as to the sanitary value of the canteen. He has treated more cases of alcoholism and has sewed up more cut heads in a given time since its establishment than previous, and this does not argue in its favor."⁴

The annual report for the fiscal year of 1897, which covered the earlier part of the Spanish-American War, revealed the admission rate for alcoholism to be 27.86 per 1,000 enlisted men.⁴

Our historians, in their writings of the First World War, presented more detailed statistics of the incidence of alcoholism among our troops, the admissions covering the period from 1 April 1917 to 31 December 1919, being 1.18 per 1,000 men. This rate did not include those cases classed as alcoholic psychoses, the rate for which was 0.14 in the same period. They made this significant statement: "It must be understood that, as used here, the term 'alcoholism' signifies more than intemperance, and the term 'alcoholic', more than a drinking man." Great emphasis was placed by these writers on another enemy of the fighting man, when they showed tables comparing the incidence of venereal disease with that of alcoholism.⁶ The national prohibition of alcohol exerted its influence on the soldier: "It has influenced the Army life and may influence it still more in the future. It cannot be wholly ignored in any history of the times * * *. On November 21, 1918, Congress passed the War Prohibition Act, which forbade until the completion of demobiliza-

⁵ The Medical and Surgical History of the War of the Rebellion. Part 3. Vol. I. United States Government Printing Office, Washington, D. C., 1888.

⁶ U. S. Army, Medical Department: United States History of the World War, The Medical Department of the United States Army in the World War. Vol. X. Neuropsychiatry. In the United States by Col. Pearce Bailey, Lt. Col. Frankwood E. Williams, and Sergt. Paul O. Komora. In the American Expeditionary Forces by Col. Thomas W. Salmon, and Sergt. Norman Fenton. United States Government Printing Office, Washington, D. C., 1929.

tion the sale for beverage purposes of all intoxicating drinks. This remained in effect until the eighteenth amendment to the Constitution became effective."⁴ The admissions per 1,000 men had increased to 10.59 by 1927, which may be considered a reflection of the times. This was the post-bellum era of the "roaring twenties." From 1927 until the repeal of the Prohibition Act in 1933, the figures for admission gradually declined to 5.79 per 1,000 enlisted men.

This continued until a new low of 2.4 was recorded for 1941. The unhappy details for World War II are yet to be recorded in their entirety. Hurst,⁷ said: "Men suffering from the early stages of various war neuroses precipitate their final breakdown by attempting to keep themselves going by means of alcohol." The rates of admission for the war years declined to 1.64 in 1945.

The present problem.—There has been greater realization during and since the last war that the soldier is not only a physiologic fighting machine, but also a thinking, feeling human being who fights best when his psychologic needs are known and implemented. Although there is a conceptual carryover among certain of both line and medical officers who act out aggressive feelings toward the alcoholic, the better informed are carrying out the wartime concept of utilization, rather than condemnation. Many valuable and intelligent soldiers are not fully effective, and may even eventually completely destroy their usefulness through overindulgence in alcohol. The elimination of the unfit is a relatively simple administrative procedure, but the replacement of an intelligent, experienced, otherwise valuable alcoholic officer or enlisted man is a different matter. In the past a compromise has been made in each case, weighing the man's assets and training against his absence from duty, real and potential poor judgment, undependability, and effect on morale. Any increase in the salvage rate of these men through treatment with antabuse would help to solve this problem.

PHARMACOLOGY OF THE DRUG

In 1948, Hald and Jacobsen⁸ reported experiments with tetraethylthiuram disulfide (antabuse) in which they found that persons who had ingested this substance and then consumed alcohol showed symptoms which differed quantitatively and qualitatively from the common findings of alcoholic intoxication. Martensen-Larsen,⁹ their coworker, conducted a series of clinical experiments that demonstrated

⁷ HURST, A.; BARBER, H. W.; KNOTT, F. A.; and ROSS, T. A.: *Medical Diseases of War*. 3d edition. The Williams & Wilkins Co. Baltimore, Md., 1941.

⁸ HALD, J., and JACOBSEN, E.: Drug sensitising the organism to ethyl alcohol. *Lancet* 2: 1001-1004, Dec. 25, 1948.

⁹ MARTENSEN-LARSEN, O.: Treatment of alcoholism with sensitising drug. *Lancet* 2: 1004, Dec. 25, 1948.

the intense discomfort experienced by persons on antabuse following consumption of alcohol. They concluded that the drug might be useful in treating alcoholism in that not only was psychologic aversion induced but also physiologic intolerance. Such intolerance to alcohol remained manifest so long as the patient continued to ingest small doses of the drug. Little is known concerning the physiologic action of the drug. It is used in the rubber industry as an antioxidant and in the absence of further experiment which will prove or disprove this hypothesis for physiologic action, it is presumed that the drug acts as an antioxidant in the body with a more or less specific action on alcohol and its derivatives.

The drug is highly insoluble in water, but will form the hydrochloride under optimum conditions. It is soluble in organic solvents such as acetone, alcohol, ether, and benzin in varying degrees, but is not soluble in the fats carried by the blood. Absorption into the system is not known exactly, but there appears to be a blood or tissue level. Rats tested with the drug at this station were given 2.5 mg. per kilogram of body weight for 4 days and then divided into two groups. One group was given alcohol by mouth and the other group an intraperitoneal injection of a sublethal dose of alcohol. In both groups a severe reaction was noted with acceleration of pulse and symptoms of intoxication preceding unconsciousness. None of the rats given antabuse died immediately as a result of this treatment, and all regained consciousness. A control group of antabuse-free rats given only alcohol had milder reactions to the alcohol without the extremely rapid pulse, and none became unconscious. Jacobsen and Larsen reported similar findings with rabbits, and attributed the increased respiratory rate and pulse to the toxic action of acetaldehyde which resulted from the incomplete oxidation of the alcohol. Two comprehensive reviews of the literature concerning both the drug, and its clinical aspects have been published by Jacobsen and Martensen-Larsen¹⁰ and by Glud.¹¹

In man, antabuse alone is relatively nontoxic and no noteworthy effect is observed after single doses of 3 grams, or after doses of 0.25 to 1 gram are taken daily for months, but, when a person taking antabuse ingests alcohol even in small quantities a train of unpleasant symptoms is inaugurated within a few minutes. How far the patient goes into the sequence of symptoms known as "the acetaldehyde syndrome" is largely a function of the alcohol intake, but all patients experience regret even to have started. Usually within from 5 to 10 minutes, the patient complains of a disagreeable warmth or flushing

¹⁰ JACOBSEN, E., and MARTENSEN-LARSEN, O.: Treatment of alcoholism with tetraethylthiuram disulfide (antabus). *J. A. M. A.* 139: 918-922, Apr. 2, 1949.

¹¹ GLUD, E.: Treatment of alcoholic patients in Denmark with antabuse with suggestions for its trial in United States. *Quart. J. Stud. on Alcohol.* 10: 185-197, Sept. 1949.

of the face, which later extends to the neck and upper part of the trunk. These areas gradually become intensely flushed. The skin temperature over these parts is increased. The sclera becomes characteristically injected, and slight edema under the lower eyelids may be noted. During this period, although there is no marked change in the blood pressure, there is an increase in the pulse rate, which may rise to 140. At about 30 minutes both the systolic and diastolic pressures begin to fall. The most rapid and pronounced fall is that of the diastolic, which may drop to 40 or less. The intense flushing is soon replaced by marked pallor and mild cyanosis. The patient complains of dyspnea, sensations of constriction in the throat, tightness and discomfort in the chest, and nausea. This is the peak of the reaction. Profuse vomiting and often severe retching usually terminates the "conditioning situation," and the patient returns to a physiologically normal state within from 1 to 2 hours. Occasionally, the nausea and vomiting may be delayed from 1 to 3 hours following the ingestion of alcohol; but the intense discomfort is uniformly experienced in all subjects.

METHOD OF STUDY

Selection of patients.—The patients selected for this study were chosen from both active duty personnel and veterans who exhibited serious alcoholic problems. In all instances they were free from psychosis, well motivated, and insofar as it was possible to ascertain, relatively free from marked psychopathy. It seemed wise not to entrust this drug to a class of patients who are distinguished for their lack of forethought and sense of responsibility. The self-referred patients appeared to be sincere in their desire to recover from their illness, and appeared to be cooperative and well motivated for the treatment which had been discussed with them in detail. Certain patients referred by their commanding officers showed considerable motivation.

The patients under discussion routinely experienced these stages of treatment: (1) open ward, (2) closed ward, (3) open ward, (4) out-patient. On initial admission the patient was placed in the open section of the neuropsychiatric service for preliminary studies which included interview, physical and neurologic examination, psychologic and psychometric evaluation, and laboratory tests. If the patient was in an intoxicated state at the time of admission, he was admitted to the closed section for detoxification and "drying out" procedures. The generous use of modified insulin, with an abundance of nourishing food, routinely produced a dramatic improvement in the debilitated alcoholic within a relatively brief period. This preparation of the subject is most important in order that he be in optimum

physical condition prior to his treatment with antabuse, bearing in mind that rather violent responses and reactions to the drug are not unknown. The patient must have been abstinent from alcohol for at least 7 days before the beginning of treatment. That this also applied to paraldehyde, if such had been used for sedation, may be appreciated, because paraldehyde, being a polymer of acetaldehyde, gives a positive reaction to tests for acetaldehyde.

In any event, the 4-day period from the initial dose of antabuse to completion of the first drinking trial was spent on the closed ward. It was believed advisable to cause the patient to have his first drinking trial under ideal, rather than either fortuitous or clandestine, conditions. Parenthetically we did encounter some whose pride was injured by our evident lack of faith in their ability to keep their word in regard to drinking. The patient was returned to the open ward after his first drinking trial, and after his second was discharged from the hospital with a 7-day supply of antabuse. Routinely, patients reported at weekly intervals for their supply of the drug, and active duty personnel were afforded group or individual psychotherapy in accordance with our plan of study.

Laboratory procedures.—The laboratory clearance of patients scheduled for treatment with antabuse provided maximal protection to the patient and secured as much related information as possible. It was desired to learn as much as practicable of the physiologic response during the reaction. Furthermore, it was necessary to determine the minimal, economical, safe, standard routine for patient clearance for antabuse therapy with an eye to the future. Because of the potential violence of the reaction experienced by patients during drinking trials, several possible contraindications for treatment were considered. Any condition which results in general dysfunction or which has left the patient in a generally debilitated condition should be carefully considered before treatment with antabuse is begun. This treatment was considered to be contraindicated in patients with cardiovascular disease, epilepsy, advanced cirrhosis of the liver, diabetes mellitus, and thyroid dysfunction. Antabuse treatment in patients with these diseases was considered worthy of investigation, but it was thought wise to defer any investigation of these patients until we had accumulated experience with more healthy and robust patients.

Electrocardiogram, electroencephalogram, BMR, complete blood count, urinalysis, bromsulfalein retention, glucose tolerance, urine concentration-dilution tests, carbon dioxide combining power, and blood acetaldehyde level determination have been routine pretreatment laboratory tests. Bromsulfalein retention was adopted as a screening test for liver damage because only advanced cirrhosis is considered to affect the detoxifying power of the liver to the point at which this

type of treatment might have serious consequences. Laboratory methods employed were those given in TM 8-277, U. S. Army, "Methods for Laboratory Technicians," October 1946, with the exception of acetaldehyde determinations which were made by the Stotz¹² method.¹³ Laboratory follow-up of patients was scheduled after 6 months on the drug in an attempt to determine whether or not there were any long term organic changes from the drug which might make its use undesirable in prolonged treatment, and to repeat work by Hald and Jacobsen. They reported that some patients were given 0.6 gram daily for several months without subjective or objective symptoms apart from those following the ingestion of alcohol.⁸

Psychiatric procedures.—Each patient was subjected to psychiatric interview and evaluation procedures, including psychologic testing. The details of this are not germane to this article since the psychiatric findings are the subject of a related study. No effort was made to delay antabuse treatment for this work-up because speed of processing and return to an effective status was desired. Furthermore it was believed that psychiatric study in detail could well be undertaken when the patient gained out-patient status.

Technic of conditioning.—All patients were transferred to the closed ward for the initial administration of antabuse which was for a period of 4 days. The drug was given on the following schedule at bedtime: First day, 2 grams; second day, 1.5 grams; third day, 1 gram; fourth day, 0.5 gram. Patients must be given antabuse for about 4 days prior to their first drinking trial in order to develop their primary intolerance. This so-called trial is the patient's initial contact with alcohol following the ingestion of the drug and is indeed an educational experience. It is at this time that the patients experience the disagreeable symptoms of the acetaldehyde syndrome.

Breakfast was withheld on the fifth day and the patients were moved to the "conditioning room." The blood pressure, pulse, respiration, and temperature were recorded and the patient was then given 30 cc. of 100-proof whisky. Within 5 minutes, the subjective and objective symptoms that have been described were observed almost uniformly in each subject. At the peak of the reaction, most extreme discomfort was reported and was followed generally by nausea and vomiting usually within an hour. As a rule, it was not necessary to give any more than 30 cc. of whisky to produce this effect; but it was necessary to give a few patients from 15 to 30 cc. more in order to secure a reaction of sufficient severity to produce the desired aversion.

¹² STOTZ, E.: Colorimetric determination of acetaldehyde in blood. J. Biol. Chem. 148: 585-591, June 1943.

¹³ This test is extremely sensitive to any impurities and must be very carefully performed.

Furthermore, the aversion was found to be intensified and the peak of reaction more quickly achieved by following the initial dose of whisky with from 5 to 10 cc. of various other beverages such as wine, gin, rum, brandy, and warm beer. The administration of these additional beverages in small quantities is desirable inasmuch as the subject is thus afforded an opportunity to develop a distaste for intoxicants other than whisky. It was determined through experience, that the patient should not be given more than 60 cc. of whisky or its alcoholic equivalent in other beverages. Any amount in excess of this served no purpose other than to intensify the reaction to the point of shock which in some instances proved alarming. In such cases, it was found that the administration of oxygen usually promptly relieved these symptoms. Occasionally, a patient was given saline infusions and supportive drugs. The most dramatic, as well as the most alarming, feature of such patients was the rapid fall in both systolic and diastolic pressure along with a rapid, thready pulse accompanied by cyanosis and other signs of vasomotor collapse. This may be obviated by the exercise of caution in the administration of the beverages. Such complications in a drinking trial must be attributed to the amount and rapidity of ingestion of alcohol in an unusually sensitive person.

Following recovery from the first drinking trial, the patients were transferred to the open ward and maintained on a dosage of 0.5 gram of antabuse daily. It was found that about 50 percent of the total number of patients studied in this series complained of fatigue and drowsiness if given the drug during the day. This was obviated by administering it at bedtime. On the eighth day, the patients were returned to the conditioning room for their second, and final drinking trial. This was identical with the first, except that only 20 cc. of whisky were given. Patients experienced the initial sensations of warmth and flushing, but the reaction rarely progressed to the stage of nausea and vomiting. Little variation in blood pressure was noted, although the characteristic feeling of constriction of the throat and tightness in the chest was common. Some elevation of the pulse rate and an increase in respiration was also uniformly seen. Within an hour, the patients had completely recovered from their second conditioning experience with alcohol. None of these patients desired even the diminished dose of whisky on the eighth day, and some vehemently voiced their objections. The patients were then considered to be adequately conditioned and were discharged to an out-patient status. Each patient was given a 1-week supply of antabuse with instructions to continue on a maintenance dose of 0.5 gram nightly. He was also instructed to return to the hospital at weekly intervals for a follow-up interview and a new supply of the drug.

FINDINGS

Laboratory.—Pretreatment laboratory screening of patients yielded essentially negative results even in patients with a long history of alcoholism. Glucose tolerance tests, blood counts, urinalyses, and concentration-dilution tests were all within normal limits. None of the patients checked showed more than 4 percent retention of bromsulfalein in 45 minutes. This was interesting in view of the popular belief that excessive drinking ultimately results in extensive liver damage.

During the drinking trials, blood samples were taken at the peak of the reaction, established at the time the vasomotor changes were at their height as evidenced in the transition from flushing to pallor to cyanosis, and the blood pressure was at its lowest point. This was commonly found to be immediately prior to the patient becoming nauseated and vomiting. The findings in these patients closely parallel the findings of Hald and Jacobsen,¹⁴ and Larsen,¹⁵ in that there was an abrupt increase in acetaldehyde, apparently dependent on the blood alcohol level and the intake of alcohol during the drinking trial. In the first drinking trial when the patient was given from 30 to 60 cc. of 100-proof whisky, the acetaldehyde level was about 50 percent greater than on the second drinking trial when he was given about half the initial dose of whisky. For the method of Stotz, an acetaldehyde level of less than 100 micrograms per 100 cc. is within the normal range. Fasting acetaldehyde levels of patients covered in this report ranged from 63 to 383 micrograms per 100 cc. (average 159) for patients processed. During the first drinking trials, acetaldehyde values ranged from 305 to 2,844 micrograms per 100 cc. (average 695). Second drinking trials yielded values ranging between 305 and 627 micrograms per 100 cc. (average 411). It was found that the increase in acetaldehyde level closely paralleled the increase in that of the blood alcohol.

Levels for blood alcohol ranged from 0.5 to 1. mg. per cc. at the peak of reaction. With few exceptions patients were given the same dose of alcohol; therefore, the rate of absorption and individual detoxifying power appear important in the elimination of acetaldehyde and prolonging the time required for a patient to reach the reaction peak. In all patients there was a drop in carbon dioxide combining power during reaction. The average drop ranged from 10 to 20 points below the pretreatment value.

Clinical.—The therapeutic results, shown in figure 1, are on our first 50 patients, because they have been under treatment for over 6 months.

¹⁴ HALD, J., and JACOBSEN, E.: Formation of acetaldehyde in the organism after ingestion of antabuse and alcohol. *Acta. Pharmacol. et Toxicol.* 4: 305-310, 1948.

¹⁵ LARSEN, V.: Effect on experimental animals of antabuse in combination with alcohol. *Acta. Pharmacol. et Toxicol.* 4: 321-332, 1948.

With the passage of time there is attrition within the group of abstainers and to include the seemingly better results in our more recent patients would not be justified even in a preliminary report. The group indicated as "lost contact" is not to be construed as treatment failure. Contact was lost usually because the patient underwent social recovery to the extent that he secured a better paying job in another locale. Any patient who fell into the failure group, and then disappeared is still counted as a failure. Many of our patients had repeatedly undergone various therapies for the alcoholism. We have found no reason to believe that failure on other therapies in itself predisposed to failure on antabuse. Our failures have been limited to those best described as pathologic personalities. Conversely, we have found that successful antabuse treatment seems to be a direct function of motivation. In our "treatment success" group there has been considerable economic betterment.

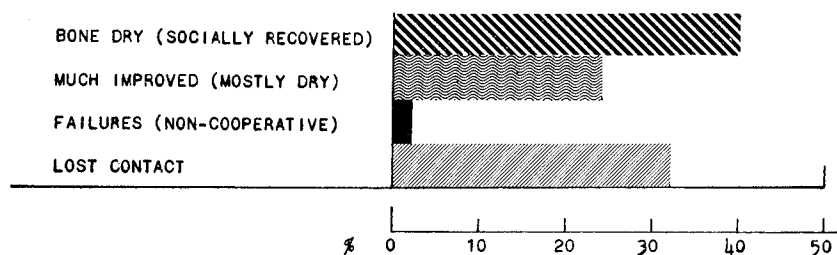


Figure 1.—The results of antabuse treatment on the first 50 patients for a period of 8 months.

Side effects have been minimal, and it is not clear whether they are caused by drug idiosyncrasy, or to psychologic factors. Complaints of fatigue, drowsiness, vague gastrointestinal uneasiness, and headache were usually transient and may be ignored in view of the ultimate goal and the rewards in treatment. Only one patient developed allergic phenomena which appeared as a mild, generalized urticaria following the administration of antabuse. The reaction developed after the first day on the drug, and it was intensified during the first drinking trial. A reduction of his dose, and the administration of pyribenzamine in doses of 50 mg. completely relieved his symptoms which at no time necessitated the abandonment of antabuse therapy. The acetaldehyde syndrome sometimes assumed alarming proportions, often with a drop in blood pressure to the vanishing point. The sine qua non of treatment for this complication was oxygen which was routinely administered as soon as it was believed the patient had been suitably impressed by his experience. It is likely that the lower oxygen tension in this mile-high location has to do both with the alarming reactions, and with the effectiveness of our low maintenance dose.

The older patients showed much more tolerance to the drinking trial as well as much less initial apprehension than did the younger, but there was no correlation between age and blood acetaldehyde level.

A state of classical conditioned reflex does occasionally occur, and we do not overlook this possibility. Several of our patients have remained abstinent over periods of months without the drug. These periods have been occasioned by the patient's inability to return on schedule for his drug, and our almost consistent refusal to provide more than a 7 days' supply. One patient, off the drug for over a month, tested his alcoholic tolerance and claimed he experienced all the subjective manifestations of the acetaldehyde syndrome.

DISCUSSION

In principle, the aversion, or conditioned reflex treatment of alcoholism, is not new to medicine. Such treatment has met with varying degrees of success in the hands of its exponents, but often proves to be not only expensive, but also disappointing. Nonetheless, such therapy has been among the most effective known. Antabuse probably is not a cure for alcoholism. It is generally conceded that in alcoholism we are dealing basically with a psychiatric problem with altered physiology frequently complicated by pathologic changes of varying degrees. Antabuse is to be regarded merely as an adjunct in therapy by which the patient is given a psychologic as well as physiologic aversion to the poison threatening his existence. In time such a "crutch" must be thrown away. The most important phase in treatment is said to lie in the successful application of the best instruments in the armamentarium of the psychotherapist that fit the individual patient. Ultimate recovery of the alcoholic depends on the resolution of his psychologic distortions to the end that he is at harmony with himself and has been enabled to make a reconciliation with the world in which he lives.

Certainly the dynamics of alcoholism are interesting, and just as interesting has been the swing of popular and professional opinion to the point of view that alcoholism is a psychiatric disease rather than any one of a number of other things. The general personality reaction of the alcoholic to withdrawal of his alcohol under closed-ward conditions, even for prolonged periods, has in the past been accompanied by no particularly untoward symptoms, or even by anxiety. This is quite different from the reaction shown by the neurotic when suddenly deprived of his compensatory symptoms, e. g., by hypnosis. In conversations with others concerning the psychiatric implications of antabuse therapy, much concern was expressed that undesirable psychiatric symptoms would almost inevitably occur were the patient rendered physiologically incapable of drinking. This concern, which

we did not share, seemed based on theory rather than on experience. It is believed that antabuse therapy provides opportunity for the study of economically and socially productive alcoholics in their home environment, in a state of abstinence unequalled heretofore except intramurally, and that this opportunity for study may be well repaid in increased understanding of alcoholism.

CONCLUSIONS

The production of the acetaldehyde syndrome by ingestion of alcohol in the antabuse-prepared patient, as reported elsewhere, is verified. At the mile-high altitude of Denver with its reduced oxygen tension the syndrome is produced in patients prepared with small doses of the drug, on the ingestion of from 30 to 60 cc. of 100 proof whisky with a routine violence of reaction not heretofore reported. The administration of oxygen markedly ameliorates the acetaldehyde syndrome at any stage, and may be lifesaving. The treatment regime is potentially dangerous in that the antabuse-prepared patient is subject to developing acetaldehyde in amounts sufficient to produce an acute, severe vascular collapse whenever he drinks alcohol. The alcoholic patient has had his own unique alcoholic experience which usually has led him to believe that his alcoholic prowess is great, and that he can take a few drinks without any acute untoward reaction. In the face of this life experience it is only intravital demonstration that will convince him that he cannot drink while on antabuse. We believe that the danger of fatality can be reduced to a minimum only by carrying out the antabuse build-up period and first drinking experience under closed conditions. Earlier published reports that the acetaldehyde level in the blood parallels that of alcohol are verified. When antabuse is released for general use, it should be strictly on a prescription basis.

It has been my further impression that (1) antabuse therapy provides a partial solution to the problems of alcoholism peculiar to the Army, (2) the antabuse-prepared patient cannot drink, (3) although a certain degree of conditioning is inevitable, and not unwelcome, the prime therapeutic effect is the realization by the patient that he is physiologically intolerant to alcohol, thus taking the problem of abstinence entirely out of the realms of temptation and will power, so that the subject can free his resources from fighting his problem, and use them in constructive efforts towards rehabilitation, (4) antabuse treatment offers an opportunity for an entirely new psychiatric study of the alcoholic, (5) the minimum routine clearance in addition to careful history and physical examination, should consist of cardiac evaluation including EKG, urinalysis, and the bromsulfalein retention test.

Penicillin in Pulpal Therapeutics

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"* * * the best root canal filling is a 'living healthy' pulp."¹

PULP capping in adults has always been considered a hazardous procedure. In general, only those pulps mechanically exposed and occurring in young people are considered as having a chance to survive the capping.

To make a rational approach to the problems of pulpal therapeutics one must consider the pulp in the light of physiologic and histologic findings. The pulp is specialized, highly vascular, connective tissue imprisoned in unyielding walls of dentine. The vascular and nervous elements find entrance and egress through the constricted apical foramen. The surface of the pulp is differentiated from the rest of the pulp by a single layer of modified connective tissue cells (odontoblasts) from which fibrils (Tomes' fibers) extend through the dentinal tubules to the dentino-enamel junction. Newly formed predentin is adjacent to the odontoblasts.

The pulp forms and nourishes the dentin; it responds to thermal, chemical, or electrical stimuli.

A persistent belief among dentists is that once the pulp is exposed it is doomed and if exposed as a result of caries it is doomed beyond any doubt or question. This belief contradicts the histopathologic findings.

The dental pulp, like other organs in the body, is focally involved by an infection before the infection proceeds to general involvement. A focal infection, however, may evoke a pulpal edema sufficient to strangulate the thin-walled venules so rigidly imprisoned in the root canal. Liquefactive necrosis or gangrene is the unhappy result.

Bacteriologic studies of caries-affected areas of teeth have variously demonstrated *Streptococcus pyogenes* and *Str. brevis*, *Staphylococcus aureus* and *Staph. albus*, gram-positive diplococci, *Str. viridans* and gram-positive and negative bacilli.

The histopathologic findings suggest that many pulps mechanically or cariously exposed are amenable to treatment which is (1) non-

¹ OTTOLENGUI, R. : Dental Items of Interest 41: 1919.

irritating; (2) bacteriostatic, germicidal, or antibiotic; (3) encourages healing; (4) permits the tooth to remain functional and vital; and (5) does not interfere with the eventual restoration of the tooth.

The antibiotics are the most rational to use. Penicillin, the antibiotic used by the author, is highly effective against the common invaders of the dental pulp.

In the early months of the study, the criteria set up as contraindicating pulp capping were (1) roentgenographic evidence of periapical infection, (2) negative vitality test, and (3) history of *repeated*, sustained attacks of pulpitis.

The pulp cappings were routinely performed immediately following *complete débridement of the caries*. Local anesthesia was an invaluable aid in keeping the patient comfortable and cooperative.

Technic.—Decay is completely removed from the cavity until sound dentin is reached. *The ingrained fear of making an exposure must be overcome* and the decay completely eliminated, if, as the x-ray film indicates, the caries extends to the pulp. Hemorrhage from the pulp is seldom extensive and the blood can be absorbed with a cotton pellet and the cavity washed with water. Though sterility is naturally a desirable operating room objective, the fact that the exposed pulp had been bathed in saliva was not considered a contraindication to capping. The tooth is isolated, the cavity washed gently with warm water, and then dried (not desiccated).

A 50,000-unit tablet of penicillin is roughly divided into two portions, then a drop of sterile distilled water (or lime water) is placed over the exposure and the half-tablet of penicillin placed in it, whereupon it will dissolve to provide a maximal concentration of penicillin at the point of exposure. With the remainder of the penicillin tablet a thick mix of zinc oxide, penicillin, and distilled (or lime) water is prepared and the exposure is amply covered. Then, on a clean slab or paper pad, a heavy mixture of zinc oxide and eugenol or zinc oxide, eugenol, and silver nitrate crystals is made and the cavity shaped *to correct contour* for the type of filling it is to receive. This step is essential to avoid disturbing the capping through subsequent operations.

Lime water was used as a solvent in only one-third of the patients treated to avoid a misinterpretation of results and to test (1) the adaptability of the pulp to repair itself and (2) the effectiveness of an antibiotic.

In posterior teeth, a few small crystals of silver nitrate are added while mixing the zinc oxide-eugenol; a hard set is thereby obtained in less than 5 minutes. Gutta percha stopping can safely be placed

over this hard zinc oxide eugenol-silver nitrate base. Forming the base eliminates repeated grinding operations on the tooth and avoids the possibility of disturbing the capping. Place an inlay or amalgam filling within 2 weeks to avoid chemical irritation from the saliva of the exposed cavity margins. Sensitivity to cold may persist for a month or more but eventually disappears.

A capping was considered a failure if severe odontalgia or neuralgia persisted after 24 hours. In a few suggestible patients in whom psychosomatic pain was suspected, acetylsalicylic acid was recommended to combat the neuralgia, and in most cases the pain disappeared in 24 hours.

The ordinary clinical symptoms of pulp disintegration such as a dull ache, sensitivity to percussion, and a sense of elongation or of a persistent neuralgia along the course of nerve supply to the affected tooth have proved to be unreliable. In those 40 or 50 cases in which there were complaints of this nature, the teeth gave normal responses within 60 days. A cooperative attitude of the patient, resulting from his desire to retain the tooth despite transitory discomfort, often made the difference between the success and failure of a capping.

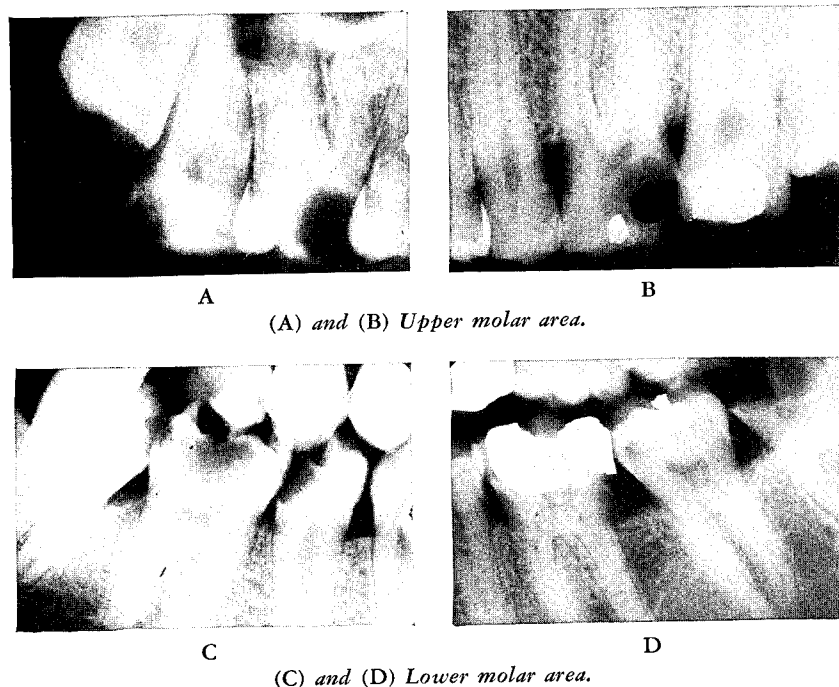


Figure 1.—Roentgenograms of teeth that have been successfully pulp-capped.

Controls were deemed unnecessary in this preliminary work because the most important conclusion would not be the efficacy of penicillin but that pulps exposed by caries can be successfully treated (fig. 1).

The slight variations in technic are also of little consequence other than to demonstrate that a pulp exposed by caries is less critical than is generally supposed.

In a private practice it is difficult to check every case or even 75 percent of the cappings placed in the last 2½ years; nevertheless, pulp tests have been made on recall cases and x-ray pictures made to check pulp response (table 1). The pulp response to testing was within normal range.

TABLE 1.—*Results of 205 pulp cappings*

	Months elapsed since pulp capping												Total
	3	6	9	12	15	18	21	24	27	30	33	36	
Cappings performed.....	20	20	19	19	20	16	19	19	16	13	19	18	205
Failures.....	1	0	0	0	0	0	1	0	0	0	1	2	5

	Age groups						Total
	2-12	13-16	17-21	22-25	26-30	31-50	
Cappings performed.....	10	18	34	78	45	20	205
Failures.....	1	1	0	1	2	0	5

SUMMARY

A rational basis for routine capping of pulps infected as a result of caries is stated and the criteria for a pulp capping agent are proposed. The author's technic using penicillin as the antibiotic is presented as clinical evidence of the successful potentialities of pulp capping.



ACTH in the Treatment of Erythroblastosis

Report of Two Cases¹

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REPLACEMENT transfusion is now generally recognized as the treatment of choice in erythroblastosis fetalis. Although we have had excellent results with this procedure, it is not without its limitations and dangers. Technically replacement transfusion may not be available and, if available, it may fail even in experienced hands. Even if the replacement is 90 percent complete, the quality of the remaining antibody is unaltered and the antigen-antibody reaction is only quantitatively reduced. Furthermore, the treatment itself imposes a severe stress on the newborn infant. Ideally a treatment directed toward protecting the infant against the "acquired" hemolytic phenomenon and maintaining the physiologic integrity of the hematopoietic system would be the one of choice. Selye,² Sayers and Sayers,³ Hills et al.,⁴ Thorn et al.,⁵ and others have emphasized the importance of the pituitary-adrenal mechanism in the response to stress. We believed that ACTH might enable the infant better to withstand the severe stress of replacement transfusion which is a prolonged surgical procedure.

The effective use of ACTH in the treatment of acquired hemolytic anemia is a matter of record.⁶⁻⁸ Gardner⁸ reports that during such

¹ Brooke Army Hospital, Fort Sam Houston, Tex.

² SELYE, H.: General adaptation syndrome and diseases of adaptation. *J. Clin. Endocrinol.* 6: 117-230, Feb. 1946.

³ SAYERS, G., and SAYERS, M. A.: Regulation of pituitary adrenocorticotrophic activity during response of rat to acute stress. *Endocrinology* 40: 265-273, Apr. 1947.

⁴ HILLS, A. G.; FORSHAM, P. H.; and FINCH, C. A.: Changes in circulating leukocytes induced by administration of pituitary adrenocorticotrophic hormone (ACTH) in man. *Blood* 3: 755-768, July 1948.

⁵ THORN, G. W.; FORSHAM, P. H.; PRUNTY, F. T. G.; and HILLS, A. G.: Test for adrenal cortical insufficiency; response to pituitary adrenocorticotrophic hormone. *J. A. M. A.* 137: 1005-1009, July 17, 1948, correction 137: 1544, Aug. 21, 1948.

⁶ HILL, J. M.: Personal communication.

⁷ DAMESHEK, W.: Blood Club Third Annual Meeting; ACTH in leukemia. *Blood* 5: 791, Aug. 1950.

⁸ GARDNER, F.: Blood Club Third Annual Meeting; ACTH in leukemia. *Blood* 5: 791, Aug. 1950.

treatment the osmotic and mechanical fragility decrease to normal levels and a fall in the Coombs titer occurs. There is additional indirect evidence of the effect of ACTH on the antigen-antibody reaction. During pregnancy there is an increase in urinary glycogenic-corticoid and ketosteroid excretion⁹ and plasma histaminase.¹⁰ This suggests an increase in maternal ACTH which may protect the fetus in utero from the antibodies of the Rh sensitized mother. The withdrawal of this protection at birth probably accounts for the rapid deterioration of the erythroblastotic infant within a few hours after birth. ACTH then could be expected to accelerate the infant's adrenocortical steroid production and thereby compensate for the loss of the protection afforded by the maternal system. Increase in reticulocytes and thrombocytes in patients receiving ACTH has been mentioned frequently in the literature. Because this literature¹¹⁻¹³ is voluminous and rapidly increasing, no attempt will be made to include a complete review in this preliminary report. In view of these known effects of ACTH, Dr. Joseph M. Hill¹⁴ suggested that its use be combined with replacement transfusion in the treatment of erythroblastosis fetalis. The first patient was so treated with gratifying results. The second was then treated with only ACTH.

MATERIAL AND METHOD

When a patient registers with the prenatal clinic, complete blood typing is included in her initial examination. If she is found to lack the D agglutinin, the blood type of her husband and children are determined as an aid in predicting the Rh type of the fetus. If there is a past history of abortions, stillbirths, or erythroblastosis, the blood is carefully examined for residual Rh antibodies. Qualitative and quantitative tests designed to identify agglutinins, agglutinoids, and crypt-agglutinoids are used.¹⁵ Patients developing atypical anti-

⁹ VENNING, E. H.: Adrenal function in pregnancy. *Endocrinology* 39: 203-220, Sept. 1946.

¹⁰ ROSE, B.; HARKNESS, E. V.; and FORBES, R. P.: 1946 Annual Report of the John and Mary R. Markle Foundation, as quoted by ROSE, B., *Proceedings of the First Clinical ACTH Conference*, MOTE, J. R., editor. The Blakiston Co., Philadelphia, Pa., 1950. p. 69.

¹¹ THORN, G. W.; FORSHAM, P. H.; FRAWLEY, T. F.; HILL, S. R., JR.; ROCHE, M.; STAEHELIN, D.; and WILSON, D. L.: Clinical usefulness of ACTH and cortisone. *New England J. Med.* 242: 783-793, May 18, 1950.

¹² THORN, G. W.; FORSHAM, P. H.; FRAWLEY, T. F.; HILL, S. R., JR.; ROCHE, M.; STAEHELIN, D.; and WILSON, D. L.: Clinical usefulness of ACTH and cortisone. *New England J. Med.* 242: 824-834, May 25, 1950.

¹³ THORN, G. W.; FORSHAM, P. H.; FRAWLEY, T. F.; HILL, S. R., JR.; ROCHE, M.; STAEHELIN, D.; and WILSON, D. L.: Clinical usefulness of ACTH and cortisone. *New England J. Med.* 242: 865-872, June 1, 1950.

¹⁴ Professor of Clinical Pathology, Southwestern Medical School, Dallas, Tex., and Consultant in Clinical Pathology, Brooke Army Hospital, Fort Sam Houston, Tex.

¹⁵ HILL, J. M.; REID, A. F.; and HABERMAN, S.: The Rh antibody problem; differentiations of agglutinins, agglutinoids, and cryptagglutinoids. *Texas State J. Med.* 45: 477-481, July 1949.

bodies are carefully followed during their confinement. At delivery the cord blood is immediately examined for the presence of adsorbed antibodies using the Coombs rabbit anti-human-globulin serum of known potency (the Coombs developing test).¹⁶ If there is a three or four plus agglutination, replacement transfusion is immediately undertaken. The clinical condition of the infant, the amount of anemia, the differential blood count, the serum bilirubin, and the type of antibody developed in the mother all are considered in the choice of therapy if the Coombs developing test on the cord blood is one or two plus. We perform replacement transfusion through the umbilical vein, using a small plastic cannula. The cannula is connected with a two-lever three-way stopcock which permits giving and taking blood in measured amounts. Fresh ABO type-specific, compatible Rh-negative blood is used. Depending on the amount of anemia at birth an initial increment of blood is given and then alternately 10 cc. of blood is given and taken until a total of 1,000 cc. has been withdrawn and replaced.

CASE REPORTS

Case 1.—The mother of this infant was a gravida V, para IV. The last child delivered of this mother had definite erythroblastosis and was treated with small transfusions. This child now has kernicterus. By the sixth week of this pregnancy an antibody of the blocking agglutinoid type was demonstrated in the mother's serum at a titer of 1:32. During her pregnancy the titer varied from 1:128 to 1:512 at term, and at the time of delivery it was 1:256. The blood type of the mother was "O" cde/cde (Rh negative); that of the father was "O" CDe/CDe (Rh positive, homozygous); and that of the siblings and patient was "O" CDe/cde (Rh positive, heterozygous). A 7-pound female infant was delivered uneventfully.

Examination of the cord blood revealed a red blood cell count of 1,800,000 with 100,000 nucleated cells per cu. mm. of which 17 percent were normoblasts and late erythroblasts; 6.5 grams of hemoglobin per 100 cc.; and 9.5 mg. of serum bilirubin per 100 cc. The Coombs developing test was three plus. The infant was pale and obviously jaundiced. The liver was palpable 1.5 cm. and the spleen 3 cm. below the costal margin. The infant was given 12.5 mg. of ACTH. One hour after delivery replacement transfusion of type "O" cde/cde blood was started through a polyethylene catheter inserted into the umbilical vein. When, at the end of 3 hours, only 320 cc. of blood had been given and 160 cc. had been withdrawn, the procedure was discontinued because of technical difficulties. After the transfusion the

¹⁶ COOMBS, R. R. A.; MOURANT, A. E.; and RACE, R. R.: In-vivo isosensitisation of red cells in babies with haemolytic disease. *Lancet* 1: 264-266, Feb. 23, 1946.

hemoglobin had risen to 9 grams per 100 cc. ACTH in doses of 12.5 mg. per day was given for 4 days, then 8.3 mg. were given daily for 3 days. Hematologic examinations were made at 6-hour intervals.

The following morning the child was given 35 cc. of packed red blood cells, type "O" cde/cde after which the hemoglobin was 10 grams per 100 cc. During the succeeding days the hemoglobin rose to 16 grams per 100 cc. without further transfusion. The nucleated cell count dropped from 100,000 to 15,600 by the fifth day. The percent of nucleated cells identified as normoblasts dropped from 50 percent to zero by the fifth day. On the third day the Coombs developing test was negative. Clinically the infant did well. There was some abdominal distention which responded well to potassium chloride given orally. At 7 days of age the jaundice was markedly reduced and the spleen tip was barely palpable. The liver remained palpable 2 cm. below the costal margin.

Case 2.—The mother of this patient was a gravida VII, para VI. The last child delivered of this mother, in January 1949, had definite erythroblastosis. He was treated at this hospital by replacement transfusion and made a complete recovery. During the third month of this pregnancy an antibody of the blocking agglutinoid type was demonstrated in the mother's serum at a titer of 1:128. During her pregnancy the titer varied from 1:64 to 1:384, but there was no increase during the seventh or eighth month as is often observed. During the eighth month an agglutinin of weak titer was found but this had disappeared 3 weeks before delivery. The blood type of the mother was "A" cde/cde (Rh negative); that of the father was "B" CDe/CDe (Rh positive, homozygous); that of 4 siblings was "A" CDe/cde (Rh positive, heterozygous); and that of one sibling was "B" CDe/cde (Rh positive, heterozygous). An 8-pound 11-ounce female infant was delivered uneventfully.

Examination of the cord blood revealed a red blood cell count of 2,000,000 with 8 grams of hemoglobin per 100 cc. and 80,000 nucleated cells per cu. mm. of which 50 percent were normoblasts, with some late erythroblasts and occasional early erythroblasts. The Coombs developing test was four plus. There was a slight icterus at birth. Both the spleen and liver were palpable 3 cm. below the costal margin. The infant was given 12.5 mg. of ACTH. This produced a drop in the eosinophils (Randolph's method)¹⁷ of from 460 to 260 per cu. mm. in 4 hours, indicating good adrenal response. During this time the red blood cell count increased to 3,000,000 with 14 grams of hemoglobin per 100 cc. The count of nucleated cells increased to 124,000

¹⁷ RANDOLPH, T. G.: Blood studies in allergy: direct counting chamber determination of eosinophils by propylene glycol aqueous stains. *J. Allergy* 15: 89-96, Mar. 1944.

per cu. mm., 84 percent of which were nucleated erythrocytes. ACTH therapy was continued in doses of 12.5 mg. at 12-hour intervals for 3 days, then 8.5 mg. every 8 hours for 2 days, and finally 6.25 mg. every 8 hours for 40 hours. Hematologic examinations were made at 6-hour intervals. There was no increase in icterus and by the seventh day it had disappeared. The erythrocyte count stabilized at 3,500,000 and the hemoglobin at 12 grams per 100 cc. The Coombs developing test gradually decreased to a trace of adsorbed antibody by the seventh day. The nucleated cell count dropped to normal by the third day largely as the result of a reduction of developing erythrocytes. Platelets, which were sparse at first, gradually increased to normal during the first 36 hours. Throughout the entire period of ACTH therapy the eosinophil count remained low, indicating a satisfactory physiologic response to ACTH. Clinically the infant did extremely well. There was some abdominal distention which responded to potassium chloride given orally. By the fifth day the spleen could not be palpated. The liver, however, remained palpable 2 cm. below the costal margin.

COMMENT

Conclusions cannot be drawn from two cases but the results are encouraging enough to warrant further trial since Potter¹⁸ has reported mortality rates as high as 90 percent in erythroblastotic infants delivered of mothers whose reproductive histories are similar to those recorded here. Further studies are being undertaken in collaboration with other Army hospitals in order to accumulate a series sufficiently large to be statistically valid. It is recommended¹⁹ that ACTH be administered in a daily dose of 25 mg. for the average newborn. This amount should be given in four equal doses at 6-hour intervals.

¹⁸ POTTER, E.: Reproductive histories of mothers of 322 infants with erythroblastosis. *Pediatrics* 3: 318, 1949.

¹⁹ MORE, J. R.: Personal communication (Armour & Co.).



Hernia of the Lung

Report of a Case

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HERNIA of the lung is an uncommon condition, less than 200 cases having been reported in the literature up to the present time. The condition may be either congenital or acquired. The congenital type represents a lack of development of part of the chest wall. The acquired type may result from: (1) direct trauma to any part of the thoracic cage causing a prolapse of the lung through the wound without an intervening pleural sac (false hernia); or (2) forcible expiratory efforts causing the pleura to herniate through a weak area (true hernia) in (*a*) Sibson's fascia in the superior aperture of the thorax,¹ (*b*) the diaphragm, or (*c*) the anterior or lateral walls of the thorax. The true type of hernia subsequent to forcible expiratory effort is observed in glass blowers, players of wind instruments, and in patients with chronic cough.²

The following case represents herniation of the lung through the superior aperture of the thorax associated with prolonged forceful expiratory efforts.

CASE REPORT

A 4½-year-old white boy was referred for investigation of a large swelling of the right side of the neck. This enlargement appeared only while the child was blowing balloons, simulating the sound of a fire siren, or forcibly laughing. His mother stated that he had been inflating balloons and plastic toys for the past 7 months. A small swelling was noted on the right lateral aspect of the patient's neck 2 months earlier while "blowing balloons." His parents became concerned only when the swelling began to increase in size. There were no other complaints and no history of chest injury.

¹ GRAY, H.: *Anatomy of the Human Body*. 24th edition. Lea & Febiger, Philadelphia, Pa., 1944. p. 1109.

² CHRISTOPHER, F.: *Textbook of Surgery*. 3d edition. W. B. Saunders Co., Philadelphia, Pa., 1944. p. 948.

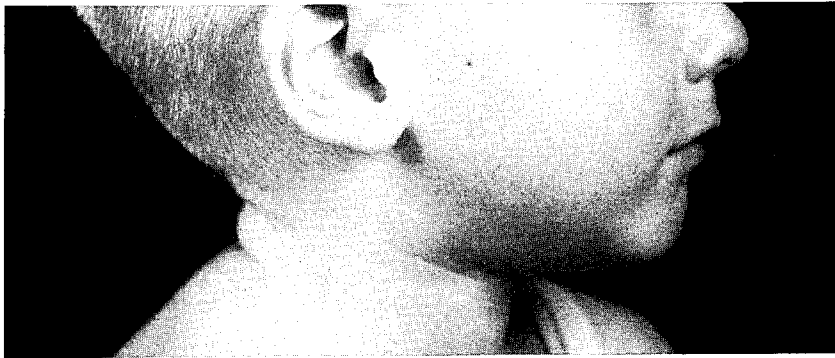


Figure 1.—Normal appearance of child during normal respiration.

Examination revealed a healthy, alert, afebrile child (fig. 1). During forceful expiration a large bulge was clearly demonstrated which completely filled and protruded the entire right anterior triangle of the neck (fig. 2). There was no cervical lymphadenopathy or palpable subcutaneous crepitation. No evidence of embryonic remnants was observed. The nasopharynx, larynx, and esophagus were normal. Routine laboratory examination was negative. Roentgenograms of the chest and soft tissues of the cervical region clearly illustrated the mechanism involved.

The herniation of the apex of the right lung was best demonstrated in the lateral projection on forced expiration. In figure 3 the apex



Figure 2.—Herniation through the superior aperture of the thorax demonstrated on forced expiration.



Figure 3.—Lateral view of cervical soft tissues on forced expiration showing herniation of the apex of the lung through Sibson's fascia.

of the lung is seen to compress the cervical tissues superiorly, resulting in the cervical bulge noted clinically. On suspended respiration the soft tissues of the neck appeared to be normal (fig. 4). The anteroposterior studies demonstrated displacement of the trachea to the left on forced expiration. It is not unusual to visualize the lung apex in lateral projections in which it is seen to overlies the cervical spine and esophagus.³ In this patient the herniation is anterior and displaces the trachea as a result of the weakness in Sibson's fascia.

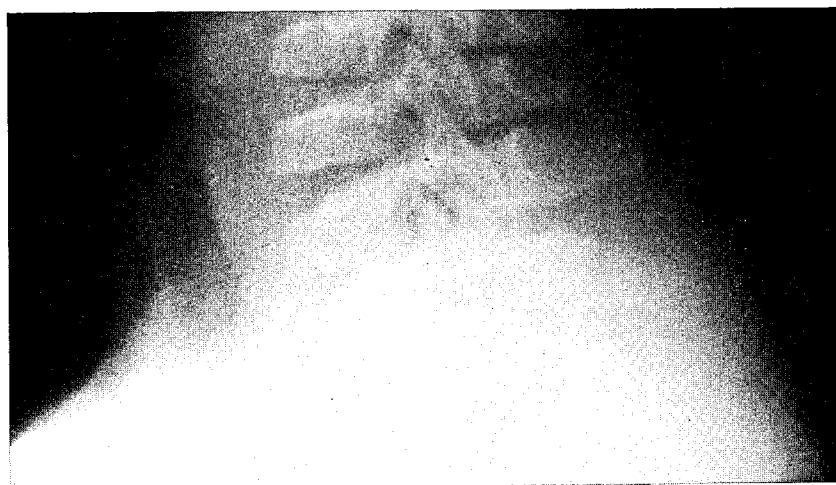


Figure 4.—Lateral view of cervical soft tissues on suspended respiration. No abnormalities demonstrated.

³ PANCOAST, H. K.; PENDERGRASS, E. P.; and SCHAEFFER, J. P.: *The Head and Neck in Roentgen Diagnosis*. 2d printing. Charles C Thomas, St. Louis, Mo., 1942. p. 798.

COMMENT AND CONCLUSIONS

A case of true hernia of the lung through a weak area of the superior aperture of the thorax (Sibson's fascia) in a child subsequent to forcible expiratory efforts has been presented. This type of cervical enlargement is an additional entity which must be considered in the differential diagnosis of neck swellings.



Analysis of Fatal Cases of Diphtheria

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DIPHThERIA was a major problem among military personnel in World War II, as a result of the introduction of large numbers of troops into the European Theater where the endemic rate was high.² The incidence of diphtheria among troops outside the United States was about six times that among troops within the United States in 1944 and 1945.³ The incidence in troops compared with that in the total population is shown in table 1. Diphtheria in its etiologic, diagnostic, and therapeutic aspects, has been covered in the literature⁴⁻⁹ and this article is concerned with the statistical analysis of

TABLE 1.—Incidence of diphtheria in U. S. Army¹ compared with United States²

Year	Number of cases		Deaths		Percent mortality	
	U. S.	U. S. Army	U. S.	U. S. Army	U. S.	U. S. Army
1940.....	15,536	23	1,467	0	9.5	0
1941.....	17,987	103	1,262	0	7.0	0
1942.....	16,260	188	1,246	1	7.5	0.53
1943.....	14,811	651	1,170	10	8.0	1.5
1944.....	14,150	1,611	1,145	22	8.0	1.4
1945.....	18,669	3,826	1,528	87	8.5	2.3
1946.....	16,354	2,315	1,259	36	8.0	1.5
1947.....	12,405	424	799	4	6.0	.95

¹ From Weekly Summary Reports; tabulations of individual medical records; and data 1940-41 from Annual Reports of Surgeon General, U. S. Army.

² From Public Health Service.

³ Tripler Army Hospital, Honolulu, T. H.

⁴ STOWMAN, K.: Epidemic outlook in Europe. *Epidemiol. Inform. Bull.* 1: 101-111, Feb. 15, 1945; also, *J. A. M. A.* 128: 185-188, May 19, 1945; also, *Brit. M. J.* 1: 742-744, May 26, 1945.

⁵ GORE, I.: Myocardial changes in fatal diphtheria; summary of observations in 221 cases. *Am. J. M. Sc.* 215: 257-266, Mar. 1948.

⁶ COOPER, K. E.; HAPFOLD, F. C.; MCLEOD, J. W.; and WOODCOCK, H. E. DE C.: Review of observations which have accumulated with regard to significance of diphtheria types in last 4 years, 1931-35. *Proc. Roy. Soc. Med.* 29: 1029-1054, July 1936.

⁷ ZINNEMANN, K.: Toxin production by 3 types of *C. diphtheriae*. *J. Path. & Bact.* 55: 275-283, July 1943.

⁸ VAN SPANJE, A. J. H.: Importance of immediate serotherapy in diphtheria; data from diphtheria ward of St. Franciscus hospital in Rotterdam. *Nederl. tijdschr. v. geneesk.* 91: 3206-3212, Nov. 8, 1947.

⁹ DODDS, R. J.: Penicillin in treatment of severe diphtheria. *Brit. M. J.* 2: 8-10, July 6, 1946.

data available in 100 selected fatal cases occurring in United States Army hospitals from 1943 through 1947. Reports of additional cases are available but are not included because of incomplete clinical records.

INCIDENCE

The geographic occurrence of the cases is shown in table 2. The recorded ages (table 3) ranged from 17 to 46 years. Four were Negroes and the rest were white.

TABLE 2.—Area of admission of 100 patients dying with diphtheria 1943-47

Area	Number	Area	Number
European theater.....	66	China, Burma, India.....	2
United States.....	19	Persian Gulf.....	1
Pacific theater.....	6		
North Africa.....	3	Total.....	100
Italy, Sicily.....	3		

TABLE 3.—Age group distribution in 100 patients dying with diphtheria

Age	Number of patients
17-20.....	29
21-30.....	60
31-40.....	10
41-50.....	1
Total.....	100

TYPES OF CASE

Ninety-three cases were classified as the pharyngeal type manifested by congestion of the fauces and tonsils, with a gray film involving the uvula, palate, or pharyngeal wall; 3 as cutaneous diphtheria secondary to wounds, abrasions, or other skin lesions; 2 as nasopharyngeal manifested by involvement of mucous membranes of the anterior nares or postnasal region with membrane formation and serosanguineous nasal discharges; and 2 as laryngeal manifested by involvement of the trachea, larynx, or bronchi, with a membrane.

PAST HISTORY

An inquiry regarding diphtheria under the past history was recorded in only five clinical records. One patient had been hospitalized 3 months previously, treated with diphtheria antitoxin, and discharged as cured. He was readmitted because of voice changes, inability to swallow, paresis, and hypesthesia of the extremities, and died 10 days

⁸ TOP, F. H.: Present recommendations concerning treatment and prophylaxis of diphtheria. *Am. J. Pub. Health* 37: 549-554, May 1947.

⁹ SCHULZE, H. A.: Diphtheria in U. S. Army in Europe. *M. Bull., Chief Surgeon, European Command (No. 6)* 2: 2-26, June 1947.

later from diphtheritic myocarditis and bronchopneumonia. Another patient had been discharged from the hospital 10 days previously, after having received diphtheria antitoxin at that institution and was apparently cured. He was readmitted with congestive heart failure and died. Another patient was exposed to diphtheria while on emergency leave visiting a sibling who died of the disease. One week after exposure, he developed a sore throat and was given an adequate amount of diphtheria antitoxin by his family physician. He was transferred to an Army station hospital and died of diphtheritic myocarditis 7 days after the onset of his symptoms. One patient gave a history of having received diphtheria toxoid several years previously. The history of a previous Schick test was elicited in only one patient. The clinical records in this series revealed no evidence that a Schick test was performed in the current admission.

SYMPTOMS

The symptoms were variable and simulated any upper respiratory infection. The duration of symptoms prior to hospitalization is shown in table 4. Eighty-eight percent of the patients were hospitalized within the first 7 days of the onset of their symptoms. One patient, a German prisoner of war, was treated in a station dispensary in a POW camp in Alabama on an ambulatory status because of chronic tonsillitis for 30 days prior to hospitalization. Another patient was admitted in coma and because he died shortly thereafter, the duration of his symptoms could not be ascertained. Fourteen patients who had been hospitalized for other causes, and contracted fatal diphtheria on the wards while on a patient status were included in this series.

TABLE 4.—Duration of symptoms prior to hospitalization in 100 patients dying with diphtheria

	Number		Number
1 day.....	25	10 days.....	3
2 days.....	22	11 days.....	1
3 days.....	13	14 days.....	4
4 days.....	10	30 days.....	1
5 days.....	6	Undetermined.....	1
6 days.....	3		
7 days.....	9	Total.....	100
8 days.....	2		

An analysis of the symptoms reported is shown in table 5. Subjective sensory changes in the skin about the face and extremities manifested by hypesthesia or hyperesthesia, and generalized weakness were the most common. Dyspnea and cyanosis were frequent and were attributable to a combination of pneumonia and congestive heart

failure. Cyanosis accompanying dyspnea was usually a terminal feature. Dysphagia was usually related to sore throat, although in some patients, it accompanied involvement of the ninth and tenth cranial nerves. The differentiation of dysphagia accompanying sore throat from toxic involvement of the cranial nerves was difficult. Generalized convulsions were considered to be attributable to bradycardia associated with heart block resulting in cerebral anoxemia (Stokes-Adams syndrome). Neurologic manifestations predominated on admission in two patients who were hospitalized because of blurred vision, inability to swallow and paralysis of the extremities.

TABLE 5.—Symptoms reported by 100 patients dying with diphtheria

	Percent		Percent
General symptoms, percent having:		Gastrointestinal, percent having:	
Fever.....	88	Vomiting.....	31
Hypesthesia.....	6	Nausea.....	22
Hyperesthesia.....	5	Abdominal pain.....	20
Weakness.....	5	Neurologic, percent having:	
Anorexia.....	5	Paralysis of extremities.....	21
Cardiorespiratory, percent having:		Blurred vision.....	17
Sore throat.....	90	Convulsions.....	16
Dyspnea.....	71	Sensory changes.....	11
Cyanosis.....	64	Paralysis (intercostal, dia-	
Cough.....	16	phragmatic, abdominal)....	9
Hoarseness.....	15	Disorientation.....	6
Chest pain.....	13	Coma.....	6
Nasopharyngitis.....	7	Facial weakness.....	5
Hemoptysis.....	7	Nuchal rigidity.....	1
Precordial pain.....	5	Blindness.....	1
Palpitation.....	2		

PHYSICAL EXAMINATION

The physical findings are shown in table 6. The lowest pulse rate counted was 20 per minute in a patient with electrocardiographic evidence of heart block and idioventricular rhythm. Detailed information regarding the physical findings, in reference to the heart and lungs, was not recorded in many of the clinical records. This was because of the type of medical installation, the tactical situation, and the brief records required by certain mobile installations in overseas theaters. There was nothing pathognomonic about the diphtheritic exudate or membrane as evidenced by the variety of colors, odors, and types and consistencies described. The onset of paralysis or paresis of the cranial nerves or extremities occurred in from 5 to 40 days from the onset of the symptoms of the disease, the average interval being 20 days.

TABLE 6.—*Physical findings in 100 patients dying with diphtheria*

TEMPERATURE	<i>Number of patients</i>	EXTREMITIES	<i>Number of patients</i>
Under 100° F.....	6	Purpura.....	3
100°-101.9° F.....	40	Edema.....	3
102°-103.9° F.....	39		
Over 104° F.....	9	CARDIOVASCULAR	
Not recorded.....	6	Rhythm:	
Total.....	<u>100</u>	Irregular.....	25
PULSE		Extrasystoles.....	18
Under 100.....	12	Gallop.....	11
100-119.....	49	Bigeminal.....	8
120-149.....	16	Fibrillation.....	4
Over 150.....	9	Pulsus alternans.....	4
Not recorded.....	14	Dropped beats.....	2
Total.....	<u>100</u>	Trigeminal.....	1
SYSTOLIC BLOOD PRESSURE		Tones:	
Over 100.....	17	Weak.....	37
80-100.....	26	Friction rub.....	1
Under 80.....	30	Murmurs:	
Not recorded.....	27	Precordial, systolic.....	14
Total.....	<u>100</u>		
HEAD AND NECK		DIPHTHERITIC MEMBRANE	
Exudate on tonsils.....	85	Odor:	
Enlarged cervical glands.....	58	Foul.....	5
Edema of pharynx.....	27	Fetid.....	3
"Bull neck".....	15	Nasty.....	1
Ulcerations on pharynx.....	11	Acrid.....	1
Pulsating neck veins.....	4	Strong.....	1
Serosanguineous nasal discharge....	2	Color:	
Nasal membrane.....	2	White.....	31
		Dirty gray.....	26
CHEST		Gray.....	21
Pneumonitis.....	47	Yellow.....	15
Atelectasis.....	4	Black.....	4
		Green.....	1
ABDOMEN		Type and consistency:	
Hepatomegaly.....	11	Adherent.....	12
Splenomegaly.....	3	Coughed up.....	12
Ascites.....	1	Removable, leaving bleeding surface.....	4
		Hemorrhagic.....	3
		Exudative.....	3
		Necrotic.....	3
		Follicular.....	1
		Gangrenous.....	1
		Slippery.....	1
		Pseudomembranous.....	1
		Purulent.....	1
		Filmy.....	1
		Thick.....	1

TABLE 6.—Physical findings in 100 patients dying with diphtheria—Continued

CRANIAL NERVE PARALYSIS		CRANIAL NERVE PARALYSIS—continued	
	Number of patients		Number of patients
Cranial nerve II:		Cranial nerves IX and X:	
Inequality of pupils.....	2	Dysphagia ¹	67
Blindness.....	1	Nasal voice.....	28
Cranial nerves III, IV, and VI:		Regurgitation of fluids through	
Diplopia.....	17	nose.....	22
Strabismus.....	2	Diminished gag reflex.....	14
Cranial nerve V: Hypesthesia or		Cranial nerve XI: Weakened neck	
hyperesthesia of face.....	1	muscles.....	1
Cranial nerve VII: Facial weakness	4	Cranial nerve XII: Deviation of	
Cranial nerve VIII: Diminished		tongue.....	3
hearing.....	1		

¹ It was difficult to ascertain to what extent this manifestation was caused by cranial nerve involvement and to what extent it was caused by local inflammation of the throat.

LABORATORY FINDINGS

Laboratory findings are shown in table 7. Facilities were not available in many of the overseas hospitals for virulence tests or special bacteriologic studies to determine the type of *Corynebacterium diphtheriae*.^{4,5} Blood cultures were obtained from 60 patients and all were

TABLE 7.—Laboratory findings in 100 patients dying with diphtheria

BACTERIOLOGIC		ELECTROCARDIOGRAPHIC—continued	
	Number of patients		Number of patients
Throat cultures for <i>Corynebacterium diphtheriae</i> :		Rhythm:	
Initial culture positive.....	59	Normal sinus.....	21
Initial culture negative.....	38	Idioventricular.....	15
Initial culture negative but		Ventricular extrasystoles.....	11
subsequent culture positive..	13	Auriculoventricular nodal....	6
Cultures positive after peni-		Sinus arrhythmia.....	2
cillin.....	16	Auricular extrasystoles.....	2
Cultures positive after sulfon-		Bigeminal.....	2
amides.....	18	Shifting pacemaker.....	1
Cultures positive after anti-		Double pacemaker.....	1
toxin.....	10	Impulse conduction:	
No culture taken.....	3	First degree A-V block.....	25
Smears for <i>C. diphtheriae</i> :		Intraventricular block.....	24
Initial smear positive.....	42	Second and third degree A-V	
Initial smear negative.....	38	block.....	15
No smear made.....	20	Parasystole.....	1
Total.....	100	QRS abnormalities:	
ELECTROCARDIOGRAPHIC		Notched-slurred.....	29
General:		Prolongation.....	24
Abnormal.....	45	Low voltage.....	21
Normal.....	5	Deep S wave.....	9
None taken.....	50	T-wave abnormalities.....	39
Total.....	100	S-T deviation.....	18

reported as negative. Urinalysis was performed on 83 patients and albuminuria ranging from 1 to 4 plus was encountered in 52. Leukocyte counts were made on 64 patients; normal counts (5,000 to 10,000) were noted in 21; most patients had counts between 10,000 and 20,000; and 8 had counts of over 20,000. Electrocardiograms were reported in 50 cases because many overseas hospitals were not equipped with electrocardiographs and patients who had clinical evidence of myocarditis had no tracings. In patients having serial electrocardiographic tracings, daily variations in the records were noted in many instances. Abnormalities in the QRS complexes and T-waves in the presence of heart block, both auriculoventricular and intraventricular were the most common findings.

DIAGNOSIS

The accuracy of a correct diagnosis was not high. Only 18 patients were correctly diagnosed as having diphtheria on admission. In 10 the diagnosis was made only by autopsy. Table 8 lists the impression recorded in the clinical records prior to the final diagnosis.

TABLE 8.—*Erroneous diagnoses considered prior to final diagnosis in 100 patients dying with diphtheria*

<i>Diagnosis</i>	<i>Number of patients</i>	<i>Diagnosis</i>	<i>Number of patients</i>
Tonsillitis.....	57	Syphilis.....	2
Peritonsillar abscess.....	25	Atelectasis.....	1
Vincent's infection.....	24	Coronary thrombosis.....	1
Nasopharyngitis.....	11	Encephalitis.....	1
Glomerulonephritis.....	6	Mononucleosis.....	1
Laryngitis.....	3	Influenza.....	1
Ludwig's angina.....	3	Mediastinal abscess.....	1
Polynueritis.....	3	Mumps.....	1
Agranulocytosis.....	2	Poliomyelitis.....	1
Cellulitis of neck.....	2	Pulmonary embolus.....	1
Hepatitis.....	2	Rheumatic fever.....	1
Pneumonia.....	2	Sickle cell anemia.....	1

MORTALITY

The interval between the onset of symptoms and death is shown in table 9 and the principal causes of death were: Pneumonia and myocarditis, 48; myocarditis, 46; pneumonia, 5; myocarditis and cerebral embolus, 1. Autopsies were performed in all cases.

TABLE 9.—Interval between onset of symptoms and death in 100 patients dying with diphtheria

Days	Number of patients	Days	Number of patients
1 to 7.....	20	57 to 63.....	3
8 to 14.....	24	64 to 70.....	1
15 to 21.....	20	71 to 77.....	1
22 to 28.....	5	78 to 84.....	0
29 to 35.....	2	85 to 91.....	1
36 to 42.....	3	Undetermined.....	6
43 to 49.....	3		
50 to 56.....	11	Total.....	100

TREATMENT

Treatment is classified as: (1) specific therapy, (2) symptomatic and nonspecific therapy, and (3) surgical intervention. Since all cases were fatal, it is difficult to evaluate any method of treatment.

Specific therapy.—Diphtheria antitoxin was administered to 83 patients. The elapsed time between the onset of symptoms and administration of the antitoxin varied from 1 to 30 days (average 6.5). The amount of antitoxin administered varied from 20,000 to 400,000 units (average 83,000). Because the effectiveness of antitoxin depends on the administration of adequate amounts early in the disease, giving it 6.5 days after the onset of symptoms would appear to be too great a delay. When facilities for an early diagnosis and treatment with antitoxin exist this should be inexcusable. Although paralysis associated with diphtheria is proportional to the time elapsing between the onset of the infection and the administration of antitoxin¹⁰ it is difficult to evaluate the effect of antitoxin in the prevention of paralysis in this series because all the patients died. Paralysis has been reported to develop within from 5 to 42 days after the onset of symptoms.¹¹ Of 17 patients receiving no antitoxin, only 3 developed paralysis of the cranial nerves or extremities prior to death. This is not conclusive, since paralysis might have developed in more of these patients had they survived for a longer period.

Symptomatic and nonspecific therapy.—The use of penicillin in treating diphtheria has been covered in the literature.^{7 8 12 13} The antibiotic was administered in adequate amounts to 83 patients. Four patients contracted the disease while on penicillin therapy for other causes. In 16 patients, cultures from the nasopharynx continued to

¹⁰ ROLLESTON, J. D.: Paralysis after diphtheria antitoxin. Arch. Pediat. 30: 335-345, 1913.

¹¹ PLACE, E. H.: Diphtheria. In CHRISTIAN, H. A.: Oxford Medicine, Vol. V, Pt. 1. Oxford University Press, New York, N. Y., 1949. p. 147.

¹² WEINSTEIN, L.: Treatment of acute diphtheria and chronic carrier state with penicillin. Am. J. M. Sc. 213: 308-314, Mar. 1947.

¹³ KARELITZ, S.; WASSERMAN, L. R.; and MOLOSHOK, R. E.: Penicillin in treatment of diphtheria and diphtheria carriers. J. Pediat. 30: 18-28, Jan. 1947.

remain positive for *C. diphtheriae* after they had received large amounts of the drug. Penicillin was ineffective in preventing the toxic complications of diphtheria. Sulfonamides were administered to 69 patients without apparently altering the course of the disease. In 18 patients, cultures from the nasopharynx continued to remain positive while large doses of the drug were being given. The use of sulfonamides in diphtheria has been described.¹⁴ Three patients in this series were treated with streptomycin. Dextrose solution was used to treat 32 patients. Hypertonic dextrose solution has been advocated in patients severely ill with clinical diphtheria.^{15 16} Simultaneous administration of insulin to speed its conversion into glycogen has also been recommended. The use of digitalis in treating congestive heart failures associated with diphtheritic myocarditis is a controversial subject.^{17 18} Cobb¹⁹ found it beneficial. The drug was used on seven patients in this series with no apparent benefit. Other non-specific therapeutic measures included parenteral fluids, vitamins, oxygen, blood plasma transfusions, pitressin, adrenal extract, arsenicals, insulin, and the mechanical respirator.

Surgical intervention.—Tracheotomy was performed on 18 patients because of respiratory obstruction. Incision and drainage of the tonsils was performed on 13 patients because of the original erroneous impression of peritonsillar abscess. Bronchoscopic aspiration was performed on seven patients who developed atelectasis of the lungs, secondary to obstruction of the bronchi. Intubation was performed on one patient because of laryngeal obstruction.

DISCUSSION

No sign or symptom appears to be pathognomonic of diphtheria. According to Stimson,²⁰ the absence of a high temperature (103° F.) is important in differentiating diphtheria from acute follicular tonsillitis and quinsy. Over half of the patients in this series had tempera-

¹⁴ THELANDER, H. E.: Diphtheria and chemotherapy. *J. Pediat.* 18: 479-482, Apr. 1941.

¹⁵ SCHWENTKER, F. F., and NOEL, W. W.: Circulatory failure of diphtheria; clinical manifestations of early and late failure. *Bull. Johns Hopkins Hosp.* 45: 276-294, Nov. 1929; Carbohydrate metabolism in diphtheria intoxication. *Bull. Johns Hopkins Hosp.* 46: 259-271, Apr. 1930; Treatment of circulatory failure of diphtheria. *Bull. Johns Hopkins Hosp.* 46: 359-364, June 1930.

¹⁶ HOYNE, A. L., and WELFORD, N. T.: Diphtheritic myocarditis; review of 496 cases. *J. Pediat.* 5: 642-653, Nov. 1934.

¹⁷ EDMUNDS, C. W., and SMITH, R. G.: Does digitalis protect against diphtheria toxin? *J. Pharmacol. & Exper. Therap.* 61: 37-47, Sept. 1937.

¹⁸ FISHER, A. M., and COBB, S.: Clinical manifestations of severe form of diphtheria. *Bull. Johns Hopkins Hosp.* 83: 297-325, Oct. 1948.

¹⁹ COBB, S., and HODES, H. L.: Fluorescein circulation times in diphtheria. *Pediatrics* 12: 303-311, Sept. 1948.

²⁰ STIMSON, P. M.: *A Manual of the Common Contagious Diseases*. 4th edition. Lea & Febiger, Philadelphia, Pa., 1947. p. 92.

tures above 102° F. and an admission impression of acute tonsillitis was made in 57 cases. The textbook statement that a temperature above 102° F. is seldom encountered in diphtheria, was not substantiated in this series. The correct admission diagnosis of diphtheria was made in only 18 cases, and in 10 cases it was made only after autopsy. This would demonstrate how unaware medical officers are of clinical diphtheria. This lack of clinical appreciation of diphtheria has been noted by other observers, and should stimulate physicians to be alert that any throat lesion presenting an exudate may be toxic diphtheria.⁹

The omission of an inquiry under past history regarding diphtheria and the failure to perform a Schick test would appear to be inexcusable on the part of the examining medical officer. A negative Schick test connotes sufficient circulating antitoxin (from 1/40 to 1/60 units per cc. of blood) to protect a person against the majority of diphtheria infections with the exception of the *gravis* strain of the organism. If Schick tests had been performed, valuable statistical information would have been derived from the fatal cases, as it has been shown that in diphtheria epidemics, the mortality among the immunized population was 0.2 percent compared with 20 percent among the nonimmune.²¹

Although throat cultures for *C. diphtheriae* were diagnostic aids, bacterial confirmation often required from 18 to 36 hours and was not helpful in making an immediate diagnosis. Concomitant throat smears for *C. diphtheriae* were positive in 42 patients, and could be considered a definite aid in the diagnosis. Albuminuria has been considered a constant finding in diphtheria and its presence in 63 percent of the patients in this series should arouse an early suspicion of the disease. The presence of continued albuminuria is believed to connote a poor prognosis in diphtheria.²² Leukocyte counts in this series were not helpful in establishing an early diagnosis. It has been reported that a leukocyte count over 10,000 in diphtheria indicates a poor prognosis, provided the type of infection, whether mixed or pure, is taken into consideration.²³ Electrocardiographic abnormalities appear early in acute diphtheritic myocarditis and have been well covered in the standard texts.²⁴ Heart block (auriculoventricular and intraventricular) are reported to connote an ominous prognosis.²⁵

²¹ BESSON, A.: De l'influence de la vaccination par l'anatoxine sur la mortalité par diphtérie. Presse méd. 55: 433-434, June 28, 1947.

²² HOYNE, A. L.: Symposium on advances in clinical medicine; acute infectious diseases. M. Clin. North America 31: 61-71, Jan. 1947.

²³ BAUMGARTNER, A.: Die Veränderungen des weissen Blutbildes bei Diphtherie. Schweiz. med. Wchnschr. 77: 1230-1231, Nov. 22, 1947.

²⁴ FRIEDBERG, C. K.: Diseases of the Heart. W. B. Saunders Co., Philadelphia, Pa., 1949.

²⁵ BEGG, N. D.: Diphtheritic myocarditis; electrocardiographic study. Lancet 1: 857-860, Apr. 10, 1937.

SUMMARY

An increase in the prevalence of diphtheria among military personnel was coincidental with the introduction of large numbers of troops into the European theater where the endemic rate was high. An inquiry by medical officers regarding the past history relative to diphtheria was neglected in the clinical records. Many physicians failed to use the Schick test as a diagnostic and prognostic aid. Eighty-eight percent of the patients were hospitalized within 1 week of the onset of their symptoms. Fourteen patients contracted fatal diphtheria while in the hospital for other causes. One-half of the patients had temperature elevations above 102° F. and a high fever did not differentiate diphtheria from acute tonsillitis or other diseases. Of the cranial nerves the ninth and tenth were most frequently involved. The presence of a membrane on the pharynx was observed in 85 percent of the patients but no physical characteristic of this finding was pathognomonic of diphtheria. The initial throat culture was positive for *C. diphtheriae* in 60 percent and concomitant throat smears in 50 percent of the patients. Albuminuria occurred in 63 percent of the patients. Abnormal electrocardiograms were noted in 90 percent of the patients from whom records were obtained. The list of 24 diseases recorded as impressions in the clinical records prior to a final diagnosis of diphtheria reflected a lack of knowledge on the part of the medical officers of the clinical aspects of the disease. A correct diagnosis was made on admission in only 18 percent and it was made only after autopsy in 10 percent. The average delay of 6.5 days between the onset of symptoms and the administration of diphtheria antitoxin reflected the inaccuracy of the early diagnoses. Penicillin does not prevent or cure diphtheria.



Diphtheria of the Skin

MILTON H. HOLLANDER, Major, MC, U. S. A.¹

CUTANEOUS diphtheria was seen not infrequently during World War II, particularly in the Pacific and China-Burma theaters. It was responsible for much disability and several deaths. It should be especially watched for in personnel returning from the conflict in Korea. It is the purpose of this article to bring up to date the known facts regarding this disease. Diphtheria of the skin is uncommon in the United States, and therefore is never seen by most physicians. Recognition of any disease depends on awareness of the existence of the disease, and the ability to diagnose it. The *Corynebacterium diphtheriae* has a predilection for the skin under hot, humid, tropical conditions. It is likely to occur under combat conditions with the associated poor personal hygiene, various cutaneous injuries, and close personal contact. About one-third of the adults of military age are Schick-positive and therefore are presumably susceptible to diphtheria. Cutaneous diphtheria may be defined as any lesion of the skin caused by virulent *C. diphtheriae*.

ETIOLOGY

The *C. diphtheriae* is polymorphic, but is characteristically slender, slightly curved, and sometimes clubbed. It is gram-positive, non-motile and nonspore forming. It is readily destroyed by heating to 60° C. for 10 minutes, but may survive freezing and drying. Smears for diagnosis are usually stained with methylene blue. Virulent bacilli cannot be differentiated from nonvirulent strains of the organism on smears taken directly from suspected lesions but a negative smear never rules out the presence of the organism. At present, virulence can be determined only by the inoculation of experimental animals with the suspected organisms. Virulent strains are classified primarily on the basis of colony growth and are divided into type *gravis*, type *intermedius*, and type *mitis*.

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PATHOLOGY

The organisms tend to proliferate at the local site and under advantageous conditions produce a toxin which is extremely potent. The toxin affects the local tissues early, causing death and disintegration of the cells in the immediate vicinity of the organisms. As necrosis proceeds, ulceration occurs. Cellular debris, fibrin, leukocytes, and other blood and tissue elements form the typical membrane of this infection. Early, there may be an inflammatory reaction about the lesion with erythema, edema, and tenderness. The toxin is absorbed by way of capillaries and perineural lymphatics. Peripheral nerve tissue, heart muscle, and kidney tubules are affected early. Both sensory and motor nerve fibers are affected, but the latter are much more frequently involved than the former. The organisms are generally found under or at the edges of the membrane.

CLINICAL FINDINGS

It is generally believed that *C. diphtheriae* is not able to penetrate the intact skin. Once the epithelial integrity is destroyed, either by trauma or cutaneous disease, organisms may be introduced and find a suitable medium for growth and toxin production. Diphtheritic lesions often occur on the lower extremities where various factors operate to produce breaks in the skin, but they have been reported from all sites, including the anal mucocutaneous junction. Insect bites and minor abrasions are common antecedents for lesions on the forearms and other areas. Diphtheria may impose itself on a variety of skin diseases including epidermophytosis of the body and/or toes, impetigo, ecthyma, acne, paronychia, and eczematous lesions, and when associated with the last, the lesions tend to be extremely indolent.

Systemic reaction is almost always absent. The patient complains only of such discomfort as may be caused by the skin lesion. Symptoms such as fever and prostration, or other evidence of toxicity, as seen in nasopharyngeal diphtheria, if present, are usually caused by secondary infection of the skin with other bacteria, such as hemolytic staphylococci.

The typical lesion is an ulcer, which is rounded, relatively deep, and appears "punched out." Early it is covered with a gray, yellow, or gray-brown membrane, which can be peeled off leaving a clean, hemorrhagic base. The base dries quickly and forms a thin, leathery covering which becomes dark brown or black and rather adherent. This sloughs off spontaneously after a variable period of time, usually in from 1 to 3 weeks after the onset of the infection. On manipulation, the adherent leathery slough can usually be loosened around the borders, and it is from this site that smears should be taken. The

margin of the fully developed ulcer is usually sharply defined, rolled, appears slightly undermined, and often has a purple tinge. The ulcers vary in size from a few millimeters to several centimeters. They may be multiple or single. They are commonly indolent, and tend to break down frequently, either spontaneously or on minimal trauma. After a few weeks they tend to become anesthetic to pin prick, a helpful diagnostic sign.

Healing follows a definite pattern. The previously rolled margins gradually flatten out. Epithelialization proceeds from the periphery toward the center, rapidly at first, but later more slowly. As a rule, the exact center, the most avascular area, is the last to heal. Because of the large zone of avascularity, larger scars are usually slow to heal.

COMPLICATIONS

Myocarditis occurs in about 5 percent of patients with cutaneous diphtheria. It generally appears suddenly and early in the course of the disease. Acute parenchymatous degeneration is followed by reparative inflammatory reaction. Acute toxic myocarditis with heart failure is most common during the second week of the disease. It is associated with typical electrocardiographic changes.

Peripheral neuritis occurs in about 20 percent of these patients. It tends to develop insidiously without pain and may not appear for from 2 to 4 months. The development of the neuritis bears no constant relation to the severity of the diphtheria. The paralysis involves (1) the palate (with hoarseness and dysphagia), (2) the ocular muscles, and (3) one or more of the extremities, the lower being involved more than the upper, in that order of frequency. The period of most pronounced involvement lasts from 1 to 2 weeks, with slow recovery over several weeks. Recovery is usually complete.

Guillain-Barré-like syndrome which is characterized by bilaterally symmetrical paralysis of the lower extremities, involving motor or sensory and motor changes, is associated with little or no increase in cells and a moderate increase in total protein (albuminocytologic dissociation) in the spinal fluid.

Kidney involvement that is characterized by albuminuria, cloudy swelling with necrosis of tubular epithelium, and interstitial damage. Glomerulonephritis is rare.

DIAGNOSIS

The diagnosis will never be made unless the medical officer maintains a high index of suspicion. The following procedure is recommended: (1) Lift up the edge of the membrane and take the specimen for smear and culture from near the margin of the ulcer. (2) Inocu-

late the culture medium with adequate material. (3) Make direct smears—generally of little value because the slide is almost invariably contaminated by numerous bacteria. (4) Use separate swabs on blood agar and on a Loeffler's slant, with subsequent identification on tellurite medium, and by appropriate carbohydrate reactions. (5) If suspected, the material should then be sent to the proper medical laboratory on a Loeffler's slant for appropriate animal inoculations for virulence studies. (6) Repeat cultures every 24 to 48 hours. Definitive diagnosis depends on skilled, experienced laboratory personnel.

TREATMENT

Isolation.—Virulent diphtheria organisms may infect wounds, and patients with this disease should be removed promptly from a surgical ward.

Diphtheria antitoxin is indicated without waiting for laboratory confirmation if cutaneous diphtheria is suspected. It hastens the healing of the skin lesions if given during the first 2 weeks after the onset of the disease. After this it is used only to reduce the incidence of complications. An adequate dose should be given at the first injection. Injected antitoxin neutralizes that toxin which is free in the circulatory system. It has no effect on that which is already bound by the body cells. For an average case, give from 10,000 to 20,000 units intramuscularly. For the severe, toxic case, give 20,000 units intravenously and from 20,000 to 40,000 units intramuscularly. Preliminary skin testing should be performed in all cases. Use 0.05 cc. of 1:20 dilution of antitoxin intracutaneously and observe for from 20 to 30 minutes.

Penicillin.—Give an adequate dose intramuscularly and additional penicillin in local compresses.

General.—Absolute bed rest for at least 2 weeks. Observe for cardiac and neuritic complications. Appropriate general care. Attendants should be Schick-negative. These lesions are best treated early, while the ulcer is still small, in order to prevent large avascular scars.

CONCLUSIONS

Cutaneous diphtheria is a not uncommon tropical and subtropical disease of military importance. It should be suspected in any patient with a chronic, indolent ulcer occurring in an endemic area.



Abscess of the Spleen¹

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ABSCESS of the spleen, although perhaps uncommon as a surgical entity, is by no means rare from a pathologic viewpoint. Of 3,600 autopsies reported by Billings² at the Pennsylvania Hospital, splenic abscess occurred in 0.7 percent. Walker³ reported a 0.4 percent incidence in autopsies performed at the Boston City Hospital. In spite of this not infrequent occurrence, there is little in medical literature concerning this condition. Because the correct therapeutic approach markedly reduces an extremely high mortality rate, it behooves us to keep such a diagnosis in mind. It is the purpose of this article to review briefly this disease entity and present a case of splenic abscess.

The pathogenesis of abscess of the spleen is of three types: (1) trauma, (2) extension from a contiguous pathologic process, and (3) metastatic spread of infection. Elting⁴ states that almost all pyogenic bacteria except gonococci have been isolated in splenic abscesses. Undoubtedly, the most common single causes are the organisms causing typhoid fever and acute vegetative endocarditis.

Approximately 15 percent of splenic abscesses are the result of trauma. Trauma produces a perisplenic hematoma which serves as a culture medium in the event of simultaneous bacteremia. Traumatic abscesses have been produced experimentally. Inlow⁵ reviewed 23 cases of traumatic splenic abscess and added one of his own. He reported that conservative treatment in such cases resulted in a mortality of 100 percent, whereas with surgical intervention the mortality dropped to 38 percent.

¹ U. S. Naval Hospital, Coco Solo, C. Z.

² BILLINGS, A. E.: Abscess of spleen. *Ann. Surg.* 88: 416-428, Sept. 1928.

³ WALKER, I. J.: Abscess of spleen. *New England J. Med.* 203: 1025-1028, Nov. 20, 1930.

⁴ ELTING, A. W.: Abscess of spleen. *Ann. Surg.* 62: 182-193, 1915.

⁵ INLOW, W. D.: Traumatic abscess of spleen. *Ann. Surg.* 85: 368-379, Mar. 1927.

By contiguity the spleen may form the floor of an abscess cavity which results from extension of left subphrenic collections or infected gastric or colonic neoplasms.

Most splenic abscesses result from hematogenous spread of infection elsewhere. This may be an afferent spread by way of the splenic artery secondary to mastoiditis (Walker's case³), furunculosis (Billings's case²), otitis media (Cutler's case⁶), peritonsillar abscess (Eliaison's case⁷), and thrombophlebitis (Lemmon and Paschal's case⁸). Efferently, intra-abdominal suppuration reaches the spleen by way of the splenic vein following pylephlebitis. Such suppuration may follow appendicitis (Wolfson's case⁹), perforation of colonic diverticulum (Cooke's case¹⁰) salpingitis, et cetera. Splenic abscesses usually occur in multiple.

The clinical manifestations of abscess of the spleen are pain in the left hypochondrium, sudden or gradual in onset, following a suitable history of septicemia or trauma. There may be little or no pain if the abscess is buried deep in the organ (Fauntleroy's case¹¹). Abscesses of the upper pole of the spleen give rise to pleuritic pain whereas lower pole involvement produces peritoneal irritation. Left shoulder pain may be prominent. General symptoms and signs are those of spiking fever, chills, and leukocytosis. Splenic abscess should be considered in any patient with pain in the upper quadrant and signs of sepsis.

Physical examination reveals an enlarged, palpable spleen which is tender. Considerable left upper quadrant muscle spasm may be present as well as left costovertebral tenderness. Marked emaciation may be present. Radiologic examination may be of help in revealing an elevated left diaphragm, with or without left pleural effusion, with the stomach and colon displaced medially on barium studies and even the left renal pelvic and calycinal pattern flattened on intravenous urography, caused by extrinsic pressure. As a diagnostic procedure splenic puncture has been supported and condemned.

Without treatment, patients with splenic abscesses run a severe septic course; the vast majority of these patients progress to a fatal termination if surgical therapy is not instituted. The procedure employed is either splenotomy or splenectomy, the former being most

⁶ CUTLER, E. C.: Abscess of spleen, report of case with recovery following operation. *J. A. M. A.* 75: 1712-1715, Dec. 18, 1920.

⁷ ELIASON, E. L.: Splenic abscess. *Ann. Surg.* 97: 301-302, Feb. 1933.

⁸ LEMMON, W. T., and PASCHAL, G. W., JR.: Splenic abscess with drainage and recovery. *Am. J. Surg.* 56: 641-646, June 1942.

⁹ WOLFSON, I. N.: Abscess of spleen. *New England J. Med.* 203: 135-137, Feb. 3, 1944.

¹⁰ COOKE, W. T.: Diverticulitis with unusual termination; pylephlebitis simulating Weil's disease. *Lancet* 1: 84-85, Jan. 9, 1937.

¹¹ FAUNTLEROY, A. M.: Splenic abscess. *J. A. M. A.* 56: 260, 1911.

often practiced. The approach may be transperitoneal, transpleural, or retroperitoneal.

In cases in which suppuration is localized to the spleen surgical intervention usually effects a cure. Of the 30 cases of splenic abscess Walker reported from autopsy material, there were 22 in which abscesses involved other organs, leaving only 8 cases in which surgery could have been beneficial. Clinically cases of splenic abscess should have a higher incidence of operability and cure, particularly, in this era of chemotherapeutic and antibiotic agents.

CASE REPORT

M. T., a 17-year-old Spanish boy, had always been in good health until 21 November 1949 when he was admitted to the hospital with the clinical picture of a ruptured appendix with diffuse, spreading peritonitis. Laparotomy confirmed this diagnosis. Appendectomy was performed, drains placed, and the abdomen closed after placing 200,000 units of penicillin in the peritoneal cavity. Smear and culture of the peritoneal exudate was positive for *Streptococcus faecalis*. Postoperatively, the patient received penicillin, streptomycin, Wangenstein suction, and intravenous fluids, including whole blood. The course was uneventful for 5 days; then icterus was noted in the sclera. Liver function studies pointed to a hepatocellular type of jaundice, probably on a toxic basis from his peritonitis. Ten days following surgery his icterus cleared, his wound had healed except for minimal drainage from the drainage site, and the streptomycin was discontinued.

On the next day the patient had his first chill with his temperature rising to 106° F. He had daily chills and fever for the next 10 days but was otherwise asymptomatic. Physical examination was repeatedly negative as were blood smears and cultures and scout films of the abdomen and chest. The diagnoses of malaria, pylephlebitis, liver abscess, or subdiaphragmatic abscess were considered but could not be substantiated clinically. The patient was started on aureomycin. On 6 December 1949 the patient complained of pain to the left of and below the umbilicus. Tenderness to palpation was elicited in the same area with the sensation of a mass present deep in the left gutter. A barium enema revealed a probable mass, extrinsic to the sigmoid, producing a nonfilling defect on its medial contour.

An exploratory laparotomy was performed on 13 December 1949. Careful exploration revealed only a resolving peritonitis with no evidence of subphrenic, subhepatic, or perisplenic abscesses or abscess formation in the pelvis or in either lateral gutter. Postoperatively the patient received penicillin, streptomycin, and sulfadiazine. The

aureomycin was discontinued. The course was uneventful. All medications were stopped 10 days after surgery and the patient was discharged to home on 5 January 1950 with all wounds healed.

The patient returned on 17 January 1950 stating that he had had chills and fever every other day for the previous 10 days with associated headache, backache, and anorexia. The temperature was 104° F. The patient was markedly dehydrated. The abdominal wounds were well healed. The liver and spleen were not palpable and no abdominal tenderness was elicited. Rectal examination was negative. Blood examination showed a red cell count of 4,700,000 and white cell count of 12,000 with polymorphonuclear segmented cells 75 percent and lymphocytes 15 percent. Malarial smear, blood culture, and urinalysis were negative. Roentgenograms of the chest were normal with no elevation of the diaphragms. Scout film of the abdomen revealed a questionable splenic enlargement. The patient had chills and fever every other day or so and noted slight pain in the left upper quadrant of the abdomen which was made worse on deep inspiration. Repeat roentgenograms of the chest revealed a healthy chest but an area of increased density suggestive of an inflammatory process in the left upper quadrant.

On 31 January 1950 through an anterior extraperitoneal approach, the left upper quadrant was entered and the perisplenic area drained of 100 cc. of pus positive for *Str. faecalis*. This seemed to be a solitary abscess cavity leading into the splenic parenchyma. Drains were placed and the wound closed. Postoperatively penicillin and streptomycin were restarted. His course was uneventful and he remained afebrile for 2 weeks. Roentgenograms reported on by Dr. F. W. Cottrell revealed an elevated left diaphragm with multiple air-fluid levels in the left subdiaphragmatic space. The wound drained well and he remained asymptomatic. Three weeks following surgery, antibiotics were discontinued. The next day he again had a chill and considerable tenderness was noted in the left flank posteriorly.

On 23 February 1950 the twelfth rib was resected with the idea of draining a perisplenic or splenic abscess pointing between the spleen and kidney. No abscess was found. The patient was turned over and the spleen approached transperitoneally. A perisplenic abscess was again encountered with considerable necrotic material present. Drains were placed and the wound closed. Penicillin was restarted and the postoperative course was uneventful.

By 1 March 1950 all medications were discontinued. On 23 March 1950 the patient developed a fever of 100° F. without any chill but with slight pain in the left upper quadrant. The fever persisted. Physical examination was negative. Roentgenograms of the chest re-

vealed an elevated left diaphragm with no air-fluid levels subphrenically but a large mass filling the left upper quadrant. An intravenous urogram showed a filling defect in the collecting system caused by an extrinsic pressure.

On 6 April 1950 through a left subcostal incision the perisplenic space was exposed. The sinus tract which had been draining minimally led to the inferior pole of the spleen and then behind the spleen. No perisplenic abscess was present. The spleen was four times its normal size and fixed to the subdiaphragmatic peritoneum by dense adhesions. A splenectomy seemed the only choice and was performed. Drains were placed and the wound closed. The patient has made an uneventful convalescence; the left diaphragm has reassumed its normal position as has the stomach and colon. He has been discharged from the hospital, well.

During the course of his two hospitalizations this patient received 85,000,000 units of penicillin, 276 grams of sulfadiazine, 124 grams of streptomycin, and 24 grams of aureomycin. He was supported by 14 whole blood transfusions of 500 cc. each.

The gross specimen in this case as reported on by Dr. H. R. Delaney, Jr., revealed a spleen approximately five times its normal size, weighing 773 grams, and measuring 18 by 13 by 8 cm. One large splenic abscess measuring 2 by 3 by 7 cm. had eroded through the capsule of the spleen on its posterolateral surface. Cut sections revealed another abscess cavity measuring 2 by 2 by 2.5 cm. deep in the splenic parenchyma, as well as multiple smaller abscesses throughout the splenic parenchyma. Smears and cultures taken from these abscesses were all sterile. Microscopic sections revealed all abscess cavities to be lined by chronic granulation tissue. The pathologic diagnosis was: (1) abscess of spleen, multiple; (2) perisplenitis, chronic; and (3) splenic hyperplasia.

SUMMARY

A case of splenic abscess secondary to appendicitis with rupture, peritonitis, and pylephlebitis has been presented. In spite of massive antibiotic therapy and splenotomy on two occasions, splenectomy was the only effective means of obtaining a good result in this case.



Two-Stage Operation in the Cure of Massive Scrotal Hernia

CHARLES BUNCH, *Commander, MC, U. S. N.*

INGUINAL hernias, either unilateral or bilateral that have descended into the scrotum and become massive in size, have been classified as inoperable in many cases. These hernias may be reducible but more often are irreducible.

Trusses in these massive hernias are of little or no value. In some cases they keep the hernia only partly reduced. Often they are of distinct harm—traumatizing the hernia without keeping it reduced. Many of these patients are more miserable with trusses than without them.

These patients, usually elderly males, are often fat, and have hypertension, arteriosclerosis, diabetes, or bronchitis; and some are nephritic or senile, but all are miserable with their hernia. Conservative treatment affords them no relief. One patient stated that he would rather die than live as he was.

Operative treatment presents obvious hazards. The age, condition of the cardiovascular and urinary systems, and general health of the patient must be considered and, because these patients often do poorly after the usual hernioplasty, the author contemplated performing a two-stage operation, the object being (1) to replace a part or most of the abdominal contents within the abdomen so as not to embarrass respiration or cardiac function or produce too much shock, and (2) to wait until a later date to operate for the actual cure of the inguinal hernia.

The literature in three large medical libraries has been reviewed and no record of any two- or more-stage operations for the cure of such hernias was found.

A two-stage operation was planned and performed on a patient with a massive unilateral scrotal (indirect inguinal) hernia. Patients in his condition are often classified as inoperable. This patient made an uneventful convalescence and his hernia was apparently cured.

CASE REPORT

E. L., a white veteran, 61 years old, was admitted to the U. S. Naval Hospital, Charleston, S. C., on 21 December 1949. He complained of a rupture that he had had for 28 years and for which he had worn a truss except during the last 6 months. In the past 3 months the hernia had become larger. On occasion he experienced severe pain in it. The hernia would become somewhat smaller when he would lie down but recently it would not totally disappear. On two occasions it would not go back at all and he had to have medical attention to obtain relief. He was fairly well developed and well nourished; his blood pressure was 150 systolic and 100 diastolic on one occasion, and 180 systolic and 120 diastolic on another; his pulse rate was 88. In the left side of the scrotum there was a large mass about the size of a football (14 inches in circumference) that could be only partially reduced by recumbency or applying gentle pressure. The external ring was about 3 fingers in width; the distance from the pubic tubercle to the bottom of the scrotum was 8 inches. The penis was lost within the scrotal folds. His arteries were moderately hardened. The electrocardiogram indicated that he had previously had an anterior infarction. Physical examination and laboratory studies were otherwise not significantly abnormal. Impression: (1) left inguinal (scrotal) hernia, massive; (2) arteriosclerosis with cardiovascular disease; and (3) senility.

Operation was performed on 30 December 1949, using spinal anesthesia with 10 mg. of tetracaine hydrochloride. An incision was made along the course of the scrotal portion of the sac. The sac was opened and found to contain a large mass of sigmoid (so-called sliding hernia). The sac of the sliding hernia was treated in the usual manner. A portion was sutured behind the bowel, the rest of the scrotal portion of the sac was trimmed away, and the upper portion was closed with a running suture of No. 1 chromic catgut. The inguinal canal was not entered. A large portion of the right scrotum was resected and closed with cotton sutures. One Penrose drain was used.

The operation lasted 50 minutes and the patient was returned to his bed in good condition. He did well following operation and was soon able to move about, sit up, and, except for some scrotal drainage, his convalescence was uneventful. On the 20th of January 1950, healing was complete and he was ready for the next operation.

On 30 January 1950, under spinal anesthesia, using 15 mg. of tetracaine hydrochloride, an incision was made over the inguinal canal. The cord was found to be considerably indurated. The sigmoid was found in the sac. The sac was excised further and the neck of the sac closed with chromic catgut. Repair was made with heavy cotton

sutures using the modified Halsted operation. The operation lasted 1 hour. The patient withstood this operation nicely and was returned to bed in good condition. He did well following operation, sitting up the following day, eating, and taking fluids well.

On 6 February the sutures were removed; the wound was well healed and he was asymptomatic. He was discharged to home on 7 February 1950.

SUMMARY

A two-stage operation for the cure of patients with large scrotal hernias, and applicable for long-standing hernias in elderly patients, is described. Such a procedure can be used in patients who are poor operative risks. Operation in two stages shortens operating time, lessens trauma, shock, and, it is believed, will lead to a cure in cases that are often classified as inoperable. The procedure involves: (1) excision of the scrotal portion of the sac (or most of it) in the first stage, partially reducing the hernia, and (2) operation later for the actual cure of the hernia by hernioplasty (the inguinal canal is not opened until the second stage). No record has been found in the literature of any multiple stage procedure being employed previously.



Cholelithic Intestinal Obstruction

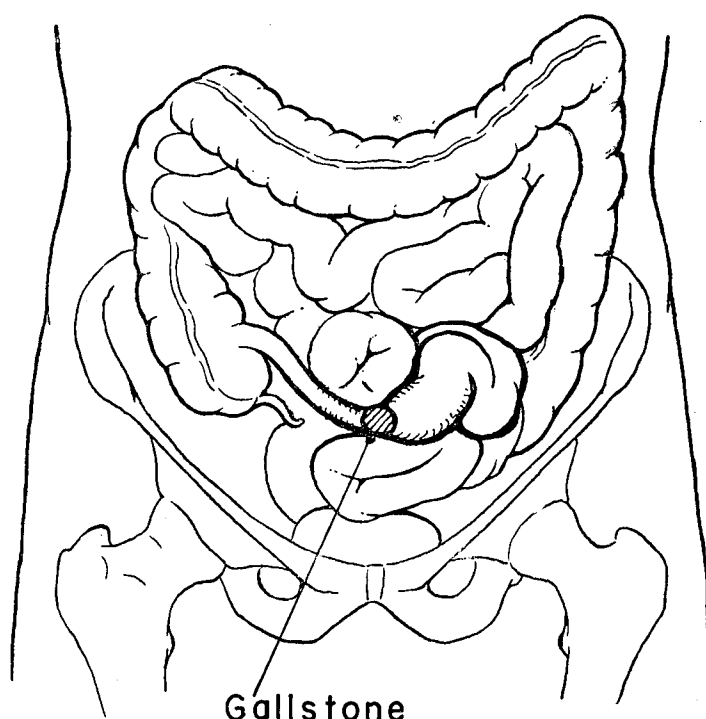
DANIEL H. MANFREDI, *Lieutenant Commander, MC, U. S. N. R.*¹

ACUTE intestinal obstruction caused by gallstones is a rare condition which allegedly carries with it a high mortality rate. About 2 percent of all cases of acute intestinal obstruction are caused by the presence of gallstones in the intestinal tract. A gallstone large enough to cause obstruction, i. e., greater than 2 cm. in diameter, must of necessity pass through a cholecystenteric fistula.

Case reports have appeared in the medical literature in which a fistula has been found between the gallbladder and the stomach, duodenum, ileum, jejunum, or large bowel. The gallstone usually erodes its way through the gallbladder wall during which adhesions form between the viscera and gallbladder; finally erosion of the wall of the involved viscera occurs with perforation into its lumen. Women are most frequently affected by this condition because cholelithiasis is more common in them than in men. The preoperative diagnosis is frequently missed, although it may be suspected and roentgenographic studies may give a clue. Women in the latter decades of life with a history of gallbladder disease and with symptoms of intestinal obstruction should be suspected of having this condition, provided other causes of intestinal obstruction, such as hernia and cancer, have been ruled out. The usual course of this condition, as illustrated in the reported case, is one of intermittent obstruction, followed later by a sudden acute complete obstruction.

The size of the stone is important, for as mentioned previously, a small stone (less than 2 cm.) may pass completely through the intestinal tract unless stopped by some extrinsic factor, such as a fibroid tumor, or cyst, or adhesion as illustrated in our case. The larger stones usually are caught in the region of the ileocecal junction (fig. 1). The diagnosis of intestinal obstruction is readily made and there are three points of importance in the roentgenologic studies which are: (1) the evidence of intestinal obstruction, (2) air in the biliary tree, and (3) the direct visualization of the gallstone. At operation, an

¹ Inactive.



Gallstone

Figure 1.—Most common site for arrest of progress of gallstone within lumen of ileum.

enterotomy is performed with removal of the stone; the abnormal condition in the gallbladder region is not disturbed. It is better prophylactic surgery to remove gallstones from the gallbladder before these stones enter the intestinal tract.

The following case illustrates some of the afore-mentioned principles.

CASE REPORT

Three days prior to admission to the hospital a 67-year-old white woman experienced acute generalized abdominal pain associated with nausea and vomiting. She had had no bowel movement for 4 days. Past history revealed that she suffered from occasional constipation which was relieved by enema, and she also experienced periodic attacks of indigestion. She had a distended abdomen with generalized tenderness throughout, but most severe in the left lower quadrant. A mass the size of a grapefruit was palpated in this region. Pelvic examination revealed a frozen fixed pelvis with a mass, probably a fibroid uterus, extending up to a point about midway between the umbilicus and symphysis pubis. The roentgenologist reported: "A

large mass-like shadow occupies the pelvis. The intestinal loops show fluid levels. A circular, homogeneous, calcium density is seen in the left lower quadrant. A calcified mesenteric node or a gallstone should be considered."

The patient was taken to the operating room 8 hours after admission, after adequate preoperative care and the making of laboratory studies. On opening the peritoneal cavity about 50 cc. of green fluid exuded. A large uterine fibroid and two large multilocular ovarian cysts were encountered. Between the uterus and the left cyst, a loop of ileum had become trapped. The bowel proximal to this point was greatly distended. On freeing this ileum from the pelvic organs, a hard mass about the size of a golf ball was palpated within the lumen of the liberated ileum (fig. 2). The fibroid and both ovaries were re-

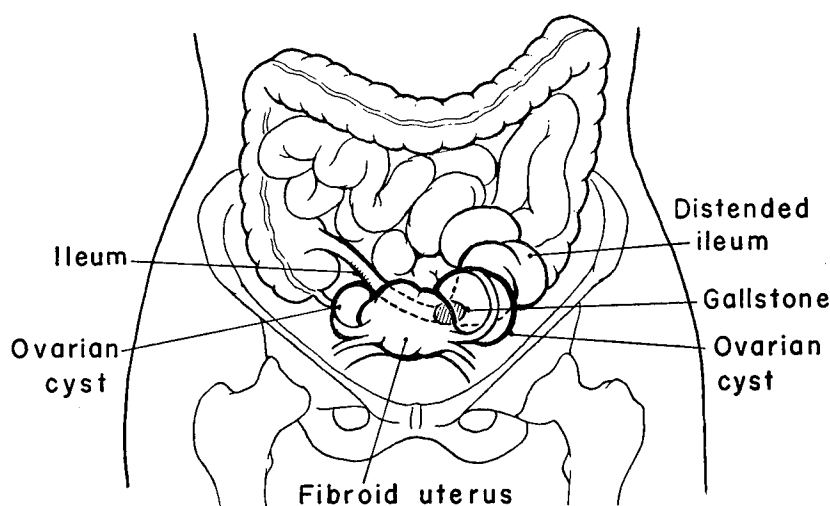


Figure 2.—Gallstone within lumen of ileum trapped between uterus and left cystic ovary.

moved and an ileotomy was performed with removal of the gallstone.

Palpation of the gallbladder area through the operative incision revealed a mass with dense pericholecystic adhesions which was not disturbed. The incision was closed without drainage; primary healing followed. Pathologic reports confirmed the physical findings. The postoperative course was interrupted by pneumonia which responded slowly to treatment. The patient was discharged feeling well, 7 weeks after operation.

SUMMARY

Cholelithic intestinal obstruction can be prevented if gallstones are removed before they enter the intestinal tract. Gallstones usually ob-

struct the lumen of the gastrointestinal tract in the region of the ileocecal junction unless they are stopped by some extrinsic factor prior to reaching this area. Treatment consists of longitudinal ileotomy of the antimesenteric border of the intestinal wall with transverse closure, together with all the basic treatment required for intestinal obstruction.



Hurler's Disease

Report of a Case

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OTIS S. LEE, *M. D.*²

HURLER'S disease is a complexity of skeletal and visceral changes usually associated with ocular manifestations. Thomson in 1900 was probably the first to note this condition. His patient was a twin. In 1908 when he saw the sibling of his first patient, he realized that he was dealing with a disease that had no counterpart in the literature, and, although he did not publish his case reports, he designated this condition in the hospital records as "Johnny McL——'s disease." Hunter,³ in 1917, was the first to publish a report of this disease. Hurler in 1919 described two more such patients, each displaying an unusual combination of anomalies, i. e., oxycephaly, dwarfism, and clouding of the cornea. Because she was one of the first to emphasize the combination of these signs, the disease is known as "Hurler's syndrome."

In 1925, Putnam and Pelkan⁴ made the first report found in the American literature. In 1936, Ellis, Sheldon, and Capon⁵ suggested the term "gargoylism" for this disease because the characteristic large head and grotesque facies of these patients resembled the gargoyles of the Notre Dame Cathedral. Binswanger and Ullrich⁶ in

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³ HUNTER, C.: Rare disease in two brothers. *Proc. Roy. Soc. Med.* 10: 104, 1917.

⁴ PUTNAM, M. C., and PELKAN, K. F.: Scaphocephaly with malformations of skeleton and other tissues. *Am. J. Dis. Child.* 29: 51-58, Jan. 1925.

⁵ ELLIS, R. W. B.; SHELDON, W.; and CAPON, N. B.: Gargoylism (chondro-osteodystrophy, corneal opacities, hepatosplenomegaly, and mental deficiency). *Quart. J. Med.* 5: 119-139, Jan. 1936.

⁶ BINSWANGER, E., and ULLRICH, O.: Über die "Dysostosis multiplex" (Typus Hurler) und ihre Beziehungen zu anderen Konstitutionsanomalien. *Ztschr. f. Kinderh.* 54: 699-712, 1933.

1933 introduced the term "dysostosis multiplex" into the German literature for this condition. Washington⁷ in 1942 first used the term "lipochoondrodystrophy" to indicate this disease. According to Straus, Merliss, and Reiser,⁸ who reviewed the literature of the world, only 65 patients had been reported up to late 1947. About one-third of these are inadequately described and doubt may be cast as to the validity of the diagnosis. About 107 patients have been reported to date.

GENERAL DESCRIPTION

Incidence.—The disease affects persons of either sex and is about 35 percent more frequent in males than in females.⁸ The majority of the reported patients were Caucasians, only two Negroes^{10 11} and two Chinese¹³ having been reported. The occurrence of this disease in siblings was recorded in 32 instances by Hurler (1919), Besdzik (1938), and others.^{9 12-18} Consanguinity of parents was found on four occasions.^{6 18 19} Because of its familial incidence and its developmental abnormalities, the disease is universally regarded as congenital.

Physical manifestations.—These patients are usually shorter than average for corresponding chronologic age, some being dwarfs. Their features are often described as coarse and ugly, usually with dolichocephalic head and prominent supraorbital ridges. The ears are frequently large, relatively low in position, and retracted against the head. Deafness may be present. The root of the nose is depressed, the nares are broad and filled with purulent mucus. The lips are

⁷ WASHINGTON, J. A.: In BRENNEMANN, J.: Practice of Pediatrics. W. F. Prior Co., Hagerstown, Md., 1942.

⁸ STRAUS, R.; MERLISS, R.; and REISER, R.: Gargoylism; review of literature and report of sixth autopsied case with chemical studies. Am. J. Clin. Path. 17: 671-694, Sept. 1947.

⁹ LUNDSTROM, R.: Gargoylism; 3 cases. Nord. Med. 33: 41-44, Jan. 3, 1947.

¹⁰ LAHEY, M. E.; LOMAS, R. D.; and WORTH, T. C.: Lipochoondrodystrophy. J. Pediat. 31: 220-226, Aug. 1947.

¹¹ HUBENY, M. J., and DELANO, P. J.: Dysostosis multiplex. Am. J. Roentgenol. 46: 336-342, Sept. 1941.

¹² HENDERSON, J. L.: Gargoylism; review of principal features with reports of 5 cases. Arch. Dis. Childhood 15: 201-214, Dec. 1940.

¹³ ENGEL, D.: Dysostosis multiplex: Pfaundler-Hurler syndrome; report of 2 cases. Arch. Dis. Childhood 14: 217-230, Sept. 1939.

¹⁴ RUGGLES, H. E.: Dwarfism due to disordered epiphyseal development. Am. J. Roentgenol. 25: 91-94, Jan. 1931.

¹⁵ ELLIS, R. W. B.: Gargoylism. Proc. Roy. Soc. Med. 30: 158, 1936.

¹⁶ STOT, G., and BURGESS, G. L.: Gargoylism. Proc. Roy. Soc. Med. 31: 1113-1116, July 1938.

¹⁷ ENGEL, D.: Etiology of multiple deformities. Am. J. Dis. Child. 60: 562-579, Sept. 1940.

¹⁸ HARVEY, R. M.: Hurler-Pfaundler syndrome (gargoylism); review of literature with report of additional case. Am. J. Roentgenol. 48: 732-740, Dec. 1942.

¹⁹ HALPERIN, S. L., and CURTIS, G. M.: Genetics of gargoylism. Am. J. Ment. Deficiency 46: 298-301, Jan. 1942.

thick, the tongue is large and often protrudes through the open mouth. Harelip and cleft palate are not infrequent. The neck is short. This, and the hunching of the shoulders, adds to the appearance of the head resting directly on the torso. The thorax is large, appearing to be in a position of deep inspiration. Often, there is dorsolumbar kyphosis. The abdomen is usually large and protuberant with umbilical and/or inguinal hernia. Splenomegaly and hepatomegaly are often present. Lanugo may be found on the back. Flexion deformities of the extremities are frequent. There is pronounced limitation of extension, but with no interference with further flexion of the involved joints. The fingers, elbows, shoulders, hips, and knees are frequently affected in this manner.⁴ Coxa valga, genu valgum, talipes equinovarus, pes planus, and pes cavus are often mentioned.

Mentality.—The mentality of these patients has been variously reported as superior, normal, or inferior,⁸ the majority of them being subnormal.

Prognosis.—These patients usually die before the twentieth year of life, although one autopsied case⁸ was 29 years old at time of death. Death is usually from some intercurrent disease or cardiac failure. The nares being frequently occluded with purulent mucus, the cleft palate, and the thoracic deformities often found in these cases make these patients vulnerable to pulmonary infections.

Skeletal findings.—Although the skeletal changes^{11 18 20 21} are perhaps the most helpful single diagnostic findings, these deformities may not be very great. The roentgenograms of the bones may be normal during infancy, but later the bony deformities which are characteristic of the disease develop. The skull is usually enlarged with widened suture lines and a large anterior fontanel. The most typical skull deformity is oxycephaly, although brachiocephaly and scaphocephaly are also reported. The forehead is prominent and is associated with heavy supraorbital ridges. The pituitary fossa is frequently elongated and shallow, but although it may be enlarged to twice its normal size, bony erosion is not seen.

The ribs are usually fixed in a horizontal position, are flared, and their distal portions show varying degrees of broadening. The clavicles are often massive and heavy. The shafts of the upper extremities are short and stubby, exhibiting bizarre swellings of the central portions which taper toward the ends. It is this swollen tapering con-

²⁰ GILLESPIE, J. B., and SIEGLING, J. A.: Dysostosis multiplex. *J. Bone & Joint Surg.* 22: 171-175, Jan. 1940.

²¹ CAFFEY, J.: *Pediatric X-ray Diagnosis*. The Year Book Publishers, Inc., Chicago, Ill., 1945. pp. 48, 631, 796.

figuration of the shafts of the tubular bones in the upper extremities which is the most diagnostic skeletal feature of the disease. In some patients the swelling of the central segments of the shafts is caused by cortical thickening, but in others it is caused by dilatation of the medullary canal. The distal ends of the femurs may appear normal. The proximal ends may show coxa valga or vara; the femoral head may be deformed and demineralized; and the acetabular cavities may be either shallow or deepened. Genu valgum is almost a constant finding. Kyphosis in the region of the twelfth thoracic and fifth lumbar vertebra is found in all severe cases. This deformity is caused by irregular growth and hypoplasia of the vertebral bodies, the affected vertebrae often being displaced posteriorly. Other vertebral bodies are delicate and narrow, especially in the cervical region. This narrowing shortens the spine and contributes to the dwarfism. Fairbank²² contributed a brief, clear, and pertinent discussion of the radiographic features of Hurler's syndrome which differentiate this condition from the Morquio-Brailsford syndrome.

Ocular signs.—These are found in over three-fourths of the patients.²³ Convergent squint was noted in four patients by Bindschilder and others.^{5 23 24} Megalocornea was reported by Meyer and Okner.²⁵ Buphthalmos with optic atrophy was found in two patients.²⁵ Two others are described by Jewesbury and Spence²⁶ as having prominent eyeballs. Huinink,²⁷ in reporting his case, stated that both optic nerves were swollen. Slot and Burgess¹⁶ described the disks in their case as red, vascular, and congested. Refractive errors were measured in several patients, and these ranged from +7 to -8D. Engel¹³ recorded the astounding determination of "37D" in his reported second patient, one of two Chinese children. He failed to mention whether the patient was hyperopic or myopic.

Subnormal dilations of the pupils after the administration of mydriatics have been noted in four patients.^{13 20 28} Helmholtz and Harring-

²² FAIRBANK, H. A. T.: 10. Gargoylism. From An Atlas of General Affections of the Skeleton. J. Bone & Joint Surg. 31B: 302-308, May 1949.

²³ CORDES, F. C., and HOGAN, M. J.: Dysostosis multiplex (Hurler's disease; lipochondrodysplasia; gargoylism) report of ocular findings in 5 cases, with review of literature. Arch. Ophth. 27: 637-664, Apr. 1942.

²⁴ HELMHOLTZ, H. F., and HARRINGTON, E. R.: Syndrome characterized by congenital clouding of cornea and by other anomalies. Am. J. Dis. Child. 41: 793-800, Apr. 1931.

²⁵ MEYER, S. J., and OKNER, H. B.: Dysostosis multiplex with special reference to ocular findings. Am. J. Ophth. 22: 713-722, July 1939.

²⁶ JEWESBURY, R. C., and SPENCE, J. C.: Oxycephaly and acrocephaly. Proc. Roy. Soc. Med. (Sect. Dis. Child) 14: 27, Apr. 1921.

²⁷ HUININK, B. A.: Gargoylism. Maandschaft voor Rendergenuskunde 6: 449, 1937.

²⁸ VEASEY, C. A., JR.: Ocular findings associated with dysostosis multiplex and Morquio's disease; report of case of the former. Arch. Ophth. 25: 557-563, Apr. 1941; also, Tr. Pacific Coast Oto-Ophth. Soc. 25: 107-117, 1940.

ton²⁴ recorded an instance of anisocoria. Opacity of the cornea occurs in about 75 percent of these patients.²⁹ When these corneal changes are present, they are pathognomonic of the disease. The changes usually appear before the age of 3 years; a few cases having been reported in which the corneas were already involved at birth. After the initial appearance, the opacities are permanent. On examination with focal illumination, the corneas are hazy and have a ground-glass appearance. Slit lamp examination shows the entire substantia propria to be uniformly speckled with gray or yellow-gray slightly refractile points of varying size. These, at first, occupy the middle and deeper layers of the substantia propria. Later, the entire depth of the substantia is involved. The epithelium may stain diffusely with fluorescein.³⁰ Bowman's membrane and the endothelium are not usually involved. Only one such patient in whom gray-white points were found in Bowman's membrane has been reported. Berliner³¹ found the cloudy opacities to occupy the central areas of both corneas with the peripheral areas being only slightly involved. Furthermore, the corneal involvement in his patient began in the anterior middle layers of the substantia and increased in density toward the posterior corneal surface. Engel,¹³ on the other hand, found the corneal opacities scattered throughout the substantia propria but most heavily aggregated in its anterior portion. Waardenburg³² described numerous and smaller lines and spots in all depths of the parenchyma. It was Cockayne³³ who called the corneal changes a corneal dystrophy. Only three slit lamp drawings^{23 25 31} of the corneal changes found in this condition have been found in the American literature.

Nystagmus has been described in a few patients. Although the visual acuity becomes reduced, these patients do not become blind.³² It is difficult to determine the exact visual acuity because of the age and/or the mentality of the patient. The corneal sensitivity appears to be normal. Sometimes the corneal opacity is so dense that details of the iris, pupil, and lens cannot be clearly determined.

²⁹ HOGAN, M. J., and CORDES, F. C.: Lipochondrodystrophy dysostosis multiplex; Hurler's disease, pathologic changes in cornea in 3 cases. *Arch. Ophth.* 32: 287-295, Oct. 1944.

³⁰ SHELDON, W.: Form of gigantism with splanchnomegaly. *Proc. Roy. Soc. Med.* 27: 1003-1007, June 1934.

³¹ BERLINER, M. L.: Lipin terabidosis of Hurler's syndrome (gargoylism or dysostosis multiplex). *Arch. Ophth.* 22: 97, 1937.

³² WAARDENBURG, P. J.: Ueber Dysostosis multiplex Hurler und die dabei vorkommenden Augensymptome. *Ophthalmologica* 99: 307-332, May 1940.

³³ COCKAYNE, E. A.: Gargoylism (chondro-osteo-dystrophy, hepatosplenomegaly, deafness) in 2 brothers. *Proc. Roy. Soc. Med.* 30: 104-107, Dec. 1936.

GENERAL PATHOLOGY

Autopsies have been reported by Washington⁷ and others.^{8 33-38} Microscopic sections of the brain reveal the ganglion cells of the cerebral cortex, the basal ganglion, and the brain stem to be balloon-shaped. The axons and dendrites are puffy. Many of the ganglion cells are filled with granular deposits of a foreign substance pushing the nuclei to one side. The Nissl substance is degenerated or absent. Some believe these deposits are lipoidal in nature.

The most striking histologic changes are found in the lymph nodes where the architecture is replaced in whole or in part by alveolated masses of large mononuclear cells containing abundant cytoplasm. The lungs frequently reveal bronchopneumonia. The liver shows fibrosis and nodular regeneration. The spleen, thymus, kidneys, pancreas, prostate, corneas, and testes may show lipoidal deposits. The pituitary gland may be enlarged. The skin, muscle, bones, heart, thyroid, and suprarenals present no appreciable abnormality. Studies of the bone show shortening of the zone of proliferative cartilage, the cartilage cells being poorly columnized. The formation of horizontally arrayed trabeculae along the under surface of the cartilage is a sequel to the slow growth of the cartilage. The trabeculae are composed of osteoblastic bone containing only traces of cores of calcified matrix. Normally these trabeculae are seen as vertical bars. This is evidence of slow growth.

Ocular pathologic changes.—The first report of pathologic eye changes was made by Kressler and Aegerter³⁹ in 1938. Their histologic examination showed that the laminae of the corneae showed empty lacunae or empty spaces between the lamellae. Therefore, the authors were uncertain as to whether this separation was an artefact secondary to fixation or the result of edema. The remainder of the ocular structures were normal. Berliner³¹ made the second report of the study of the pathologic eye changes in this condition. His slides showed Bowman's membrane being replaced in places with cells of vacuolated protoplasm, these cells varying from spindle shape to

³⁴ TUTHILL, C. R.: Juvenile amaurotic idiocy; marked adventitial growth associated with skeletal malformations and tuberculomas. *Arch. Neurol. & Psychiat.* 32: 198-209, July 1934.

³⁵ REILLY, W. A.: Atypical familial endocrinopathy in males with syndrome of other defects. *Endocrinology* 19: 639-648, Nov.-Dec. 1935.

³⁶ STRAUSS, L.: Pathology of gargoylism; report of case and review of literature. *Am. J. Path.* 24: 855-887, July 1948.

³⁷ LINDSAY, S.; REILLY, W. A.; GOTHAM, T. J.; and SKAHEN, R.: Gargoylism; study of pathologic lesions and clinical review of 12 cases. *Am. J. Dis. Child.* 76: 239-306, Sept. 1948.

³⁸ ASHEY, W. R.; STEWART, R. M.; and WATKINS, J. W.: Chondro-osteo-dystrophy of Hurler type (gargoylism); pathological study. *Brain* 60: 149-179, June 1937.

³⁹ KRESSLER, R. J., and AEGERTER, E. E.: Hurler's syndrome (gargoylism); summary of literature and report of case with autopsy findings. *J. Pediat.* 12: 579-591, May 1938.

globular shape. Corneal nuclei lay in the spaces found between the lamellae. In the deeper central regions were spaces containing lipid granular staining material. According to Berliner, therefore, the presence of these granules refutes any possibility that these spaces are the result of artefacts. He also found a few pigment granules on the posterior corneal surface; some of these pigment granules were in the endothelial cells. Further confirmation of such pathologic findings have been made by Rochat⁴⁰ and Hogan and Cordes.²⁹

THEORIES OF PATHOGENESIS

The cause of the disease is unknown but concepts as to its pathogenesis fall, in general, into two schools of thought.

Lipochondrodystrophy.—The concept that gargoylism is a lipochondrodystrophy was introduced by Tuthill.³⁴ This was based on the demonstration of an intracellular and extracellular lipid in the brain of one of Hurler's original patients. Similar lipid granules are found in the recognized diseases of lipid metabolism, such as Niemann-Pick's, Tay-Sachs', Christian's, and Gaucher's disease. If, however, Hurler's disease is a true lipochondrodystrophy related to the afore-mentioned metabolic diseases, then visceral lipoidoses and increased blood cholesterol values might be expected, but Reilly³⁵ reported that no lipid deposition was found in the liver and spleen of his patient at autopsy. Furthermore, chemical analysis of the organs of another patient at autopsy failed to reveal increased concentrations of lipids so characteristic of all major types of lipoid dystrophy.¹⁰ Blood cholesterol values within normal limits have also been reported in some patients. Lindsay et al.³⁷ believed that the fundamental alteration in tissues was the storage of a water-soluble substance, possibly a complex carbohydrate, but not lipid or protein material. In general, biochemical investigations have revealed nothing definite.⁵

Fascial contractures.—Some authors^{8,38} believe that most of the deformities of gargoylism are caused by fascial contractures. Thus, the bilateral pes cavus would be caused by contracture of the plantar fascia; the equinovarus deformity by contracture of the ankle ligaments and the cruciate ligaments; the abduction of the thighs by contracture of the fascia lata and/or other ligaments about the head of the femur; the flexion of the knees by contracture of the popliteal fascia or ligaments of the knee joints; and the rigidity of the spine by contracture of the anterior and posterior longitudinal ligaments, the ligamentum flavum, and, possibly, the interspinous ligaments. Thus, Hurler's would be a disease of collagen, chiefly of the fascia

⁴⁰ ROCHAT, G. F.: Corneal opacity to dysostosis multiplex (gargolism, Hurler's disease). *Ophthalmologica* 103: 353-356, June 1942.

and ligaments. Although this concept readily explains the physical deformities found in this disease, no adequate explanation has been presented for the corneal, cerebral, and visceral changes.

CASE REPORT

A white male child, 2 years, 1 month, and 21 days of age, was first seen at the University Hospital, Iowa City, Iowa, on 15 December 1948 because his head had been enlarged since February 1948.

Birth history.—He was born 1 month prematurely after a 5-hour labor and weighed 6½ pounds. The mother was a healthy primipara; there were no complications at delivery; the child cried spontaneously. Two days after birth, the child turned “black” because of phlegm in his throat. This was aspirated and there were no untoward sequelae. The infant was breast fed for 3 weeks and then put on a formula.

Postnatal development.—He sat up at the age of 5 months and cut his first tooth at 10 months. He walked alone at 1 year, but with

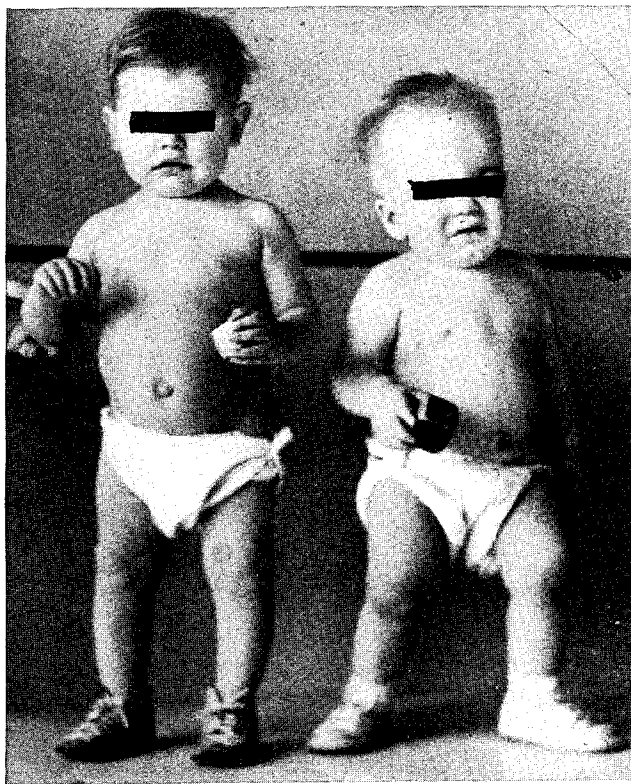


Figure 1.—Comparison of patient (right) with a child 1 month younger.



Figure 2.—Lanugo on back.

the knees bent. He has never said anything but "ma-ma" and "da-da."

Past and family history.—There were no known abnormalities in maternal or paternal family trees. The mother was 23 years of age. There were no other children. The child had frequent upper respiratory infections with a constantly "running nose." In November 1948 he had diarrhea with soft yellow-green stools which cleared up after 6 days without treatment.

Physical examination.—The patient was 31 inches tall (corresponds to height of 14-month-old child) and weighed 30 pounds (fig. 1). His head was dolichocephalic with a circumference of 54 cm. (notably large for his age as the average would be from 48 to 50 cm.). The anterior fontanelle was patent, measured 1 by 1.5 cm., and bulged when the patient cried. The supraorbital ridges were prominent. There was lanugo on the back (fig. 2).

There was useful vision in each eye and no nystagmus. Fixation was central in each eye. The lids and conjunctivae were normal. Corneal sensitivity was normal, and on diffuse illumination, the corneas appeared cloudy (fig. 3). Slit lamp examination revealed

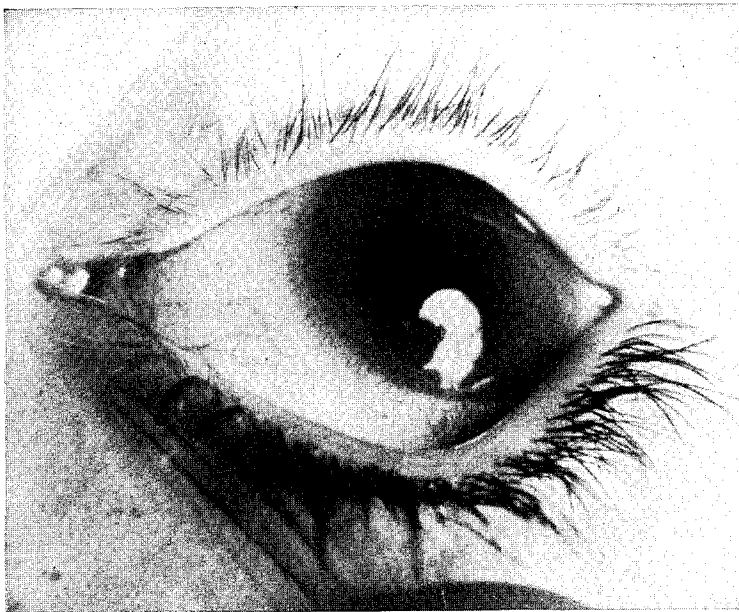


Figure 3.—Appearance of cornea.

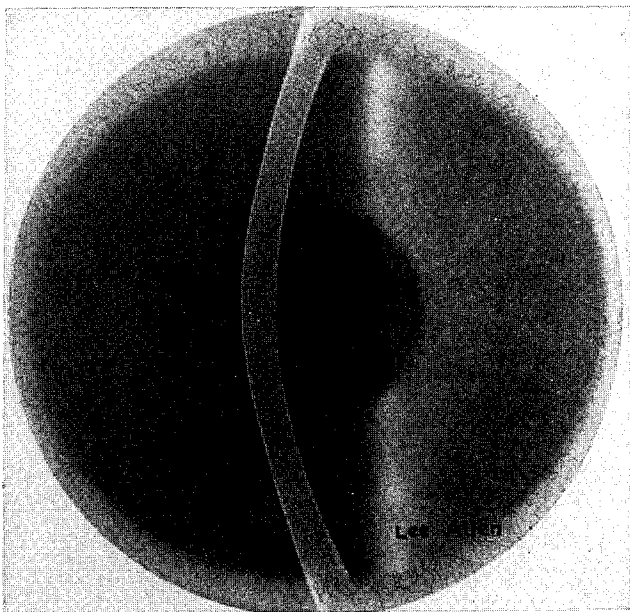


Figure 4.—Slit lamp drawing showing corneal changes.

a normal epithelium, the substantia propria throughout its entire depth had many yellow-white flecks and points which were more dense in the periphery. The endothelium was normal (fig. 4). The anterior chambers slightly deeper than normal. Pupils were round, equal, and reacted to light. Consensual reflex was present. Administration of 0.5 percent pontocaine, 4 percent homatropine, and 0.2 percent scopolamine gave poor dilation. Floaters were not seen in the vitreous humor. The fundi were poorly visualized because of

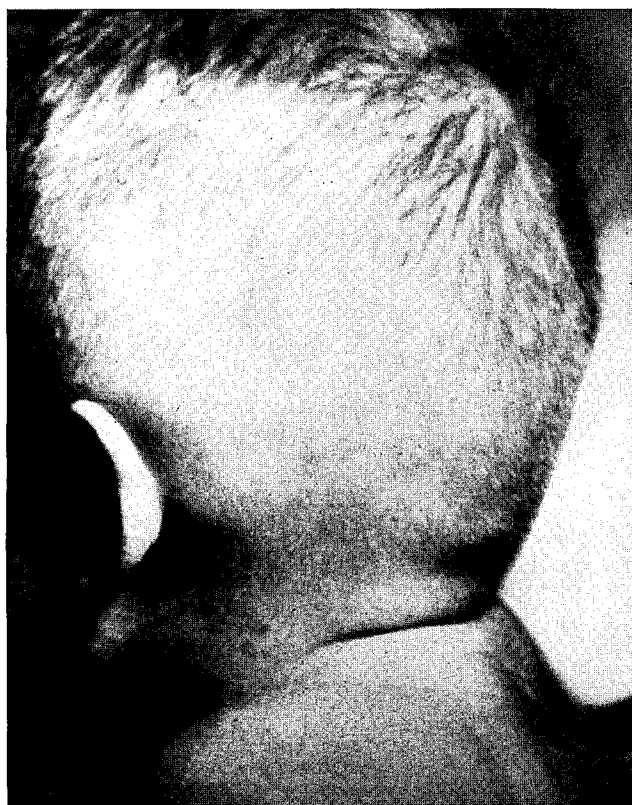


Figure 5.

the corneal opacities. The disks appeared to be congested but we believed this was only apparent. Maculae could not be visualized with sufficient clarity. The epithelium of the corneas did not stain with fluorescein. Schiötz's tonometer readings were 16 mm. Hg. bilaterally.

The root of the nose was depressed. The respiration was noisy and there was a chronic mucopurulent discharge. The lips were normal; there were 12 widely spaced and underdeveloped teeth; the tongue was large and often protruded through the open mouth; the high-

arched, narrow palate had a slight cleft. The neck was short and made the head appear to be set low between the shoulders (fig. 5). The thorax was slightly flared and appeared to be in a position of inspiration; bronchial rales were heard throughout. The abdomen was pot-bellied. There was an umbilical hernia (fig. 6), and the liver was palpable 4 cm. below the right costal margin; the spleen was also palpable. Because scapulohumeral motion was restricted, the patient could not raise his arms above his head. There was 50 percent limitation in abduction and elevation; rotation was normal. The elbows had normal range of flexion and extension, but supination was limited to about 50 percent. The digits were short and stubby. The motion in the knees was limited to from 60 to 65 degrees.

Laboratory studies.—The red blood cell count was 4.9 million; the hemoglobin, 12 grams. The white blood cell count was 13,400 with 80 percent polymorphonuclear cells, 15 percent lymphocytes, and 5 percent monocytes. Other laboratory tests are shown in table 1.

TABLE 1

	<i>Normal</i>
Total fat, 630 mg. per 100 cc. plasma.....	500-700
Cholesterol, 207 mg. per 100 cc. plasma.....	150-205
Esters, 107 mg. per 100 cc. plasma.....	60-80 ¹
Serum calcium, 12 mg. per 100 cc.....	9-11
Serum phosphorus, 5.6 mg. per 11 cc.....	4-7
Phosphotase, 8 Bodansky units (serum).....	1.5-4.0
Cephalin flocculation, 24 hr. and 48 hr. negative.....	Negative
Phospholipids, 228 mg. per 100 cc.....	225-250

¹ Percent of total plasma cholesterol.

Cattell infant intelligence scale.—Language development was slightly more retarded than motor and perceptual development. He did comprehend and follow simple directions. His general intelligence level appeared to be in high-grade mental defective range. Mental age of 16 months.

Femur bone marrow puncture.—The bone marrow was hyperplastic in both the erythroid and myeloid series and there was a particularly large number of eosinophilic myelocytes, but no abnormal cells were seen. Impression: Hyperplastic bone marrow.

Roentgenograms of the skull showed an increase in the size of the cranial vault, the prominent frontal area and the special increase in the anteroposterior diameter of the skull giving it a dolichocephalic configuration. The lateral view also showed the shallow, elongated sella turcica frequently associated with the patient's condition. The anteroposterior view also showed the characteristically dense supra-orbital ridges (figs. 7, 8, and 9). Roentgenograms of the upper and



Figure 6.—Umbilical hernia.



Figure 7.—Roentgenogram of skull.

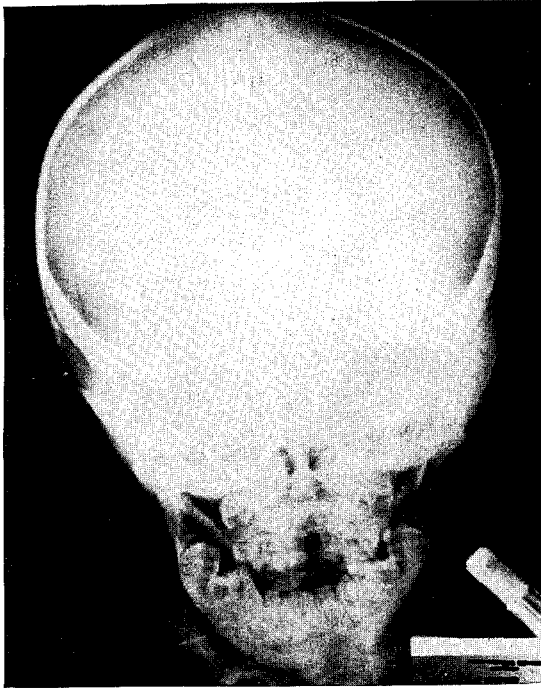


Figure 8.—Roentgenogram of skull.

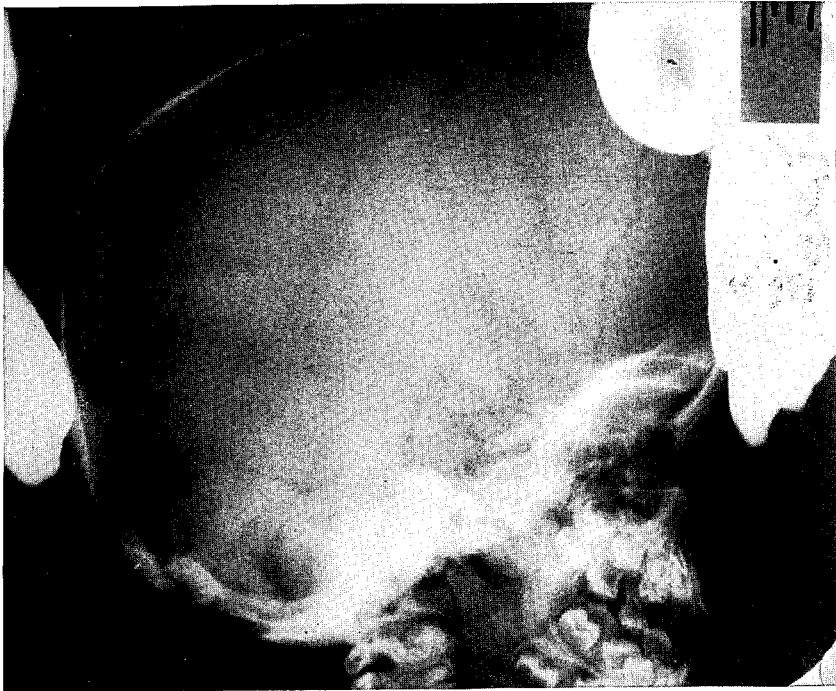


Figure 9.—Roentgenogram of skull.

lower extremities showed a bone age of 3 months according to the wrist development. The degree of retardation varied in this patient; the elbow joint development was consistent with about 17 months of age. The long bones showed widening of their shafts, the central portions



Figure 10.—Roentgenogram of left forearm and hand.

showing a fusiform contour while the distal ends of the humerus showed the characteristic tapering seen in this patient's condition. This was in contradistinction to the condition of chondrodystrophy in which the ends of the long bones flare and overhang the central portions (figs. 10 and 11). Roentgenograms of the dorsolumbar spine in anteroposterior and lateral projections showed the characteristic upper lumbar kyphosis commonly seen in this patient's condition. There was hypoplasia of the lower dorsal and upper lumbar vertebrae with irregularity in their contour and posterior displacement of the body of the twelfth thoracic and those of the first and second lumbar vertebrae. The anteroposterior view included the pelvis and both hips. There is evidence to suggest the characteristic coxa valga deformity and poor mineralization of the femoral head (fig. 12).

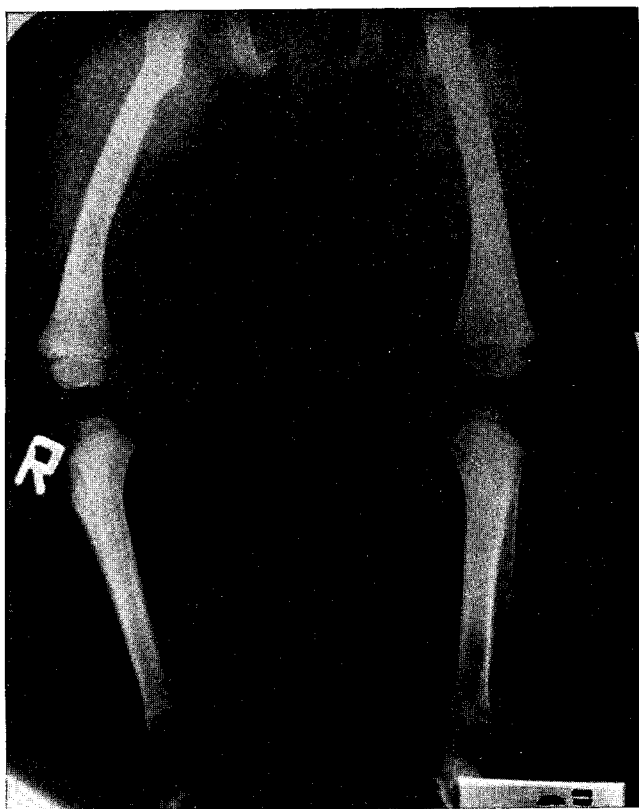


Figure 11.—Roentgenogram of lower extremities.

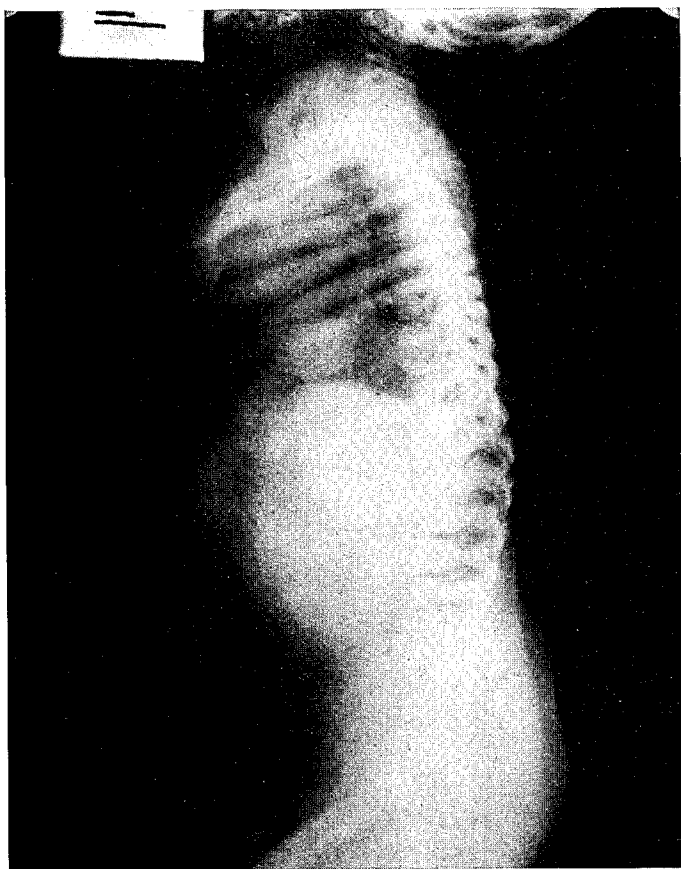


Figure 12.—Roentgenogram of thorax and hip.

The roentgenographic survey of this patient showed many of the characteristic findings of Hurler's syndrome. These were especially the dolichocephalic enlarged skull with elongated shallow sella and heavy supraorbital ridges; the upper lumbar kyphosis with hypoplastic vertebral bodies which were posteriorly displaced; the increase in traverse diameter of the central portion of the long bones tapering distally; the suspected bilateral coxa valga; the demineralized ossification centers for the femoral heads; and the evidence of variable degree of retardation in bone growth.



Serum Levels of Orally Administered Penicillin¹

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IT HAS been long debated whether or not the soldier in the field should have penicillin in his emergency kit for immediate administration when wounded. If such a plan were favorably considered, the administration of penicillin by mouth would be the method of choice. While there are many points for and against this use of penicillin, the effectiveness of the drug, if taken orally under such circumstances, must be known. The action on the serum level, as well as the therapeutic response, are well known when penicillin is given subcutaneously. It is not our purpose to discuss the issue of whether soldiers should be issued oral penicillin for use in the field, but rather to make some observations on the expected response if penicillin were given by mouth to troops under such circumstances. This subject has been discussed at length by the Armed Services Field Medical Matériel Group, and it was pointed out that the therapeutic action of penicillin under such circumstances is not well known at this time.

DOSE AND METHODS OF ADMINISTRATION

The specimens submitted to the laboratory consisted of blood drawn from patients given (1) 500,000 units of penicillin G² orally on an empty stomach; or (2) 300,000 units of procaine penicillin G intramuscularly in aqueous solution. One specimen was taken just before treatment was started, and ½, 1, 2, 3, 4, 5, and 7 hours thereafter. A few tests were made on specimens 24 hours after administration, but because none of these showed an assayable penicillin level with either

¹ Oliver General Hospital, Augusta, Ga.

² Buffered penicillin G potassium crystalline tablets, 500,000 units each.

method of administration, these tests were discontinued. The subjects from whom the blood was taken included normal healthy male patients who were on the surgical service for the purpose of having uncomplicated hernias or some other noninfected surgical defect repaired. None of these subjects had previously received penicillin by any route. Only one subject in the entire series had an infection treated with penicillin given orally. He had a mild furunculosis, from which hemolytic *Staphylococcus albus*, sensitive to 0.25 units of penicillin per cc., was cultured. This patient received 500,000 units of penicillin by mouth every 6 hours on an empty stomach. His lesions cleared rapidly within 72 hours. The study was brought to an end, however, before conclusive experiments could be made on the blood level of penicillin after oral administration of repeated doses.

METHOD OF ASSAY

The test organism used was *Staphylococcus aureus* (Heatley). At the end of each week, the organism was plated out on Chapman's salt-mannite agar, which was then incubated at 37° C. for 48 hours. Several large, golden-yellow colonies were transferred to tryptose-phosphate broth (pH 7.2 to 7.4). This procedure was designed to avoid small colony "G" variants which are frequently somewhat resistant to penicillin. Twenty-four hour tryptose-phosphate broth cultures were used in the test. Half a milliliter of the 24-hour broth culture was added to 100 ml. of medium just before use.

In preparing the standards a series of 10 sterile cotton-plugged test tubes are set up. To each tube, 0.2 ml. of mannite broth³ is added. To tube No. 2, 0.2 ml. of a 20 unit per ml. standard solution of penicillin is added.⁴ Serial two-fold dilutions are carried through to the tenth tube, the final 0.2 ml. being discarded. The dilutions may be represented as follows:

Tube	1	2	3	4	5	6	7	8	9	10
Units	0	2.0	1.0	0.5	0.25	0.125	0.0625	0.0312	0.0156	0.0078
per ml.										

Half a milliliter of mannite broth containing 0.5 ml. of a 24-hour broth culture of the test organism per 100 ml. is added to each tube with aseptic precautions. The standard series is incubated at 37° C. for 24 hours with the test. Following incubation, the standard is read by noting the last tube in which complete inhibition is manifested

³ Beef extract, 1 gram; proteose peptone No. 3 Difco, 10 grams; *d*-mannitol, 10 grams; phenol red, .025 grams; distilled water q. s. to make 1,000 cc. Sterilize at 15 lb. pressure for 15 min.

⁴ Our standard penicillin was obtained from the Penicillin Division, Food and Drug Administration, Washington, D. C., and was prepared by carefully weighing a small amount on an analytical balance, sufficient water being added to produce the desired concentration or a convenient multiple thereof. The standard solution was then kept in the freezing tray of the refrigerator, and did not deteriorate for a period of over a month.

by failure of the phenol red indicator to turn yellow. The end-point is usually clear-cut and unmistakable, the end-point tube being definitely red and the next tube a distinct yellow. The end-point was usually at tube 8 in this series.⁵ Variation from this end point occurs, if at all, when the standard is freshly made up.

Procedure for unknown fluid.—Six sterile Wassermann tubes are set up in a rack, and the following procedure is then carried out:

Tube	0	1	2	3	4	5
Ml. of mannite broth.....	0.0	0.0	0.2	0.2	0.2	0.2
Ml. of unknown fluid.....	0.4	0.2	0.2	Serial dilution through last tube, discarding final 0.2 ml.		
Dilution.....			1:2	1:4	1:8	1:16
Ml. of mannite broth+staphylococci.....	0.5	0.5	0.5	0.5	0.5	0.5
Penicillin present (u./ml.), when standard.....	0.078	0.0156	0.312	0.625	1.25	2.5

The above protocol is similar to that used for the Rammelkamp technic.

DISCUSSION

One of the patients (No. 7) who received penicillin orally showed nonspecific inhibition of the test organism (corresponding to 0.08 unit in the treatment sample). Since the subsequent ½-hour specimen showed a zero level, the test was not excluded. This was the only occasion on which this phenomenon was observed.

Because of the wide variety of tests used and the possible uncontrolled variables present in various laboratories, conclusions drawn from interlaboratory comparisons are hazardous. One of the most logical approaches to the problem of comparison of oral with other routes of administration is that of Hoffman and Volini⁶ who pointed out that the arbitrary acceptance of any given blood level as an "adequate therapeutic level" is fallacious. They preferred to achieve, by means of oral administration, a series of blood levels that would compare favorably with those obtainable by an accepted clinically tested method of intramuscular injection. For this purpose, they adopted the routine intramuscular injection of 20,000 units of crystalline penicillin, every 3 hours, which they found in their laboratory gave plasma levels of 0.5 unit at ½ hour, 0.06 unit at 2½ hours, and 0.03 unit at 3 hours. Having stated their viewpoint, the authors unfortunately failed to carry it through to the extent of making their comparison precise. In the present study, a direct comparison of the serum levels of penicillin obtained by oral administration with that obtained by a clinically proved and acceptable procedure has been made.

⁵ The end point was read at tube 7 once and at tube 9 once, each in a large series of tests.

⁶ HOFFMAN, W. S., and VOLINI, I. F.: Studies in oral administration of penicillin; assays of various preparations and determination of effective therapeutic dose. *Am. J. M. Sc.* 213: 513-519, May 1947.

The statistical constants used were the median and the first quartile. Frequently it is not fully appreciated that statistical constants to be used with serial dilution technics must be judiciously selected. As an example, a little consideration of the characteristics of data resulting from twofold serial dilution shows that an arithmetic average cannot be used. The results obtained with any serial dilution technic, such as that of Rammelkamp and the one employed in this study, are discontinuous, so that the values obtained actually represent a *range*, rather than a true concentration. The reported value of 0.312 unit per cc., for example, actually is the lower boundary of the range, 0.312 to 0.625. It can readily be appreciated that the averaging of such results is not a valid statistical procedure. The median, however, can be and frequently is used. In addition to the median, it was believed that the use of the first quartile would be interesting from a practical point of view. Just as the median divides the distribution above and below it into equal parts, so the first quartile divides the distribution so that 75 percent of the values obtained are above and 25 percent are below. This is perhaps more satisfying to the clinician than the median. The 100 percent level is unfortunately too likely to be pulled down by a rare case, giving too pessimistic a view of the results obtainable.

RESULTS

One hundred and seventy-seven assays were made on 23 patients receiving penicillin orally, 68 were made on 9 patients receiving procaine penicillin intramuscularly, and 10 were made on 2 patients receiving 100,000 units of crystalline penicillin G intramuscularly.

TABLE 1.—*Frequency distribution of blood levels*
PATIENTS GIVEN 500,000 UNITS OF PENICILLIN G ORALLY

Blood level u/ml.	Time after administration of drug (hours)						
	½	1	2	3	4	5	7
Above 2.5.....	0	0	0	0	0	0	0
Above 1.25.....	0	0	0	0	0	0	0
Above 0.625.....	2	3	0	0	0	0	0
Above 0.312.....	0	2	1	0	0	0	0
Above 0.156.....	1	4	3	4	3	2	1
Above 0.078.....	3	4	9	8	3	3	1
Below 0.078.....	17	10	10	11	17	14	8
Total.....	23	23	23	23	23	19	10

PATIENTS GIVEN 300,000 UNITS OF AQUEOUS PROCAINE PENICILLIN G INTRAMUSCULARLY

Above 2.5.....	1	1	1	1	1	1	-----
Above 1.25.....	0	0	3	1	0	0	0
Above 0.625.....	2	2	1	5	5	3	0
Above 0.312.....	5	5	3	1	2	3	3
Above 0.156.....	1	0	1	1	1	2	1
Above 0.078.....	0	1	0	0	0	0	1
Below 0.078.....	0	0	0	0	0	0	0
Total.....	9	9	9	9	9	9	5

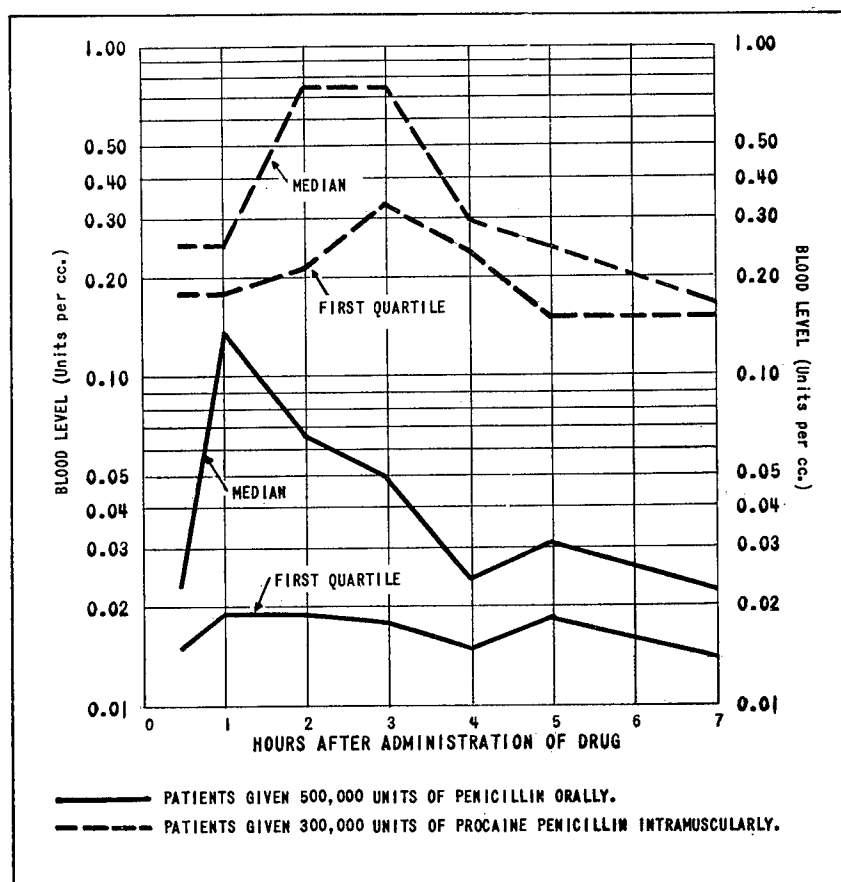


Figure 1.—Serum levels of penicillin.

From figure 1 it may be seen that, with the intramuscular administration, we are dealing with serum levels that are roughly 10 or 11 times as high as those obtained by the use of penicillin orally. In addition, the occurrence of zero (no detectable penicillin) levels is much more frequent as shown by table 1. In fact, such zero levels were not obtained in the 7-hour interval studied with the intramuscular administration whereas they were as frequent as 70 percent at 7 hours with the oral administration.

It is of interest to know when the peak level is reached after administration of penicillin. In both our series, peak levels were rather scattered because of variation in absorption time in different patients. With oral administration, peak levels are usually reached in about 1 hour. With intramuscular administration, peak levels occurred after from $\frac{1}{2}$ to 3 hours in this small series.

SUMMARY AND CONCLUSIONS

Serum penicillin levels were performed on two groups of patients, one group received 300,000 units of procaine penicillin G intramuscularly, the other group received 500,000 units of crystalline penicillin G orally. Comparison of the two sets of determinations was made by means of frequency distributions, medians, first quartiles, occurrence of zero levels, and distribution of peak levels.

The serum levels of penicillin shown represent the maximum expected in healthy men when a massive single dose is given orally on an empty stomach. Absorption is expected to be less when it is given on a full stomach or in the presence of nausea, vomiting, or shock. A therapeutic serum level is not obtained by the administration of a single dose; repeated doses are essential to obtain such a result. This point is being investigated further. Subcutaneous administration of penicillin seems to be the method of choice and has a more universal application in therapy than oral administration.



Merostotic Paget's Disease

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WILLIAM G. TURMAN, *First Lieutenant, MC, U. S. A.*¹

SIR JAMES PAGET² in 1876 selected certain types of chronic deforming osteodystrophy and labeled them osteitis deformans. He dealt, however, only with the generalized deforming osteitis, even though there were occasional reports of single bone lesions of the same type that did not appear to fall into his group of osteitis deformans. In 1833 Bowlby³ reported a case of osteitis deformans of the tibia with progressive bowing for over 30 years. There was no extension of the process to other bones of the skeleton and the patient later died of a head injury. With the development of the roentgen ray, the problem became more complicated and many indistinct single bone lesions could be seen in the spine in which obtaining a specimen for biopsy was impossible. Discussions of cases of this type became numerous. The affected vertebrae appeared denser on the roentgenogram, and therefore such terms as "vertebrae noire" or "ivory vertebrae" were used. Schmorl⁴ reported the biopsy of a case of osteitis deformans of a single bone lesion in a tibia as early as 1905, but other monostotic (involving only one bone) cases were still labeled "hereditary lues," "para-cancer," "localized osteomalacia," and "osteomalacia chronica deformans hypertrophica."

In 1931 Schmorl⁵ published all his available data on this subject

¹ Percy Jones Army Hospital, Battle Creek, Mich.

² PAGET, J.: Chronic inflammation of bones (osteitis deformans). *Tr. Roy. Med.-Chir. Soc. Glasgow* 60: 37-63, 1877.

³ BOWLBY, A. J.: Two cases of curvature of femur, one due to osteitis deformans; the other to injury followed by chronic inflammation. *Tr. Path. Soc. London* 34: 192, 1833.

⁴ SCHMORL, G.: Über ostitis deformans Paget. *Virchows Arch. f. path. anat.* 283: 694-751, 1932.

⁵ SCHMORL, G.: Zur Kenntnis der Ostitis deformans Paget. Aufhellungszonen in der Kortikalis und periostale Ossifikation. *Fortschr. a. d. geb. d. Röntgenstrahlen* 43: 202-207, Feb. 1937.

and accepted the monostotic form of Paget's disease as an entity, but did not agree with earlier writers that this is a rare finding. In his observations of 4,603 spines, he found the single lesion more frequently than the polyostotic (involving more than one bone) form. Groh⁶ agreed with this finding even to the point of demonstrating two distinct types of Paget's disease in a single vertebra. In 5 years he found 9 monostotic and only 2 polyostotic cases. Sugarbaker⁷ reviewed 51 cases of Paget's disease, with 12 of this series or 24 percent being of the monostotic form. The tibia was involved in 6, the skull in 2, the humerus in 2, the sacroiliac region in 1, and the radius in 1 case. Newman⁸ reported 82 cases, 12 of which were found to have only one bone involved. Moore⁹ stated that monostotic Paget's disease was seen in about 3 percent of all autopsies, the lumbar vertebrae being most often affected.

Improved roentgenologic technic is responsible for the recognition of two different types of bone changes in monostotic Paget's disease of the spine. Schmorl has found that part of the vertebral body may be involved early in the disease but that soon the entire body, with its processes and often its spurs, if any are present, will be uniformly involved. The body involved is enlarged and its trabeculae are coarse, dense, and interlacing, giving the familiar mosaic structure. There is also an accompanying narrowing of the sagittal diameter. This type of Paget's disease eventually collapses under the pressure of weightbearing and cases have been reported with complete collapse and slipping of the vertebra above. In the second type of Paget's disease the entire vertebral body is extremely dense throughout, giving it the appearance of ivory; its trabecular structure is thickened and coarse; and the segment is enlarged uniformly in all dimensions. These changes must be differentiated from similar forms seen in leukemia, myeloma, osteoplastic metastatic lesions from carcinoma of the prostate or breast, osteosclerosis, and syphilis. The vertebra so affected withstands weightbearing and does not collapse. The non-collapsing type, sometimes known as the combined type, is usually without pain whereas the collapsing or sclerotic type is painful, probably because of pressure on the nerve roots.

Decalcification, new osteoid tissue formation, and inorganic salt deposition take place simultaneously in Paget's disease. The decal-

⁶ GROH, J. A.: Mono-osteitic Paget's disease as clinical entity; roentgenologic observations in 9 cases. *Am. J. Roentgenol.* 50: 230-243, Aug. 1943.

⁷ SUGARBAKER, E. D.: Osteitis deformans (Paget's disease of bones); review of 51 cases. *Am. J. Surg.* 48: 414-421, May 1940.

⁸ NEWMAN, F. W.: Paget's disease; statistical study of 82 cases. *J. Bone & Joint Surg.* 28: 798-804, Oct. 1946.

⁹ MOORE, S.: Osteitis deformans. *Am. J. Roentgenol.* 10: 507-518, July 1923.

cification is more apt to predominate in the earlier and more active stages of the disease and the inorganic salt deposition in the later and less active stages. The most striking alteration of blood in patients with osteitis deformans is an elevation of the concentration of phosphatase, an enzyme possessing the property of hydrolyzing phosphoric esters. The normal value expressed in Bodansky units is from 1 to 3. This enzyme is a product of body cells in general, but is present in the greatest concentration in the intestinal mucosa, kidney, and whole bone. Bone lesions involving a fair portion of the skeleton such as infantile and adolescent rickets, renal rickets, osteomalacia, osteogenesis imperfecta, multiple myeloma, osteogenic sarcoma, carcinoma with bone metastases, hyperparathyroidism, and Paget's disease, are accompanied by a rise in the phosphatase content of the plasma. The phosphatase level is also elevated in diseases associated with extensive liver damage. The highest values are found in Paget's disease. Since the increase in plasma phosphatase is the result rather than the cause of osteitis deformans, reflecting the cellular activity incident to osteogenesis, it is of no value in differentiating Paget's disease from other conditions in which bone formation occurs. Coupled with roentgenographic evidences, however, it is a distinct aid in the diagnosis. Although values as high as 216 units have been reported, the average concentration in Paget's disease is about 23.5 units. In one series of 4 monostotic lesions the average elevation was 8.97 units.⁷ The average of the polyostotic group was 13.9 units. In another series of 9 cases of monostotic lesions the average elevation was 9.6 units.⁶ There seems, therefore, to be a direct relationship between the measurable serum phosphatase activity and the extent of bone involvement in the skeleton. Higher levels are seen in patients who exhibit the combined phase than are found in those whose roentgenograms reveal the sclerotic phase and it is logical to assume that the sclerotic form of the disease is less active than the combined form or that it is an evidence of healing.

The following case of a solitary bone lesion occurring in the head of the right humerus represents merostotic (lesion limited to one segment of a single bone) Paget's disease.

CASE REPORT

A 43-year-old former Army nurse while en route to the United States in February 1945, awoke one morning with pain in the right shoulder and inability to raise the right arm. Immediate treatment consisted of sedation, and a diagnosis of chronic bone cyst was made. She gradually improved and in April appeared before a disposition board because of cystitis. Six months on limited duty was recom-

mended. Her pain and inability to raise the right arm were still present, but had become less acute. Prior to separation from the service in January 1946 clearance was given for the "cyst of the right humerus" which was diagnosed at the time as chronic tenosynovitis of the right supraspinatus muscle with healing osteoporotic changes in the head of the humerus, cause undetermined.

In September 1949 she was admitted to this hospital. Her symptoms since the onset of the shoulder pain consisted of a constant dull ache in the right shoulder and aggravation of pain on certain motions of the shoulder. Physical examination revealed no limitation of motion of her right upper extremity, and no atrophy of her shoulder girdle. There was an area of tenderness over the proximal portion of the humerus.

Her blood calcium was 9.3 mg. per 100 cc. Acid phosphatase was normal and alkaline phosphatase 3.9 units. The leukocyte count was 12,000 with 78 percent neutrophils and 22 percent lymphocytes. A roentgenogram of the right shoulder demonstrated a general in-

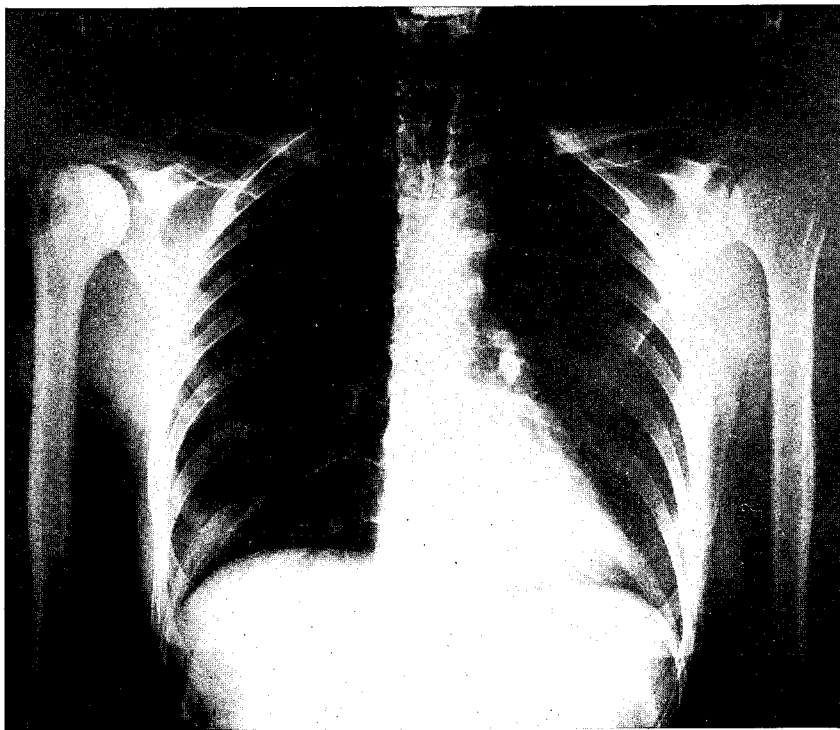


Figure 1.—Roentgenogram showing involvement of the proximal half of the right humerus. Note the cystic area in the head of the humerus and thickening of the cortex of the proximal half of the shaft, with narrowing of the medullary canal.

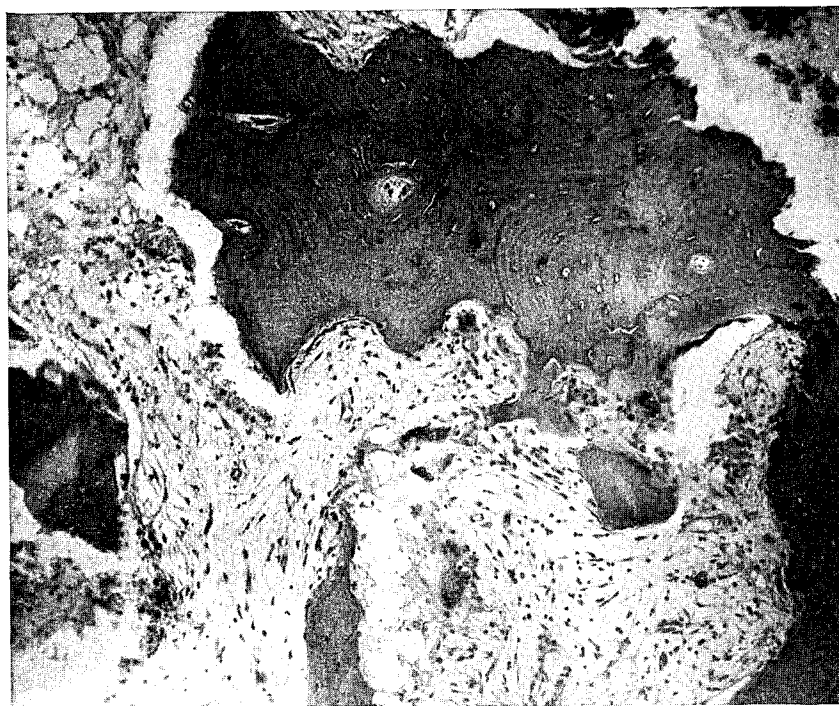


Figure 2.—Photomicrograph of specimen for biopsy. Note the evidence of increased osteoblastic and osteoclastic activity with the prominent laminations and "mosaic" appearance of the bone.

crease in bony density of the head of the humerus with coarsening of the trabecular pattern (fig. 1). There was an area of decreased density about 2.5 cm. in diameter, underlying the greater tuberosity of the humerus. The roentgenographic diagnosis at this time was sclerotic osteitis. The patient had a skeletal survey and no significant lesion was found other than minimal hypertrophic changes of the cervical and thoracic spine and phalanges.

A specimen for biopsy was obtained from the right shoulder and an iliac bone graft was placed in the defect. The biopsy report indicated Paget's osteitis deformans, which was confirmed by the Armed Forces Institute of Pathology (fig. 2). The postoperative course was uneventful and the patient returned to nursing in civil life. Three months after the operation she was having less pain in the right shoulder and had no limitation of motion. There is no evidence in the literature to lead us to expect widespread manifestations of this disease in this patient, but rather it is expected that this is a self-limiting process and is confined to the right humerus.



Roentgenographic Findings in Recurrent Shoulder Dislocation¹

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ALEXANDER O. HAFF, *Colonel, MC, U. S. A.*

RECURRENT or habitual dislocation of the shoulder joint is characterized by repeated displacement of the head of the humerus from the glenoid cavity without the initiating trauma which is required for ordinary dislocation. The original dislocation may be associated with an injury sufficient to produce displacement of the humeral head, but subsequently the dislocation occurs from some simple shoulder movement, usually in abduction and external rotation, such as in swimming, boxing, painting, or reaching for an object overhead. In many patients no severe trauma has ever been incurred and the displacements are always spontaneously produced. In most patients reduction of the recurrent dislocation is accomplished by the patient himself following the original incident which usually required professional treatment. In some instances the displacement has always been self-reducible. Temporary discomfort and disability usually occur at the time of dislocation but the greatest complaint of the patient is the fear of incurring dislocation at a time when it would cause embarrassment. Patients must curtail their activities to avoid such incidents. The displacements are usually anterior and inferior to the glenoid rim and the condition is noted most often in athletic men and in epileptics. It is frequently bilateral and there is often a definite familial predisposition to the condition. It must be differentiated from repeated shoulder dislocation which is associated in each instance with severe trauma. In the latter condition, 3 or 4 dislocations may be experienced but in the habitual or recurrent type it is not unusual for the patient to report from 25 to 50 recurrences of shoulder displacement.

ETIOLOGY

Structural anatomic weakness of the shoulder joint makes it especially vulnerable to dislocation. The size of the head of the hu-

¹ Tripler Army Hospital, Honolulu, T. H.

merus is out of all proportion to the size of the shallow glenoid cup and the joint capsule is extremely lax. The fibrocartilaginous glenoid labrum adds some depth to the glenoid cavity but it is loosely supported anteriorly by the attached capsule and glenohumeral ligaments. Bony anomaly of the anterior glenoid rim or of the humeral head, congenital defect of the glenoid labrum, or structural inadequacy of the subscapularis muscle have been noted as possible predisposing factors in recurrent dislocation.

Most observers believe that recurrent dislocation of the shoulder is the result of an initial ordinary shoulder dislocation with subsequent incomplete healing of the soft tissue injury caused by inadequate immobilization. Capsular tears have been demonstrated as a result of ordinary shoulder dislocations. The original theory of mechanism of recurrent dislocation was repeated displacement of the humeral head through these unhealed capsular defects. More recently this has been supplanted by the concept of recurrent displacement into a distended capsule or a capsule stripped from its attachment to the glenoid rim without any herniation of the humeral head.

Bankart² has insisted that the recurrent type of dislocation of the shoulder is a separate entity and bears no relationship to the ordinary type of dislocation. The latter variety is usually caused by an abduction and external rotation force with leverage of the head from the glenoid cavity between the subscapularis muscle and the head of the triceps. Bankart contended that the recurrent type was caused by a direct anterior propulsion of the head of the humerus or a posterior thrust against the elbow with the latter close to the side of the body. He believed that in the ordinary variety of dislocation the capsular tear always healed and that habitual dislocation did not result. In the true recurrent variety he stated that the glenoid labrum and its attached capsule were stripped from the anterior and inferior glenoid margin. Because the labrum is fibrocartilaginous it does not reattach to the bony margin of the glenoid and this stripping of labrum and capsule increases the mechanical inadequacy of the shoulder joint so that subsequent repeated dislocation occurs without significant trauma.

Still another factor contributing to habitual dislocation is a defect in the posterolateral surface of the humeral head which is noted in many patients. This defect was originally reported by surgeons who performed resection of the humeral head in the treatment for recurrent dislocation and it was found so frequently that it became known

² BANKART, A. S. B.: Pathology and treatment of recurrent dislocation of shoulder-joint. *Brit. J. Surg.* 26: 23-29, July 1938.

as the "typical defect." Bankart, however, disregarded this bony change and considered it an incidental finding and of no etiologic significance in recurrent dislocation. He was convinced that the "typical defect" was the separation of the glenoid labrum. Most writers on the subject have considered the defect in the head to be the result of fracture at the time of the original dislocation or a pressure defect caused by the repeated contact of the head against the glenoid rim during the recurrences. Tavernier³ and other French observers believed that the defect was a congenital bony anomaly of the humeral head and was the underlying cause of habitual shoulder dislocation. Eyre-Brook⁴ recently studied an autopsy specimen and noted that the defect in the head of the humerus fitted perfectly when placed against the rim of the glenoid cavity.

ROENTGENOGRAPHIC FINDINGS

There have been many studies of the roentgenographic changes in patients with recurrent shoulder dislocation. Schultze⁵ and more recently Pilz⁶ have emphasized the importance of special technics to demonstrate abnormalities of the humeral head and the glenoid margin. The most consistent findings have been a grooving or notching of the posterolateral portion of the humeral head and the frequent presence of a vertical line of sclerosis at the margin of the groove. Flattening of this area of the head or of the greater tuberosity is also a common observation. Cystic changes have been reported in the head of the humerus and periosteal proliferation at the glenoid margin has been noted. Occasionally loose joint bodies are encountered. Grooving of the head of the humerus sometimes results in a marked deformity which is referred to as "hatchet head."

There is disagreement concerning the origin of these roentgenographic findings. The French writers believed that the deformity of the head of the humerus was on a congenital basis whereas Hill and Sachs,⁷ from a study of 119 patients with shoulder dislocation, believed that the defects were caused by compression fractures at the time of the initial injury. Over two-thirds of their patients showed evidence of

³ TAVERNIER, L.: Recurrent luxation of shoulder. (Read at the Congress of the French Orthopaedic Society, Oct. 11, 1929.) *J. Bone & Joint Surg. (News Notes Section: French Orthopaedic Society)* 12: 458-461, Apr. 1930.

⁴ EYRE-BROOK, A. L.: Morbid anatomy of case of recurrent dislocation of shoulder. *Brit. J. Surg.* 30: 32-37, July 1942.

⁵ SCHULTZE, E. O. P.: Die habituellen Schulterluxationen. *Arch. f. klin. Chir.* 104: 138, Mar. 24, 1914.

⁶ PILZ, W.: Zur Röntgenuntersuchung der habituellen Schulterverrenkung. *Arch. f. klin. Chir.* 135: 1-22, 1925.

⁷ HILL, H. A., and SACHS, M. D.: Grooved defect of humeral head; frequently unrecognized complication of dislocations of shoulder joint. *Radiology* 35: 690-700, Dec. 1940.

compression fracture. There were 15 patients with recurrent dislocation and of these 11 showed compression fracture of the head and 2 presented fractures of the greater tuberosity. Most observers believed that the roentgenographic findings in the humeral head and at the glenoid margin were caused by the repeated trauma incident to the recurrent displacements. It was agreed, with the notable exception of Bankart,² that the injury to the head with resultant flattening or grooving was at least partly responsible for many of the recurrent displacements. Various authors have reported roentgenographic defects in the humeral head in between 20 and 100 percent of patients with recurrent dislocations. Those who have insisted on roentgenograms taken in internal rotation or tangential views with the tube lateral to the elbow have reported a much higher incidence of the defects.

ANALYSIS OF PRESENT SERIES

The reason for the relatively high incidence of bilateral recurrent shoulder dislocation and the familial tendency of the condition is not clearly understood. There is also uncertainty concerning the mechanism of dislocation in the substantial number of patients in whom no severe trauma was associated with any of the dislocations from the onset. These facts suggest the possibility of some congenital bony, capsular, or muscular defect as a predisposing cause of the recurrent type of shoulder dislocation. Some observers favored a congenital origin of the defect in the humeral head as the explanation whereas others such as Sever,⁸ Reich,⁹ and Magnuson and Stack¹⁰ believed there was a basic inadequacy of the shoulder girdle muscles, particularly the subscapularis.

In a recent study of 20 patients with recurrent shoulder dislocation treated by surgical repair, one of us (E. A. B.) reported definite roentgenographic changes in 70 percent. Seven (35 percent) presented definite grooving (fig. 1) or notching of the head of the humerus, usually with a vertical line of sclerosis at its margin. A hatchet-head deformity was present in one patient (fig. 2). The roentgenograms of 6 patients (30 percent) showed flattening of the posterior portion of the humeral head. In 2 instances there were cystic changes in the head and in 2 patients there was definite bony proliferation at the glenoid margin (fig. 3). Loose bodies were noted in the shoulder joint of 3 patients (fig. 4). All roentgenograms were

⁸ SEVER, J. W.: Recurrent dislocation of shoulder joint; mechanical consideration of its treatment. *J. A. M. A.* 76: 925-927, Apr. 2, 1921.

⁹ REICH, R. S.: Traumatic dislocation of shoulder. *J. Bone & Joint Surg.* 14: 73-84, Jan. 1932.

¹⁰ MAGNUSON, P. B., and STACK, J. K.: Recurrent dislocation of shoulder. *J. A. M. A.* 123: 889-892, Dec. 4, 1943.

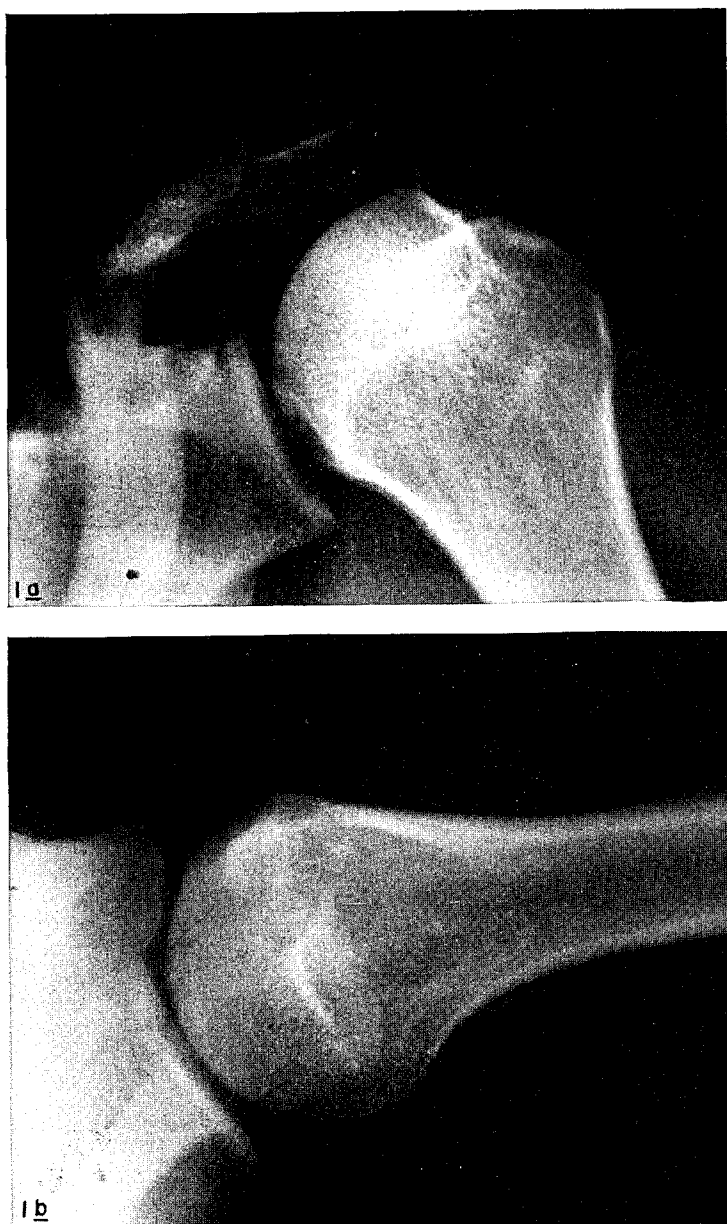


Figure 1.—Roentgenograms showing definite grooving of the postero-lateral portion of the humeral head in a patient with recurrent shoulder dislocation. (1a) Anteroposterior view showing vertical line of sclerosis at the margin of the defect. (1b) Lateral view of the groove.

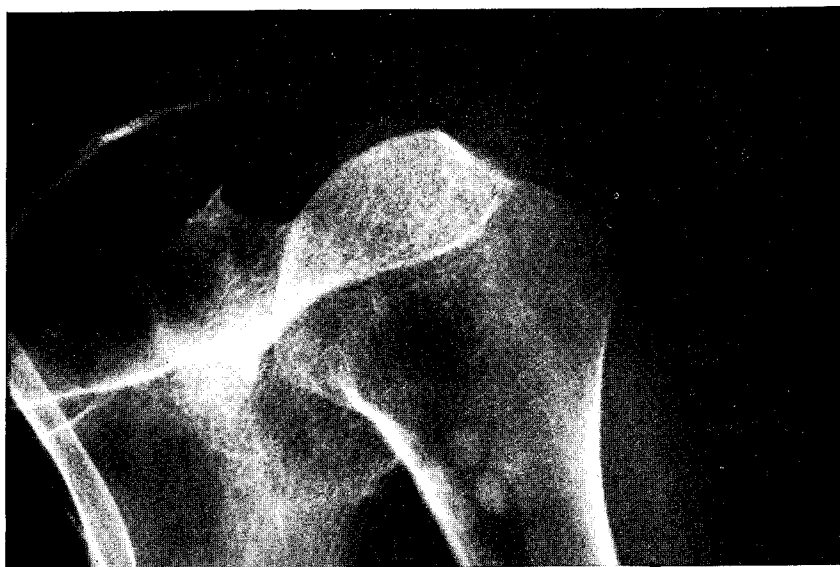


Figure 2.—Anteroposterior roentgenogram of shoulder showing severe grooving of the humeral head resulting in "hatchet-head deformity."

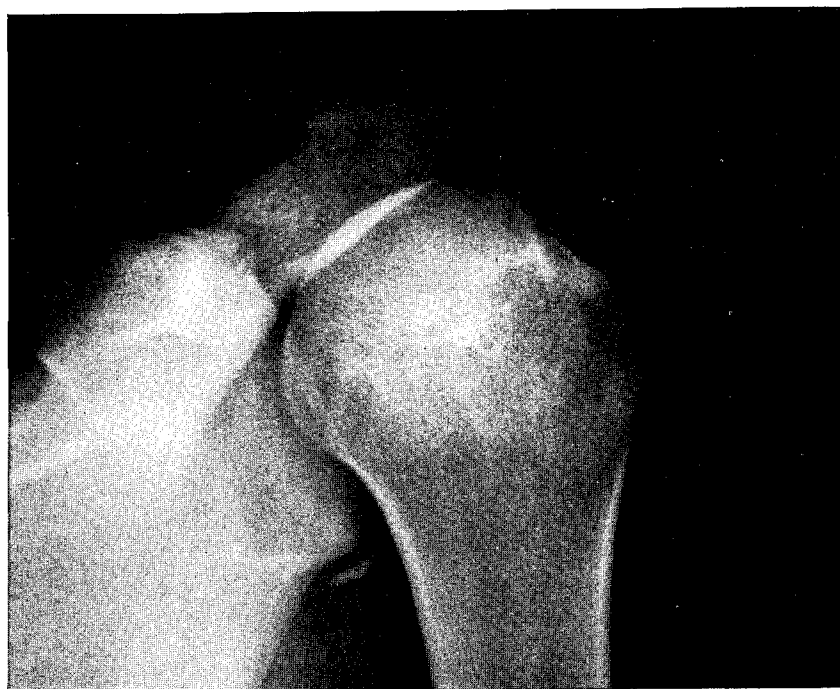


Figure 3.—Anteroposterior roentgenogram showing proliferation of the periosteum at the glenoid margin caused by separation of glenoid labrum and capsule.

taken in internal rotation but, because special lateral views were not always made, the incidence of roentgenographic changes observed in this series may be low.

The patients who presented the greatest defects in the humeral heads were studied in an attempt to demonstrate the position in which the defects were most apparent on the roentgenograms. It is probable that the defects vary in their anatomic position in the humeral heads so that no standard position will be suitable for all patients. After

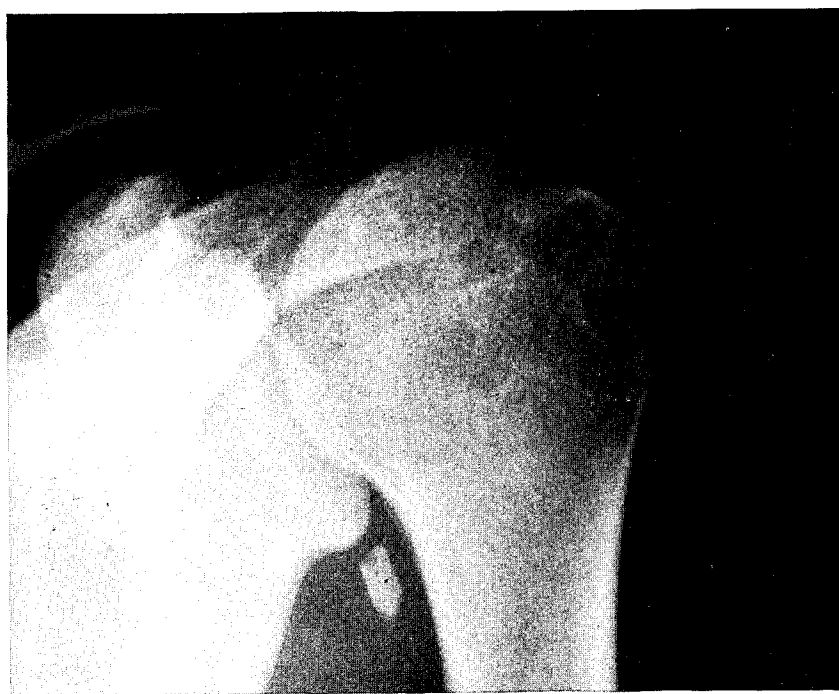


Figure 4.—Anteroposterior roentgenogram of shoulder showing a loose osteocartilaginous body below the glenoid margin. This was found at operation to be in the subscapular bursa.

much experimentation with varying degrees of abduction and rotation in these patients, 45° of abduction of the arm and 60° of internal rotation of the shoulder was chosen as the most desirable in demonstrating the defects in the humeral heads. An anteroposterior view with the shoulder in this position was made with the patient supine, the unaffected side of the chest raised 45° from the table and the affected forearm across the abdomen. A lateral view was made with the shoulder in the same degree of abduction and rotation and with the patient supine. In this view the tube was aimed at the axilla so that the principal ray was directed horizontally to the center of the axilla and with a 15° angle cephalad. The cassette was placed in contact with

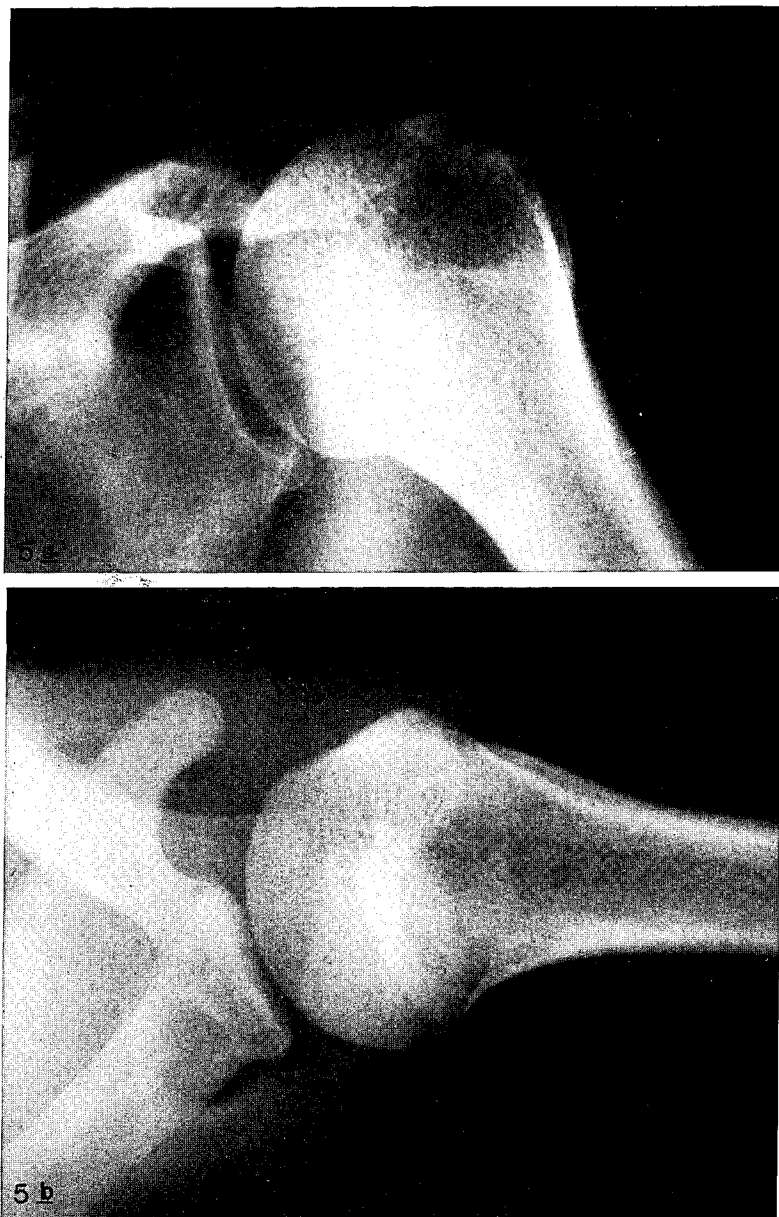


Figure 5.—(5a) Anteroposterior roentgenogram of a control patient showing flattening of the posterolateral surface of the humeral head. (5b) Lateral view of a control patient showing similar flattening.

the upper portion of the shoulder and the shoulder was elevated as much as necessary to center the tip of the acromion on the roentgenogram. Both views were at 40-inch target-film distance. Attempts to obtain a satisfactory tangential view of the defect proved unsuccessful.

In view of the difference of opinion concerning the significance of the roentgenographic findings in recurrent shoulder dislocation and the lack of understanding concerning the bilateral, familial, and spontaneous varieties, a roentgenographic study of 100 normal shoulders was undertaken. These patients gave no history of any injury to the shoulder and made no complaints referable to this area. They were not selected in any other way but no patients over 45 years old were included in order to rule out advanced degenerative changes. The ratio of men to women was about that which was present in the series of 20 recurrent dislocations. Anteroposterior and lateral views were made with the shoulder in 45° of abduction and 60° of internal rotation.

In this control series 28 percent showed varying degrees of flattening of the posterolateral portion of the humeral head on either the lateral or anteroposterior view. In 8 patients the flattening was bilateral. Figure 5 shows the degree of flattening noted in the anteroposterior and lateral views of patients in the control series. These resemble closely the flattening noted in patients with recurrent dislocation. In no patient in the control series was there any evidence of grooving or notching of the head of the humerus, nor was there a vertical line of sclerosis in the humeral head, cystic change, proliferation of the glenoid margin, or a loose osteocartilaginous body in the joint.

DISCUSSION

The presence of flattening of the humeral head in 28 percent of our control series, including 8 percent with bilateral flattening, suggests that this may be a congenital defect which predisposes to recurrent dislocation. Speed¹¹ quoted Fourmenstraux as observing 4 instances of roentgenographic defects in humeral heads in a series of 80 clinically normal shoulders. Further consideration, however, emphasized the fact that in no control patient was there grooving or notching of the humeral head. Furthermore, the incidence of flattening of the humeral head in the dislocation group was the same as in the control series. It may be assumed from this that grooving, notching, and vertical sclerosis are the result of trauma either at the time of the initial dislocation or caused by repeated dislocations. Simple flatten-

¹¹ SPEED, K.: Recurrent anterior dislocation at shoulder; operative cure by bone graft. *Surg., Gynec. & Obst.* 44: 468-477, Apr. (pt. 1) 1927.

ing of the head on the other hand occurred similarly in the two groups and is of no clinical significance except that it represents another anatomic structural weakness of the shoulder joint. Because its frequency was no greater in the dislocation series than in the controls it cannot be designated as a cause of recurrent dislocation. This assumption was strengthened by a consideration of the patients in the recurrent dislocation series in whom there was no initial severe trauma and in whom all dislocations were caused by some simple shoulder movement. There were 11 such patients with spontaneous recurrent shoulder dislocations. Of these patients, 3 (27.3 percent) showed flattening of the humeral head on the roentgenograms and 4 (36.4 percent) showed grooving or notching. It can be seen that the incidence of deformity of the head in this group was the same as in the entire dislocation series and the incidence of flattening was no greater than in the controls. If the flattening were of any significance in the production of recurrent dislocation, one would expect much greater evidence of this defect in patients in whom there was no history of shoulder injury.

From these observations it seems likely that the important defects noted in the head of the humerus in the dislocation series are the grooving and notching and that the patients showing only flattening may be considered as essentially negative. In the patients without history of severe trauma there were still 4 (36.4 percent) who showed grooving or notching. This would suggest that at least in some patients it is the repeated trauma of dislocation and contact between humeral head and glenoid rim that produces the groove or notch and not the impact of the original dislocation with a resultant compression fracture.

The presence of a notch or a groove in the posterolateral portion of the head of the humerus in a substantial number of patients who have recurrent shoulder dislocation is probably of some significance in the ease of recurrence. Most recent observers have noted at operation a separation of the labrum and capsule from the anterior and inferior glenoid margin in between 75 and 100 percent of patients with recurrent dislocations. It seems most likely that the principal cause of recurrence is the separation of the labrum and capsule and that the grooving or notching of the humeral head is a secondary contributing factor.

SUMMARY

The roentgenograms of 20 patients with recurrent dislocation of the shoulder have been studied in comparison with those of 100 clinically normal shoulders. The incidence of flattening of the posterolateral portion of the humeral head was about the same in the two groups. Notching or grooving of the head of the humerus with vertical lines of sclerosis in the head was noted in 35 percent of the dislocation series.

Cystic changes in the head, periosteal proliferation at the glenoid rim, and loose osteocartilaginous bodies were also present in this group. None of these changes was present in the controls. In 11 of the 20 patients in the dislocation series severe trauma was never associated with the dislocations. In this group there was the same incidence of grooving, notching, and flattening of the humeral heads.

Flattening of the humeral head is merely another manifestation of a structurally weak shoulder joint. It cannot be considered as a cause of recurrent dislocation and its presence on the roentgenogram is probably of no significance. Grooving or notching of the humeral head may be a contributing factor in the cause of the recurrent dislocations but it was demonstrated on the roentgenograms in only slightly more than one-third of the patients in this series. It does not appear to be the "typical defect." The grooving or notching is apparently not congenital in origin. It is probably caused by trauma either at the time of the original dislocation or as a result of repeated contact and pressure of the head of the humerus against the glenoid rim at the time of the recurrences. There is no evidence that deformities of the humeral head are responsible for recurrent shoulder dislocations in which there is never a severe shoulder injury. They do not furnish an explanation for the familial or bilateral dislocations.



Dermoid Cyst of the Floor of the Mouth

LEO KORCHIN, *Captain, DC, U. S. A.*¹

DERMOID cysts of the floor of the mouth originate from ectodermal elements included within the mesoderm at the time of closure of the embryonic fissures. The presence of these embryonal nests of tissue does not ordinarily become evident until the ages of from 10 to 25 years when a slow-growing, smooth, painless mass makes its appearance in the midline behind the mandibular symphysis, or on one side below the angle of the jaw.² The lining of this type of cyst consists of stratified squamous epithelium surrounded by a wall of dense fibrous tissue. Any one or all the dermoid structures such as hair, teeth, nails, and sebaceous and sweat glands may be present. The cystic cavity frequently contains sebaceous material. The treatment for this benign growth is complete excision. The prognosis is good.

CASE REPORT

A 20-year-old man reported to this clinic on 20 April 1950 complaining of a swelling involving the floor of the mouth and extending below the chin which had been present for about 1 year. This was painless and stationary in size.

Extraorally there was a slight, nonindurated, painless swelling under the chin and to the right of the midline. The overlying skin was nonadherent and the mass felt smooth (fig. 1). Intraorally the floor of the mouth on the right side was raised from the anterior midline to the molar area. With the tongue drawn to the opposite side the mucous membrane of the floor of the mouth could be seen well above the occlusal surfaces of the mandibular teeth (fig. 2). The over-

¹ Post Dental Clinic, Fort Jay, N. Y.

² PADGETT, E. C.: *Surgical Diseases of the Mouth and Jaws*. W. B. Saunders Co., Philadelphia, Pa., 1938. p. 486.

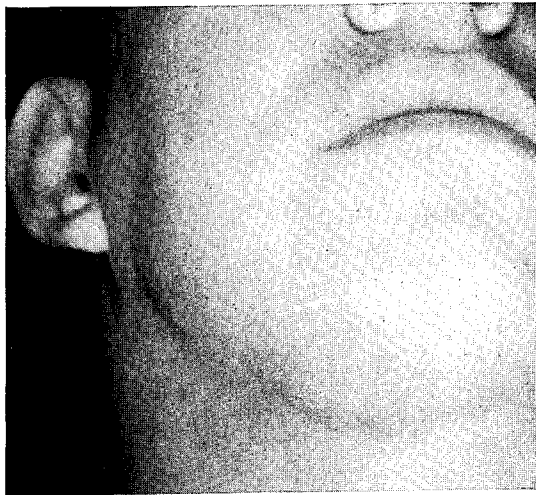


Figure 1.—Photograph showing external swelling.

lying mucous membrane was freely movable and, except for a slightly yellow hue, was normal in texture and appearance. Wharton's duct was patent and free flowing. No other abnormalities were noted. On bimanual palpation a firm mass the size of a walnut, well circumscribed anteriorly but losing its outline posteriorly, was felt. Pressure intra-orally made the extraoral swelling more evident and vice versa. There was no lymphadenopathy. Roentgenograms of the involved

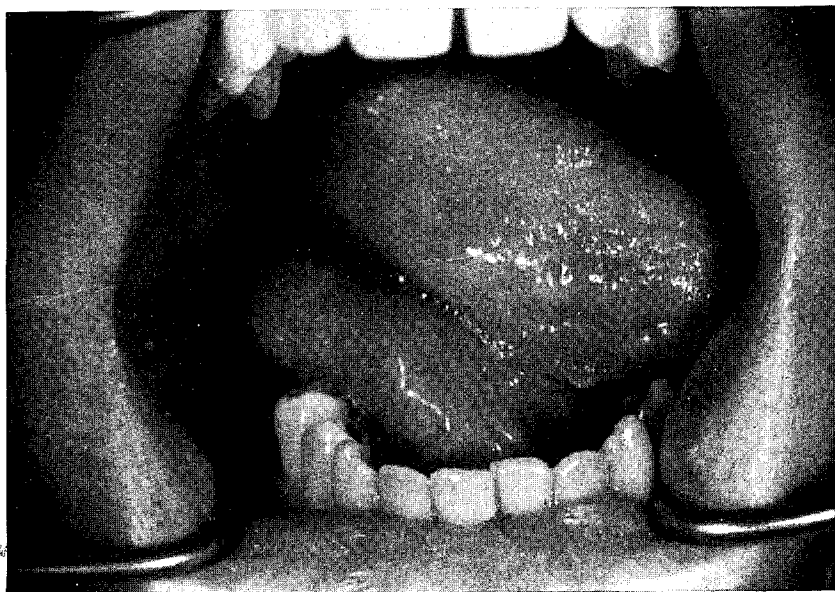


Figure 2.—Photograph showing sublingual swelling.

area were negative. The laboratory findings were negative. Aspiration was attempted but no material could be withdrawn.

A diagnosis of dermoid cyst of the floor of the mouth was made and complete enucleation through an intraoral approach was recommended. Preoperative medication consisted of 0.2 gram of seconal, followed 1 hour later by 10 mg. of morphine sulfate and 0.4 mg. of scopolamine. On 27 April, under double inferior alveolar block anesthesia supplemented with infiltration of the tissue overlying the cyst, an incision about 4 cm. in length was made in the floor of the mouth on the right side. By blunt dissection the cyst wall was reached and the cyst completely enucleated from its bed above the mylohyoid muscle. A



Figure 3.—Photograph of cyst after removal.

rubber dam drain was placed in position and the wound was closed. The cyst was of doughy consistency and weighed 17 grams.

As a prophylactic measure, 300,000 units of procaine penicillin were given twice a day for 4 days. The wound was irrigated with hot saline solution every hour. The drain was removed on the second and the sutures on the fourth postoperative day. The patient was discharged to duty on the fifth postoperative day.

Pathologic report.—The specimen consisted of a circular thin-walled cyst measuring 3 cm. in diameter (fig. 3). The external surface of the wall was dull, glistening, and gray-brown with small ecchymotic areas. On section, the wall was very thin; the lining was dull and

glistening. The cyst was filled with a caseous yellow-brown material. The microscopic examination revealed a cyst wall lined by a low stratified squamous epithelium. There was some fragmentation of the keratin layer. Within the fibrous stroma around the squamous epithelium there were sebaceous glands, remnants of sweat gland acini and striated muscle. Dilated engorged blood vessels with some hemorrhage were seen within this area.

Anatomic diagnosis.—Dermoid cyst of the floor of the mouth and sublingual region. This cystic structure could also be an epidermal inclusion cyst from the skin in the submental region.



A Report of the Distribution of Whole Blood to the Pacific Theater

M. T. SPROUL, *Commander, MSC, U. S. N.*

THE collection and distribution of proved group O whole blood to the Pacific Theater is a major medical assignment of the Armed Services. Group O whole blood is collected in acid-citrate-dextrose solution by the American Red Cross through their National Blood Program from centers located throughout the United States. The blood is sent to the Armed Services Central Blood Processing Laboratory at Travis Air Force Base, Fairfield, Calif., for processing. The blood group and Rh factor are rechecked and the titers for its content of anti-A and anti-B agglutinins are determined. A proof grouping is made with known A and B cells. Only proved group O blood is shipped to the Pacific Area from the Laboratory. The amounts of blood shipped from the Laboratory are determined by requests from the shipping and receiving section of the 406 Medical General Laboratory Blood Bank, in Tokyo, Japan. They regulate their requests for blood from orders received from the field commanders in Korea.

After the processing is completed the blood is packed in refrigerated shipping containers. Each container holds from 16 to 24 bottles of blood, placed in circular racks so that the bottles are adjacent to the metal ice container. From 10 to 18 pounds of water ice serve as the refrigerant. The total weight of the shipping container including the bottles of blood is from 87 to 105 pounds. The refrigerated containers are precooled before the blood is packed. With an ambient temperature of from 50° to 80° F. the blood maintains a constant temperature of about 45° F. for 48 hours. When the ambient temperature exceeds 80° F. it is necessary to re-ice about every 24 hours.

I accompanied a shipment of blood from the Travis Air Force Base to an evacuation hospital in Korea. In less than 4 days, and after

TRANSPORTATION AND DISTRIBUTION OF WHOLE BLOOD FOR THE PACIFIC THEATER

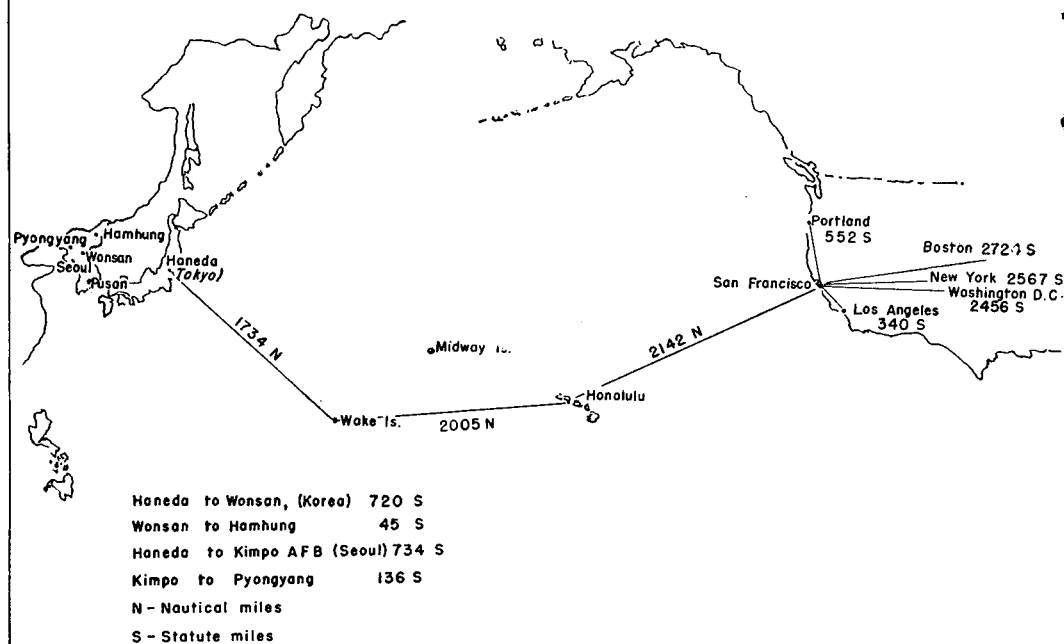


Figure 1.

transport over 6,500 miles from the place of collection, the blood was being given to war casualties (fig. 1).

The Military Air Transport Service is responsible for transportation and re-icing of the blood en route. The blood is consigned directly to Tokyo without transfer on a plane stopping in Honolulu and Wake for refueling and re-icing when necessary. A team from the 406 Medical General Laboratory Blood Bank Shipping and Receiving Section meets the plane at Haneda Air Force Base and transports the blood to refrigerators in Tokyo. There it is inspected, repacked, and iced for shipment to Korea. All blood shipments from the 406 Medical General Laboratory Blood Bank are accompanied by a courier who delivers it to the final destination. Table 1 shows the itinerary and temperature reports of such a shipment. The 406 Medical General Laboratory Blood Bank collects blood from donors in Japan, most of which is used in the United Nations Military hospitals located there. The organization for distribution is shown in figure 2.

TABLE 1.—*Itinerary and temperature report*

Location	Time	Temperature inside refriger- ated container	Ambient temperature	Remarks
	5 Nov.	<i>Degrees Fahrenheit</i>	<i>Degrees Fahrenheit</i>	
	2200	42	¹ 40	Iced for shipment.
	2220	42	64	Taken to freight terminal.
	2345	45	60	Loaded on plane.
Travis AFB	6 Nov.			
	0100	46	60	Take-off.
	0800		74	
	1300		78	Arrived Honolulu.
	1330	50	86	Re-icing on air strip in Hono- lulu.
Honolulu	1445		86	Reloaded on plane.
	1515	45	82	Take-off.
	2200		60	
	7 Nov.			
Wake	0245	45	76	Arrived Wake. Ice about one-half melted; not re-iced here.
	0300		68	Take-off.
Haneda AFB	1440	45	56	Arrived Haneda. Blood loaded on truck for trans- portation to Tokyo.
Tokyo	1550	46	¹ 39	Blood placed in refrigerator.
	2100		70	Re-iced, placed on truck for transportation to Korea.
	2200	46	45	Arrived Tachikawa AFB. Blood placed in commis- sary refrigerator.
Tachikawa AFB	8 Nov.			
	0600	45	53	Blood loaded on plane.
	0800	45	68	Arrived Ashiya. Blood left on plane.
Ashiya	1400	45	60	Take-off.
Wonsan	1630	45	50	Arrived Wonsan.
	1700			Take-off.
Yong-Po	1730		60	Landed Yong-Po.
	1800		60	Blood loaded on ambulance for transportation to Ham- hung.
Hamhung	2100	46	55	Arrived 121 Medical Evacua- tion Hospital, Hamhung. Blood placed in ice boxes.

¹ Refrigerator.

Of the many thousand bottles of whole blood shipped to Japan for the use of war casualties only two have been broken. The breakage was caused by defective bottles and not by careless handling. All blood is handled with exceptional care. Because of the perishable nature of blood, and the dire need for it in the treatment of war casualties, it receives top priority. The efficiency of the Armed Services Blood Program has been a major contributory factor in reducing the mortality of war casualties.

No reports of reactions caused by incompatibility from the use of proved group O whole blood have been received. The allergic and pyrogenic reactions are estimated at less than 1 percent. It is difficult to get accurate reports of reactions from the field, but the above estimates were made from observations of blood being used and verbal reports of medical officers interviewed in the field. In the majority of instances when used in an evacuation hospital or hospital ship it is

ORGANIZATION FOR DISTRIBUTION OF WHOLE
BLOOD FOR THE PACIFIC THEATER

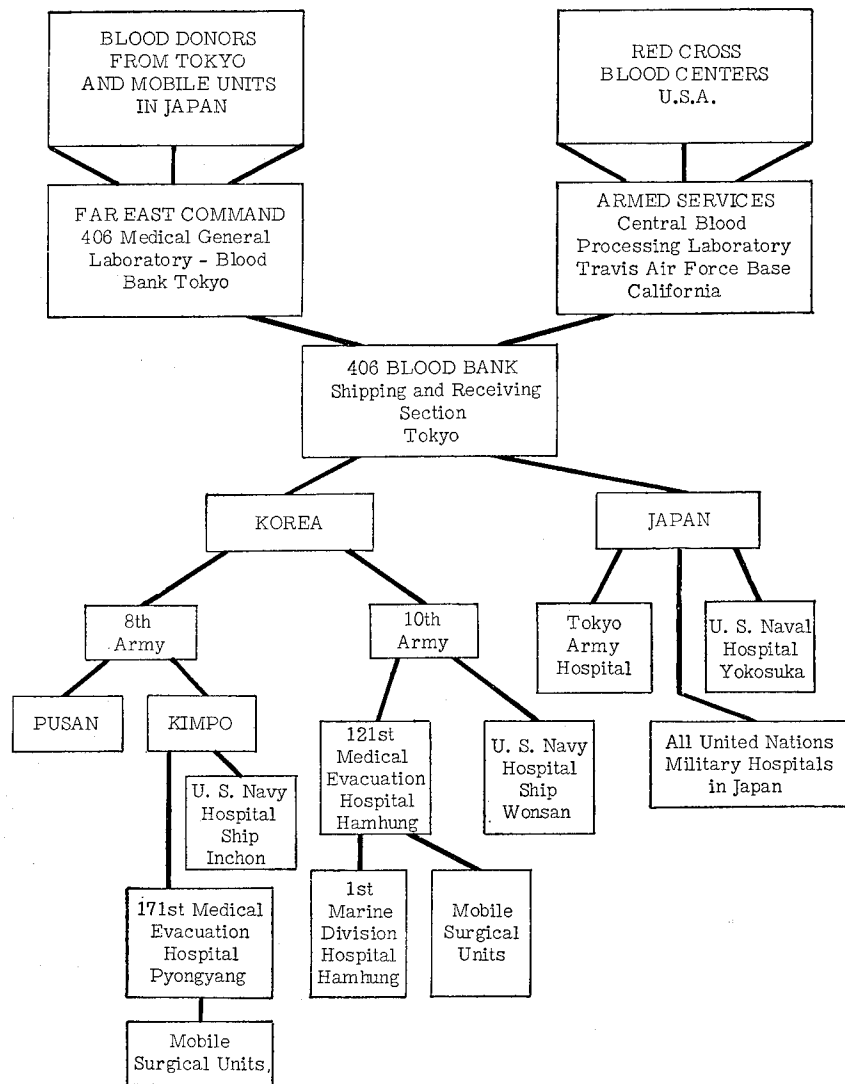


Figure 2.

cross-matched prior to its use. Because of the coordinated effort of the Armed Services and the successful recruitment of donors by the American Red Cross through their National Blood Program the requirements of whole blood for the war casualties in the Korean action have been met with adequacy and extreme efficiency, insofar as the exigencies permit.

Improved Method in Intranasal Dacryocystorhinostomy¹

ROBERT H. WARD, *Commander, MC, U. S. N.*²

MEYER WIENER, *M. D.*³

ALMOST every specialist who has had extensive experience in surgery of the eye, ear, nose, or throat has given his name to some detailed method of correcting drainage of fluid from the eye or tear sac into the nose. It is not our intention to review all of the literature on the subject, but to present a method which we have found to be most effective in its results as well as simple in its execution. The procedure has as its basic principle the technic of Wiener and Sauer⁴ with the addition of placing a tube in the new opening between the conjunctival sac and the nose to prevent closure of the nasal end of the canal by granulation tissue.

Placing a drain in the opening is not new. Holmes⁵ passed a wire in the opening from the nasal side and left it in place for 3 weeks. Others have left lead and other types of stylets in the opening under varied conditions. Mosher,⁶ in his discussion of a paper by Chamberlain, stated: "All intranasal methods must face the danger of reclosure of the canal and every operation on the lacrimal and nasal duct is only a temporary success supplemented with frequent probing or the prolonged use of a stylet." This has not been found to be true in the intranasal method quoted⁴ because the opening can almost invariably be held patent by limiting the amount of granulation tissue with daily

¹ Read before the California Medical Association, San Diego, Calif., 2 May 1950.

² Head of the Department of Ophthalmology, U. S. Naval Hospital, San Diego, Calif.

³ Honorary Consultant, Ophthalmology, Bureau of Medicine and Surgery, Department of the Navy.

⁴ WEINER, M., and SAUER, W. E.: New operation for relief of dacryocystitis through nasal route. *J. A. M. A.* 75: 868-873, Sept. 25, 1920.

⁵ HOLMES, E. M.: Intranasal operation for relief of nasal lacrimal stenosis. *Ann. Otol. Rhinol. & Laryng.* 23: 286, June 1914.

⁶ MOSHER, H. P.: Discussion on CHAMBERLAIN, W. B.: Endonasal operation on lacrimal sac. *J. A. M. A.* 69: 17-20, July 7, 1917.

applications of 20 percent silver nitrate solution. Occasionally, however, the nasal end of the canal closes and requires another minor operation. The idea, suggested by Commander L. E. Wible, MC, U. S. N. and one of us (R. H. W.), of introducing a small catheter into the upper canaliculus down through the newly made nasal opening and out through the nose, uniting the two ends of the catheter on the outside, seemed to be a most logical scheme for preventing closure of the opening by granulation until complete epithelialization has taken place.

Twenty-eight operations using the Wiener-Sauer method have been performed at the United States Naval Hospital, San Diego, of which the catheter method was used in the last five. The technic used is as follows:

The patient is given 15 mg. of morphine and 0.3 mg. of scopolamine hydrobromide $1\frac{1}{2}$ to 2 hours before starting the operation. Previ-

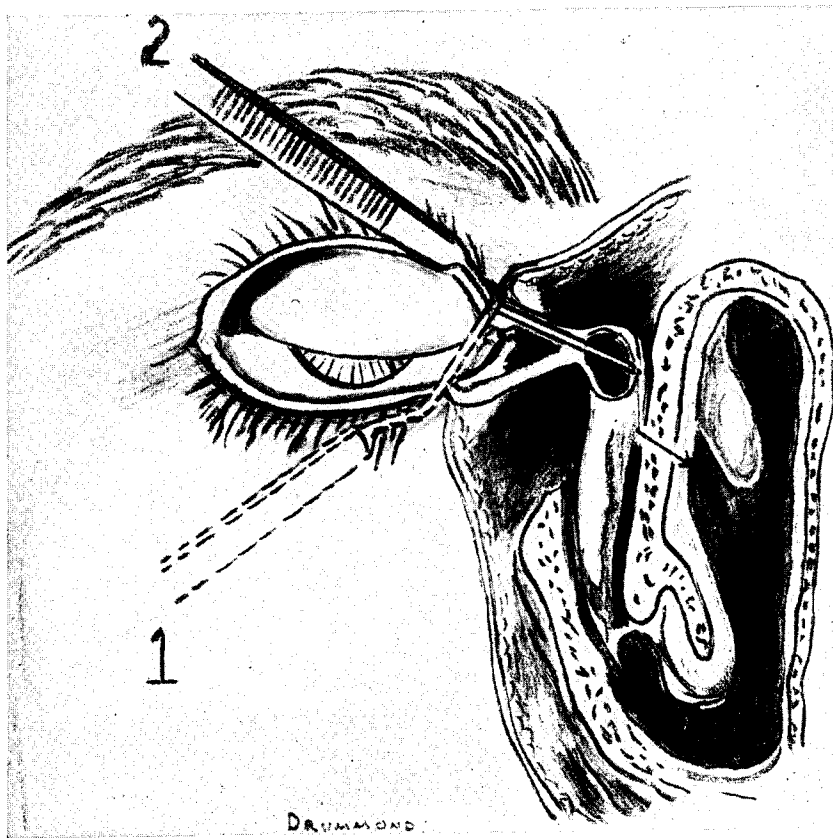
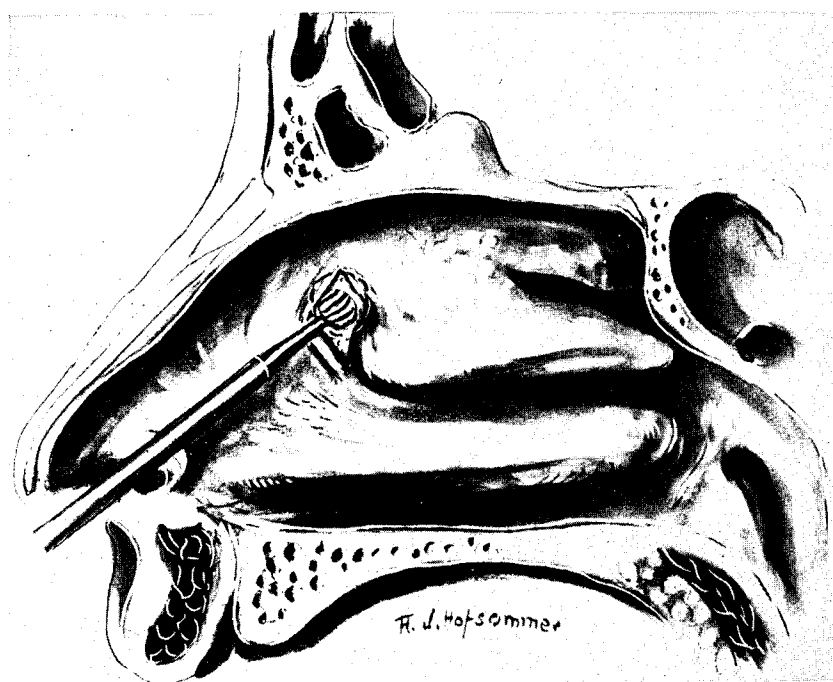


Figure 1.—Schematic drawing showing the direction of the Ziegler probe (indicated by dotted line with arrows).

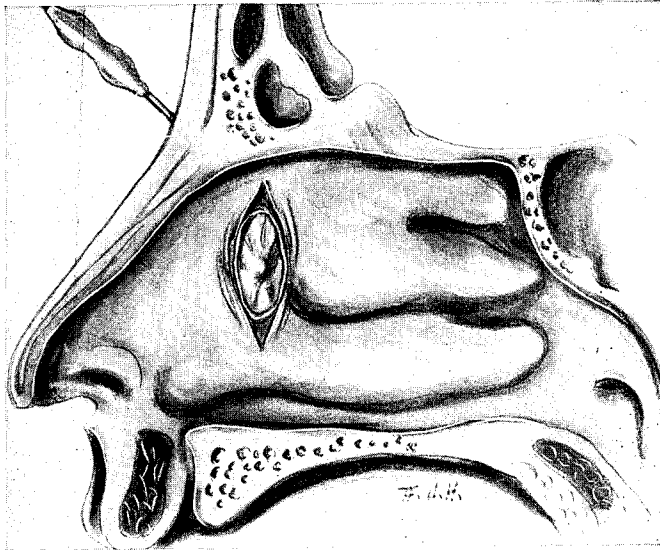


—From Wiener, M.: *Surgery of Eye*. 2d edition. Grune & Stratton, New York, N. Y., 1949.

Figure 2.—Dental bur entering hole made by Ziegler probe.

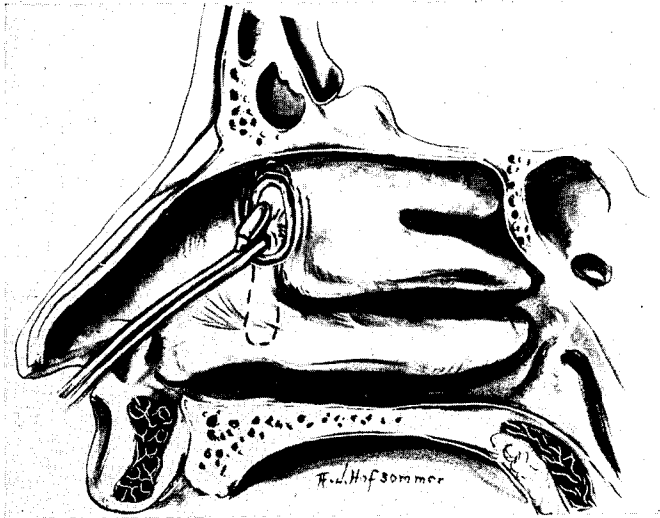
ously, a thorough examination of the nose, including roentgenographic visualization of the lacrimal region, with special reference to ethmoidal cells has been made, and at the same time, usually, visualization of the sac cavity with lipiodol, which often proves helpful.

The lower and upper canaliculi and sac are anesthetized, the upper punctum dilated and the canaliculus stretched with the Galezowski dilator. A Ziegler probe is introduced as far as the sac, pushed down as far as the bottom of the sac, which approximates the level of the middle turbinate, and aimed to keep the point of the probe as far forward as possible. It is then turned at a 45° angle and pushed through the thin cribriform plate of the ethmoid into the nose (fig. 1). Using the tip of the probe as a guide, a vertical incision about 2 cm. long is made in the nasal mucosa, the probe point being in the middle of the incision. The mucosa is stripped back from its bony attachment on either end of the incision. The end of an electrically driven dental bur is then placed against the tip of the probe, and a hole is drilled in the bone as the probe is gradually withdrawn (fig. 2); the opening in the bone approximates the size of the sac and must reach the bottom of the sac. The Ziegler probe is replaced with a No. 2 Bow-



—From Wiener, M.: *Surgery of Eye*. 2d edition. Grune & Stratton, New York, N. Y., 1949.

Figure 3.—The sac being pushed into the opening by No. 2 Bowman probe.



—From Wiener, M.: *Surgery of Eye*. 2d edition. Grune & Stratton, New York, N. Y., 1949.

Figure 4.—The biting forceps takes hold of the protruding sac and bites off as much as possible until a large opening has been made.

man probe and the sac is teased into the newly made opening so that it may be grasped with the forceps and a good-sized piece excised (figs. 3 and 4).

On completion of the operation all blood and secretions are washed out of the sac with a syringe introduced into the canaliculus, and a No. 6 ureteral, x-ray whistle-tip catheter is introduced through the upper canaliculus and passed through the newly made opening into the nose until it protrudes through the external nares, where it is grasped and pulled out sufficiently to be joined to the other end of the catheter by a piece of adhesive tape (figs. 5 and 6). The catheter now forms a continuous circle which the patient can freely manipulate



Figure 5.—Catheter in place.

without pulling it out of the opening. He is thus able to keep the nasal window open by pulling the catheter down, cleansing the crusts which have formed, and then applying merthiolate ointment.

The sac is irrigated through the other canaliculus on alternate days. However, the upper punctum and canaliculus are used whenever this has been made possible through the occasional overstretching or tearing of the punctum during the operative manipulation. This procedure obviates cauterization to control granulation, or at least, reduces it to a minimum. The catheter is left in for 3 or 4 weeks and is held in place by a small strip of adhesive tape against the temple.

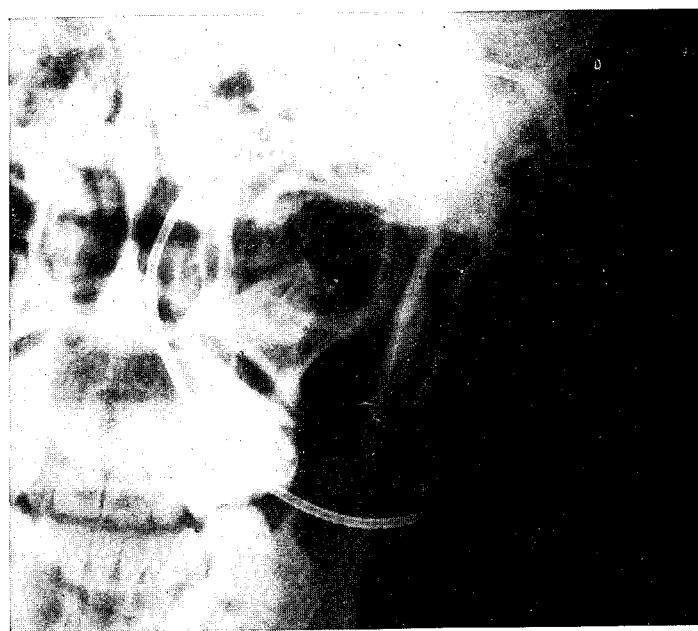


Figure 6.—Roentgenogram showing catheter in place.

Five patients, one of whom had a diverticulum of the sac, have been operated on using the catheter. Although this is a small series of cases and the longest follow-up period in the series was 16 months, the healing has been prompt and without complication. For this reason it was considered that these 5 cases are worthy of reporting, if only as the means of stimulating interest and discussion. Of the 23 other cases operated on without the use of the catheter, one, the result of trauma from an airplane accident, with deformity of the nasal bones and alveolar process of the maxilla, had intermittent clogging of the new opening.



A Study of Illumination for Dental Offices

HARRY E. DENEN, *Commander, DC, U. S. N.*¹

IT HAS been stated many times that human eyes were never intended for observation of objects nearer than the length of the arm. In prehistoric ages man's existence depended on his ability to see only objects the size of animals used for food and to guard against beasts of prey. It was not until man began to delve into the mysteries of life that he realized that his vision had definite limitations. Museums throughout the world exhibit various sets of spectacles, constructed centuries ago, showing that man in his quest for knowledge began to use his eyes on smaller objects which necessitated an adjustment of his vision by the supplement of magnifiers or suitable lenses to overcome his inability to see these objects. I have observed that most persons who are employed in fields necessitating the use of their eyes on small objects wear glasses. On the other hand farmers, machinists, laborers, and those whose field of endeavor does not necessitate the use of their eyes except to see large objects rarely wear glasses. Exceptions are the aged or those who have a severe ocular defect.

Paralleling the advance of our civilization has been the evolution and improvement of artificial lighting. The research facilities of public utilities corporations are constantly attempting to evaluate our light needs and to make scientific improvements to aid our vision. Efficiency in classrooms and in industrial plants depends on good lighting. Dentistry is a science that requires almost constant use of the eyes to see small objects. Because the size of such objects as cavities in the teeth and margins on restorations necessitate close observation, a dentist works closer to his field than the average person reading a newspaper. For this reason and because of the nonreflecting background of the oral cavity, either magnification or an increase in the light source is necessary in this type of work.

Certain ocular defects are benefited by correct lenses. It is also true that, as a person grows older, circulatory changes may affect his

¹ U. S. S. *Shenandoah*.

vision. Nevertheless, correcting the impaired vision with glasses is of no avail if a person must work in an inadequately lighted field. Many forms of artificial light such as headlights, spotlights, and intraoral lights are used to project light into the oral cavity. In this article these will be referred to as the concentrated light sources. With only this thought in mind, lighting engineers have designed many types of operating lights. This, however, does not entirely solve the problem. The oral cavity not being a source of light reflection, the operator must still work in a field where the concentrated light source may be good, but not optimal unless it is augmented by a surrounding light.

Working for any length of time in an area where light has been concentrated tends to blind the operator temporarily if he looks away from his work field. It sometimes takes several minutes before the eye reflexes readjust themselves. In most dental offices I have seen this matter has been grossly neglected. Many offices have overhead lighting already installed and usually no correction is attempted, although it is just as important to facilitate accommodation with adequate surrounding light as it is to increase the source of the concentrated light.

It is necessary first to make the operating or concentrated light source adequate and to project it without shadows, heat, or glare, then to increase the surrounding light to balance the concentrated light so that when the operator's gaze moves out of the field of operation his eyes will adjust without difficulty. On board ship it is often difficult, because of the regulations, to make all the changes which might be desired in the space allotted to the dentist. On board this ship the space allotted to the dental clinic accommodates three operating units and a prosthetic laboratory. The stock operating lamp was attached to each unit (fig. 1) and was an adequate source of concentrated light. The surrounding light consisted of nine 100-watt incandescent bulbs, in open fixtures which were distributed throughout the clinic, one light being placed over each operating unit. In the prosthetic laboratory three 100-watt overhead lights constituted the surrounding light source and one 75-watt bench light was used for the concentrated light source at each of the three prosthetic work benches. This gave inadequate surrounding light. Increasing the size of the bulb to a greater wattage gave more light but also resulted in a prohibitive increase in heat, especially on warm days. Even though the air-conditioning unit was used to full capacity the increased wattage not only kept the temperature up, but eventually caused a breakdown of the air-conditioning unit because of overloading.

With the consent of the commanding officer and the assistance of the chief dental repairman, six overhead fluorescent light fixtures, containing a total of twenty 40-watt fluorescent tubes, were constructed

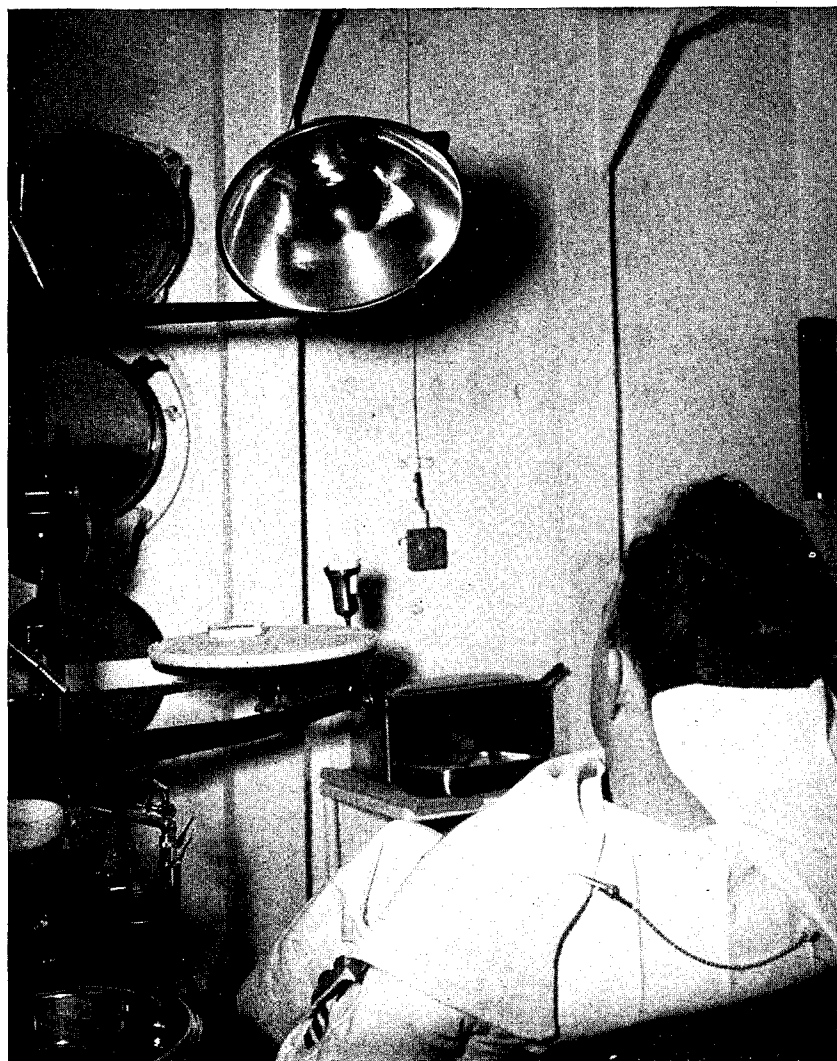


Figure 1.—Stock operating lamp attached to dental operating unit.

aboard ship for experimental replacement of the nine 100-watt bulbs. Each bench light was replaced with a 30-watt fluorescent lamp. The amount of wattage used was not only decreased by 235 watts but the heat factor became negligible and the surrounding light was increased sufficiently to balance the concentrated light. In the prosthetic laboratory where heat generation is always a problem because of furnaces and Bunsen burners, this change has made the compartment noticeably cooler. Dental officers who operated under the fluorescent lights for definite periods and who then changed back to the old lights

testified that the fluorescent lights (1) gave more light, with attendant softness of the reflected light, and (2) resulted in no blind spots when the gaze was shifted away from the field of concentrated light. The low ceiling necessitated placing any type of fixture close to the operator's head, so because of the generation of less heat the fluorescent light was preferred. Headaches which had frequently been experienced at the end of the day no longer occurred.

The dimensions of the lamp constructed and the materials used are presented herewith. Similar ready-made lamps can be bought but as budgets are often limited this may not be possible. If lamps are purchased commercially (1) the light reflected from the fixture must be directed overhead, as well as downward by reflectors, and (2) if the fixture is to be used aboard ship, rigidity of construction with adequate bulb protection must be provided; no glass should be included in the assembly.

All supplies used in the lamp were readily obtainable through the Bureau of Supplies and Accounts. The construction of the lamp was simple and the only tools required were those used to cut and bend metal. The lamp we constructed withstood severe ship vibration during gunnery practice at sea. We used three different types of metal in making the framework of the fixture: aluminum, stainless steel, and galvanized tin. For all practical purposes galvanized tin was preferred because it was easier to cut, bend, drill, and solder. As the fixtures were painted or enameled white, the surface of the metal was of no importance. Prior to painting galvanized tin it was found that a wash of vinegar or acetic acid was necessary before applying a chromate and the finishing paint. This removed a coating of zinc which prevented adherence of the paint to the surface.

To accommodate four 40-watt fluorescent tubes, the following material was needed:

- 16-gage galvanized tin plates, 60½ by 25½ inches.
- 1 or 2 ballasts (one 4-tube or two 2-tube ballasts).
- 4 starter retaining tube holders.
- Sufficient electric wiring.

Before bends were made in the tin, a center section 37 by 13 inches was cut out. This allowed the top of the fixture to be open so that light could be reflected from the ceiling instead of necessitating a reflector which would direct all light downward and cast shadows above and around the fixture.

A ½-inch flat bend of the material on all outer edges afforded stabilization as well as a neater appearance on the bottom edges of the fixture. The dimensions of the finished frame were 50 by 15 by 5 inches (fig. 2).

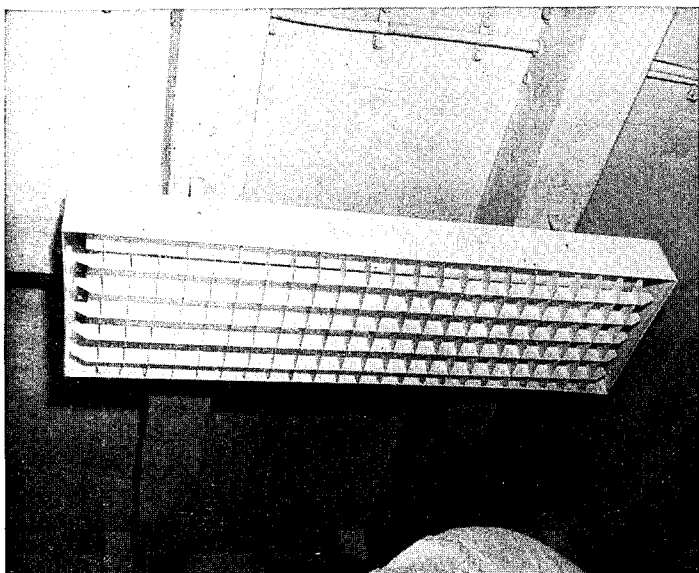


Figure 2.—Finished fixture with louver and tubes.

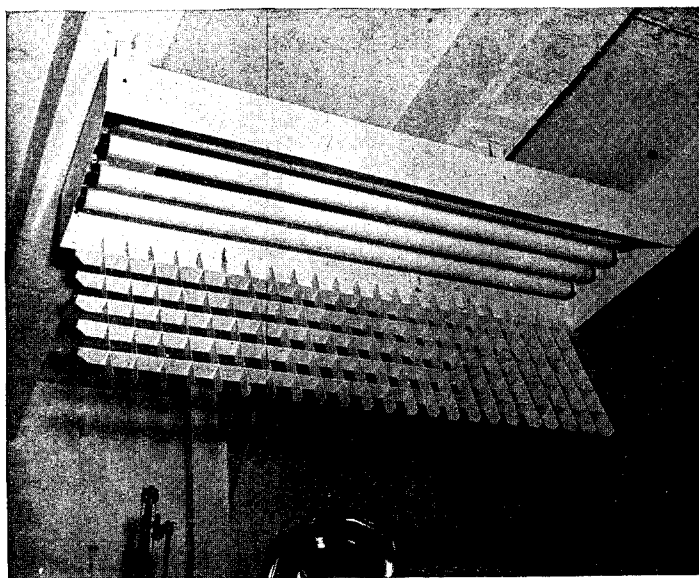


Figure 3.—Finished fixtures with louver lowered.

Louvers were constructed because they overcome the stroboscopic flicker associated with fluorescent lighting. These consisted of five strips of 16-gage galvanized tin, 48 by $1\frac{1}{2}$ inches. These were cut half way through with a bandsaw at intervals of $1\frac{1}{2}$ inches. Nineteen strips, 14 by $1\frac{1}{2}$ inches, were cut and sawed in like manner. These were fitted together to form a framework of $1\frac{1}{2}$ -inch squares. A small bit of solder was applied to the corners of each square to increase rigidity. The louvers were installed in the finished fixture by attaching a hinge at the sixth short strip from each end and retaining it in position by two $\frac{1}{4}$ -inch strips suspended from the top of the fixture. This allowed the louvers to be lowered for cleaning and replacement of burned out tubes (fig. 3).

The ballasts come either in 2- or 4-tube assemblies. Each two 40-watt fluorescent tube assembly requires a 2-tube 40-watt ballast. It was found, for our purpose, that a 4-tube ballast was easier to wire. Each ballast was accompanied by a wiring diagram which had to be followed implicitly. The position of placing the ballast must be left to the one who makes the fixture because much depends on the position of the fixture when attached. It may be desirable to conceal the ballast entirely by making an overhead receptacle for it and having the wires leading to the fixture come through a pipe suspension for the hanging fixture. Because our ceiling was low the fixture was placed close to the ceiling and as one side of the fixture would never be noticed the ballast was attached to the fixture on that side.

The tube holders were fastened to each end of the fixture. It was found more practical to place two of the starter retaining holders on one end of the fixture and two on the other end to facilitate wiring. At this point the fixture was ready for painting. After painting the surface with zinc chromate, a flat white paint was used. A finishing coat of white enamel is best as it gives a soft reflected light without glare.

SUMMARY

Greater protection must be afforded to the eyesight of those who work with small objects in a limited field of vision. With the diminished number of dental officers and the presence of the constantly increasing work load it is important that their vision be protected. In future planning of dental clinics advantage should first be taken of natural sources of light and then they should be equipped with adequate artificial light.



Psychologic Reactions to Winter Arctic Conditions

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THE observations summarized in this article were made when I accompanied an Army Medical Test Team to an arctic area during the winter of 1948-49. They are based on a study of the experiences of a group of soldiers during two winter months of arctic service. The severity of the cold and wind was not the chief cause for complaint among the soldiers. Because none of the men had ever experienced severe cold before, they were, at first, apprehensive and somewhat fearful of it, but as they gained experience in working in the cold, and as they became conditioned to the severity of the climate they complained less. This suggests that all troops departing for arctic assignments might receive a conditioning course in which they would be exposed to the type of climatic conditions they would encounter on reaching the locale of the assignment. This course would dispel fear of the severe cold, and prepare the soldiers for extreme changes in climatic conditions.

All of the soldiers of the Team were, however, concerned with the isolation attending their assignment. They did not believe that the recreational facilities available to them were sufficient to dispel the depressing effects of the isolation. Added to their concern over what they considered poor recreational facilities was their lack of acceptance of their housing. The cold was important from a psychologic standpoint primarily because it intensified the isolation. In the arctic environment, soldiers are unable to move about with the ease which is common in more temperate climates. Outdoor group socializing experiences did not exist for the men of the Test Team and, when they were not working or walking between one building and another they were, as a rule, indoors. Here they were dissatisfied with the recreational facilities afforded them and as a result there was a lowering of morale.

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The severe cold had other indirect psychologic effects. Although the special clothing issued to the men, for the most part, kept their bodies warm, protection of the face was inadequate and it was not possible for the men to work outdoors for prolonged periods without going indoors at intervals to get warm. This made working difficult, reduced the soldier's productivity, and limited him to an area near a building, tent, or vehicle where he could get warm. Also, dexterity of the fingers was reduced because of the bulky mittens which the men were required to wear to prevent freezing of the hands. This, at times, resulted in frustrating experiences for those who had to perform tasks requiring the use of their fingers. An element of insecurity existed in the soldiers' minds in that they had no confidence in the long range protection afforded by their special clothing, chiefly because of the occurrence of frostbite of the face.

Working conditions were made difficult also because of the destructive effects of the cold on motor vehicles. As in other military field conditions, efficient operation of motor vehicles is necessary for the successful accomplishment of a mission and relates to the morale of the soldier at work. Because of exposure of the vehicles to the severe cold, wind, and infiltration of fine particles of snow, motors operated with great difficulty and broke down frequently.

As in all other military situations, good officer leadership under arctic field conditions was important. Because of the isolation and the additional hardships and possible dangers imposed by arctic field conditions, the soldiers, more than ever, looked to their commanding officer to provide for their welfare. It appeared that, as much as possible, the commanding officer of the Test Team provided his soldiers with the kind of leadership his group required. Under the more difficult field conditions, he gave them more considerate and individualized attention than he might have given under more favorable conditions. The men believed that their commanding officer was concerned with their welfare and that he was doing as much as he could for their comfort. The commanding officer worked with the men in performing the more arduous tasks and participated in difficult manual labor from time to time. This impressed the men and sustained their morale in the face of adversities.

Morale was fairly good because the men knew that their situation was temporary and that they were to be sent home after about 2 months. Had they been required to serve for 18 months or 2 years, the morale might have declined after the first few weeks. Even during their temporary assignment, the soldiers at times became tense and irritable and complained about the living conditions, lack of recreational facilities, and frustration which they met in attempting to perform tasks in a rigorous climate to which they were unaccustomed.

Personality type, in itself, did not appear to be related to good or poor personal adjustment during the arctic operation. In a conversation with Sir Hubert Wilkins, the arctic and antarctic explorer, he stated that he did not believe that any special type of personality was required for good personal adjustment in the Arctic; just an "average fellow." He stated further that he thought the average, healthy man had no trouble getting along in the Arctic. Successful personal adjustment of the soldier appeared to be most highly correlated with the stability of his personality and his successful record of performance as a soldier prior to his departure for the Arctic. The soldier who had a record of efficient performance, combined with a stable personality, did an efficient job and made the best adaptation to the arctic assignment especially if he had had successful military experience in the field. The soldier whose military record was poor adapted poorly during the arctic operation.

All of the soldiers of the Team were of the Army Medical Service and most had been trained in military occupational specialties which did not require extensive field experience and training. Because most of the men found it necessary to work outside their occupational specialties most of the time, several of them were considered by the commanding officer to have performed poorly, not adapting themselves to the rougher field work as readily or as efficiently as those who had had field experience.

The soldier who was rated as having done the most efficient job during the arctic winter had an outstanding combat record and, with one minor exception, a consistently good performance as a soldier throughout his military service. Another soldier whose performance was superior in the Arctic was a sergeant who, at the time of his selection for the project, objected strongly to his assignment. Despite his initial uncooperative attitude, his record of more than 20 years as an efficient soldier, much of it in the field, was continued with his efficient performance during the temporary arctic detail.

The most inadequate soldier of the Team was one who had the poorest military and civilian record. Assumedly, he performed no worse in the Arctic than he had performed on his usual military assignment and on civilian jobs. An immature soldier with a military record of inefficiency, alcoholic habits, and poor emotional adjustment, continued his usual poor performance and adjustment while a member of the Team. The alcoholic habits of another enlisted man resulted in his evacuation as a result of an injury sustained in a fight with a fellow soldier. He had been an efficient worker until the period of drunkenness which resulted in the fight.

In assignments to arctic or to other stations where the field conditions are rigorous, the emotionally stable, physically healthy soldier

will make a satisfactory adaptation to his environment provided attention is given to his *psychologic* needs. In addition to *primary* or *biologic* needs such as food, water, and oxygen, man, whether he be soldier or civilian, has other needs of which he is more conscious and which are strongly related to the manner in which he adapts to his environment. Affection, recognition, security, freedom from fear, and self-accomplishment are some of the principal *social* needs which man constantly strives to attain to make him proficient. Satisfaction of these needs is strongly related to motivation and, hence, to the manner in which a person performs an assigned task.

In the assignment of military personnel to arctic or other field conditions, several of the soldier's strongest social needs should be met if maximum efficiency of performance is to be maintained. Primarily the soldier should be exposed to good leadership in his organization. This implies that he will receive all possible attention to his welfare and comfort. Good leadership thus contributes to the fulfillment of the soldier's needs for affection and security. Whenever possible the soldier should be assigned to the military occupational specialty for which he has been trained. If he has been trained for a task and has had experience with a particular job, usually he can perform this assignment better than any other. The soldier is happiest when he is able to excel in whatever he is doing and to satisfy, to a high degree, his need for self-accomplishment.

Whether soldiers are assigned to arctic regions or to any other unusual environment they should receive a course which will, to some extent, prepare them for the conditions which they are to encounter. This, to a high degree, overcomes the soldier's fears of the unknown and gives him a greater feeling of security. The soldier's clothing and other equipment should be designed to protect him against the hazards which he will encounter. This provision also serves to dispel the soldier's fears and contributes to the fulfillment of his need for security.

The successful adjustment of the soldier under rigorous field conditions, depends, to a great degree, on how he is treated after he encounters these conditions. That field conditions in a cold climate, in themselves, do not produce emotional breakdowns among soldiers is suggested by the fact that among American troops in Alaska, during more than a 2-year period, the incidence of neuropsychiatric conditions was lower than among the troops in any other Army theater outside the continental limits of the United States.²

² From figures furnished by the Medical Statistics Division, Office of the Surgeon General, Department of the Army.

Emotional problems encountered among soldiers under arctic field conditions do not appear to be different from those encountered under field conditions accompanied by other climatic extremes. Furthermore no particular personality type performs with greater efficiency under arctic field conditions than it would under field conditions in other climatic extremes where leadership, housing, recreation, isolation, and other variables are the same. The soldier who is able to perform efficiently in one type of climatic extreme, with few exceptions, should be able to perform in the same manner in another.



Acute Intermittent Porphyria¹

Report of a Case

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HOWARD L. KUHL, *Lieutenant, junior grade, MC, U. S. N. R.*

IN THE past decade an increasing number of cases of true porphyria have been recognized and reported in the literature. The majority of these reports deal mainly with the gastrointestinal manifestations of the disease and their differential diagnosis. Our case is reported because of its almost pure central nervous system involvement.

The basic cause of porphyria is an "inborn error" or deficiency in porphyrin metabolism.² A congenital and an acute intermittent type are recognized. Congenital porphyria may be acute or chronic. The acute congenital type appears early in neonatal life or early infancy and is manifested by epidermal photosensitivity, the appearance of blebs and necrotic areas on the skin, endochondral staining of bones, anemia, splenomegaly, and hepatomegaly. The chronic congenital type is characterized by an onset at from 40 to 50 years of age, epidermal photosensitivity, blebs on the face, and porphyrinuria.

Acute intermittent porphyria is now recognized as a chronic, inherited, Mendelian dominant, metabolic disorder. It is characterized by (1) gastrointestinal disturbances, i. e., pain, nausea, vomiting, constipation, and weight loss; (2) polyneuritis, mental symptoms and/or paralysis; (3) fever and leukocytosis; (4) arterial hypertension; (5) tachycardia and electrocardiographic changes; and (6) porphyrinuria.

The porphyrin compounds are red pigments occurring in nature in plants and animals. They have been found as basic components of hemoglobin, myoglobin, chlorophyll, catalases, and cytochromes. These substances are concerned with cellular respiration.³ The porphyrins themselves are synthesized in the animal body in the forma-

¹ U. S. Naval Hospital, San Diego, Calif.

² WATSON, C. J.: In CECIL, R. L.: *Textbook of Medicine*. 7th edition. W. B. Saunders Co., Philadelphia, Pa., 1947. pp. 734-738.

³ CALVY, G. L.: *Porphyria*. *Surg., Gynec. & Obst.* 90: 716, June 1950.

tion of hemoglobin. In this process varied amounts of protoporphyrin are not utilized and are converted to coproporphyrin and excreted as such in the urine and feces. This is present in normal persons and in patients affected with porphyria. These amounts may be increased in such diseases as carcinoma, peripheral neuritis, Hodgkin's disease, beri-beri, cirrhosis, infections, and pancreatitis.

CASE REPORT

A 36-year-old man was admitted to the hospital on the dental service complaining of a painful swelling of his right mandible which had followed the extraction of several teeth 1 month previously. Physical examination on the dental service revealed a tender swelling of the right side of the face extending from the inferior border of the orbit to the inferior border of the mandible. There was no temperature elevation, the blood pressure was 150/90, and the pulse was 96. He was immediately placed on penicillin and crysticillin therapy. He was delirious throughout the night, was observed in a convulsive seizure the following morning, and was obviously out of contact with his surroundings.

Following consultation, he was transferred to the neuropsychiatric service where he appeared generally disheveled, was perspiring profusely, was tremulous, and mentally confused. He complained of annoying visual hallucinations consisting of Lilliputian human figures. He was disoriented as to place and time, was generally uncooperative, resistive, and negativistic. Neurologic examination revealed severe generalized tremors, moderately severe paresis of both lower extremities, unsteadiness, jaundiced scleras, and hyperpigmentation of the skin. Shortly after his admission to the ward he was observed in a brief epileptoid seizure consisting of a fall, a cry, tonic and clonic movements, and later, urinary incontinence. The entire seizure lasted 30 seconds. Following urinary incontinence it was noted that the patient's pajamas were stained a dark purple. The temperature had risen rapidly to 102° F. rectally. Lumbar puncture, cerebrospinal fluid studies, and skull roentgenograms revealed no abnormal findings.

The following morning the patient was noticeably less tremulous and less confused but still quite unsteady and weak. He was severely jaundiced. A specimen of urine was obtained and half the specimen exposed to direct sunlight. After 30 minutes' exposure, the exposed urine was distinctly darker than the protected portion. The laboratory reported the urine to be dark amber in color and cloudy with 100 mg. of albumin per 100 cc., numerous granular casts, an occasional red blood cell, and 10 to 15 white blood cells per high-power field. The Watson-Schwartz test for porphobilinogen was strongly positive. Other laboratory studies showed 17 mg. of urea nitrogen per 100 cc.

of blood; an icteric index, 16; a red blood cell count of 4,200,000; a white blood cell count of 7,000 with a normal differential count; and a 2 plus standard blood Kahn test. Cephalin flocculation and thymol turbidity were within normal limits but repeated glucose tolerance curves showed a tendency to rapid increase in the blood sugar level, with a very slow reduction and, during the first test, 2 plus sugar was noted in both the second and third urine specimens.

Electroencephalographic tracings first showed changes suggestive of an irritative high frequency activity in the right parietal lead, but was considered within normal limits. An EEG 3 weeks later revealed very fast waves and was considered indicative of a diffuse type of cortical abnormality consistent with a toxic encephalitis.

On the third hospital day the diagnosis of porphyria, acute intermittent type, was established. The treatment consisted of penicillin, closed ward nursing care, riboflavin, niacin, and dental surgery. The patient was given 1,000 mg. of mephenesin, q. i. d. to control his severe tremors. The patient began to improve almost immediately under treatment, but during the first 4 or 5 days his mental condition was unstable. He was often extremely restless, agitated, and actively hallucinated in all spheres, but a few hours later would be in a good contact, quiet, and cooperative. He soon became able to rise from the floor without assistance, was much steadier on his feet, and was less tremulous. Following the first week of treatment, he was alert, active, and mentally clear. Only a moderate tremor of his outstretched fingers remained. His sleeping, eating, and bowel habits improved greatly.

On his fourteenth hospital day urine specimens were negative for porphobilinogen for the first time. Steady improvement continued so that after 3 weeks in the hospital the patient was exercising voluntarily, was sociable, pleasant, cooperative, and was more interested in his personal hygiene. During his convalescence, he was referred to the clinical psychologist, and was studied by a battery of tests which included the Wechsler Scale for Memory, Wechsler-Bellevue Adult Intelligence Scale, Bender-Gestalt and the Shipley-Hartford tests. There was no impairment of memory for remote or recent events. The full scale intelligence quotient equaled 100. There was no evidence of gross organic involvement. There was evidence of an impoverished cultural and educational background with no impairment of intellectual functioning. Other examinations included the eosinophilic response test which showed a 14 percent fall in circulating eosinophils following epinephrine injection. Special studies made at the Scripps Metabolic Clinic Laboratory revealed the absence of porphyrins in urine collected on the date of discharge.

Past history revealed that the patient had been admitted to another hospital in 1944 and following 3 months' hospitalization was discharged with a diagnosis of chronic hypertrophic arthritis. He was discovered to have had a syphilitic infection about 1 year prior to the present admission and was treated with 6 million units of penicillin by a local physician. Although the patient gave a history of chronic constipation, no history of abdominal crisis or cramps could be elicited. He had never had a convulsive seizure prior to the present hospitalization. He volunteered the history of frequently voiding dark-colored urine associated with alcoholic ingestion, exhaustion, and infection. He had always been considered as the one person in the family who "couldn't hold his liquor." One older brother is said to have similar symptoms but has refused to consult a physician.

The patient was discharged on the twenty-eighth hospital day, symptom free, and was advised to seek treatment for his syphilitic infection privately, to abstain from alcoholic excesses, and to avoid overexertion.

DISCUSSION

A noteworthy feature of this case was the apparent diffuse involvement of the central nervous system with the acute psychotic episode, convulsions, hallucinations, and paresis. It may be possible to draw a definite conclusion concerning the pathophysiology of this disorder. Protophyrin applied topically to smooth muscle creates spasm.⁴⁻⁶ The basic mechanism for this spasm is unknown. It may be that the fundamental changes occurring in the nervous system are caused by (1) contact of excess porphyrins with smooth muscle, creating spasm with resulting anoxia to the central nervous system cells; or (2) direct anoxia of the central nervous system cells resulting from high porphyrin levels in the blood. The latter is more likely because the porphyrins are so closely related to cellular metabolism and an excess creates tissue anoxia with the result that neurones are the first to suffer. Peters⁷ reports electromyographic changes consistent with a patchy degeneration of motor nerves in porphyria. The essential postmortem changes reported in fatal cases are best shown in the anterior horn cells of

⁴ WATSON, C. J.: *The Porphyrins and Their Relation to Disease: Porphyria*. Oxford Medicine. Vol. IV, Part II. Oxford University Press, New York, N. Y. p. 228 (1-34).

⁵ DOBRINER, K., and RHODES, C. P.: Porphyrins in health and disease. *Physiol. Rev.* 20: 416-468, July 1940.

⁶ RASK, E. N., and HOWELL, W. H.: Photodynamic action of hematoporphyrin. *Am. J. Physiol.* 84: 363-377, Mar. 1928.

⁷ PETERS, G. A.: Acute porphyria; report of two cases with electrical studies in one. *Ann. Int. Med.* 30: 1237-1248, June 1949.

the spinal cord. These show perinuclear chromatolysis, cellular swelling, and vacuolization of the cytoplasm.⁸⁻¹¹

The electroencephalographic record at the height of the disease showed only rapid waves, but a tracing 3 weeks later was typical of a toxic encephalitis. There was an associated impairment of glucose metabolism.

⁸ FULLER, R. H.: Acute porphyria. *Armed Forces Med. J.* 1: 214-217, Feb. 1950.

⁹ DENNY-BROWN, D., and SCIARRA, D.: Changes in central nervous system in acute porphyria. *Brain* 68: 1-16, Mar. 1945.

¹⁰ MASON, V. R.; COURVILLE, C.; and ZISKIND, E.: Porphyrins in human disease. *Medicine* 12: 355, 1933.

¹¹ BAKER, A. B., and WATSON, C. J.: Central nervous system in porphyria. *J. Neuropath. & Exper. Neurol.* 4: 68-76, Jan. 1945.



The British Army Health Organization

R. W. SCOTT, *Lieutenant Colonel, R. A. M. C.*¹

RECENT years have seen a great widening of outlook in the struggle for the attainment of health. There has been a realization of the way in which the complicated interplay of environmental factors may affect health. Linked with this is the additional factor that the increased tempo of modern warfare, combined with the ever-growing complexity of weapons, equipment, and materials demands a higher degree of mental and physical health than ever before. The continuance of the system of National Service has also had far-reaching effects; it imposes a special responsibility in that the health of the nation's youth at a most important stage in their lives is placed in the trust of the Armed Forces. The maintenance of health is one of the basic functions of the Army Medical Services as a whole and within the medical services it is the special province of the Army Health Organization.

RESPONSIBILITY

The prime responsibility for the health of the Army falls on higher commanders who are advised by their senior administrative medical officers who in turn receive technical advice from the army health officer on their staff. At unit level the responsibility falls on the unit commander. This aspect of the problem, the welding together of the traditional art of man-management and modern scientific methods of disease control constitutes the "health discipline" already discussed by Cantlie.² The duties of the Army health personnel may therefore be classified primarily as advice, inspection, and research, with the special executive responsibilities in education and propaganda, in the control of infectious disease and in particular problems such as malaria control measures outside unit limits.

¹ Army Health Directorate, British War Office.

² CANTLIE, N. (Sir): Health discipline. *U. S. Armed Forces Med. J.* 1: 232-237, Feb. 1950.

The responsibilities of the Army Health Organization were laid down in an Army Council Instruction published in 1948. They are: (1) Supervision in general of the environment of the soldier from the point of view of the maintenance of his health; (2) the medical aspects of recruiting and categorization, diet and nutrition, work, training including physical training and recreation; (3) supervision of water and food supplies; (4) the medical aspects of shelter of all kinds including scales of accommodation, selection of camp and barrack sites, the layout and design of buildings, heating, lighting, and ventilation; (5) the medical aspects of clothing and equipment of the soldier and assistance in regard to personnel research into all such matters; (6) methods of disposal of waste matter of all kinds and the hygienic aspects of bathing, swimming, and laundry facilities; (7) disinfection and disinfestation; (8) industrial hygiene and occupational hazards throughout the Army; (9) preventive medicine in general and in particular the prevention of infectious diseases; (10) supervision of arrangements for hygienic training of all kinds; (11) the maintenance of statistics of disease incidence in all commands and a watch on the trends of disease; (12) supervision of the health of the school child at home and abroad as also of maternity and child welfare work throughout the Army; and (13) liaison with the other services and with the Ministry of Health or other civil organizations at home and abroad on important public health matters.

PERSONNEL

The Army Health Organization is administered by a Directorate of Army Health which is an integral part of the Army Medical Directorate at the War Office. The Director of Army Health, usually a major general or a brigadier, is chairman of the Army Health Advisory Committee which is composed of leading civilian authorities on public health, malariology, physiology, nutrition, statistics, et cetera. Their expert advice can be obtained on difficult problems. The department consists of a statistical section controlled by civilian statisticians which deals with army medical statistics on a world-wide basis and a general section staffed by a lieutenant colonel, who is Assistant Director of Army Health and two majors, Deputy Assistant Directors of Army Health. At the headquarters of each command in the United Kingdom there is a Deputy Director of Army Health, a colonel and each military district has a Deputy Assistant Director of Army Health who is a major. Each command has a pool of noncommissioned officers qualified as "hygiene assistants" who are distributed to districts as required. Their duties are inspectorial and advisory.

The staff officers in the higher appointments are fully qualified specialists in Army health with considerable military experience and the

appropriate civilian public-health qualifications. The officers in the junior appointments, less well qualified, are classified as graded specialists. Hygiene assistants may reach officer status and be commissioned as hygiene officers (nonmedical). They are employed as instructors in teaching establishments, as staff captains (hygiene or malaria) in the larger headquarters and in administrative appointments.

In overseas commands the organization is similar. The staff officers are identical. The other ranks in each command are more numerous and have more executive duties than in commands in the United Kingdom. For administrative convenience they are normally grouped into units called hygiene companies or hygiene wings which are commanded by nonmedical hygiene officers.

EDUCATION

All personnel of the medical services have their part to play in health education and particularly those of the Army Health Organization. The main educational activities are centered on three establishments. The first is the Army Health Department of the Royal Army Medical College in London. This has a staff consisting of a professor of Army health (colonel), a reader (lieutenant colonel), a lecturer (major), and an analytic chemist (civilian). This department is concerned with research and with the training of medical officers in the principles of Army health. The training is done in three phases, the short introductory course given to national service medical officers on entry, the long senior course given to regular officers at about their tenth year of service, and the specialized instruction for graded specialists in Army health in order that they may obtain their civilian qualification and become full specialists.

Second, there is the Army School of Health which is directed to the more practical aspects of instruction in Army health. It is commanded by a colonel. The teaching staff includes a chief instructor, lieutenant colonel, two majors (specialists in Army health), two hygiene officers (nonmedical), and a number of noncommissioned officers. Courses are provided for medical officers on first joining and for the other rank personnel of the Royal Army Medical Corps in order that they may qualify as hygiene assistants. The bulk of the work at the school is, however, the instruction of regimental personnel. Regular courses are held for instructors in health at primary training centers, for regimental sanitary-duty men, for water-duty men, and for senior and junior regimental officers. Special instruction is provided for students at the Staff College and for cadets from Sandhurst. Courses are also given to officers and men of the Territorial Army and members of the Cadet Forces. The school carries out re-

search into field apparatus, disinfectants, insecticides, water-purification methods, and other subjects related to practical hygiene. A mobile Army health team, which is based at the school, tours the United Kingdom giving demonstrations and lectures and showing films to units of both the Regular and Territorial Armies. Certain civilian organizations make use of the school including the Civil Defence Staff College and the London School of Hygiene and Tropical Medicine. Arrangements are also being made for cadets of the Colonial Administrative Service to attend for instruction before taking up their first overseas appointments.

The third institution is the Far East School of Hygiene at Singapore, which, although small, gives courses similar to those at the Army School of Health, for British personnel serving in the Far East, for Gurkha troops, and for locally enlisted troops. In other overseas commands local demonstration grounds are set up by the hygiene companies and short courses of instruction are given on problems appropriate to the command.

The pattern of health education which it is hoped to achieve is that the recruit will receive lectures on elementary hygiene, particularly personal hygiene, at his training center. This instruction will be reinforced by films on communal and personal hygiene and related subjects prepared by the Army Health Organization. The trained soldier will receive a set program of lectures from his medical officer each year. It is hoped soon that the corporal will receive a short course of instruction at the Army School of Health before he becomes a sergeant. The young regimental officer will receive a course at the school because Army health questions are included in his promotion examinations. The senior officer will be able to attend refresher courses. It is hoped also that captains will receive a short course of instruction before promotion to major.

In addition special arrangements are made for lectures and films to be given to troops while on troopships. The textbooks on the subject have been rewritten. A "Handbook of Army Health," an elementary publication for all arms is in print and will appear shortly. A "Manual of Army Health," a technical work for Army health specialists is being prepared, and a small pamphlet entitled "Your Health and You" which is to be handed to each soldier when going abroad is in print. A similar publication for families going overseas is in preparation.

MEDICAL CLASSIFICATION AND PERSONNEL SELECTION

World War II demonstrated the importance of achieving the maximum use of manpower both in the services and on the home front. Put briefly, the problem is to get the man into the employ-

ment for which his physique, temperament, intelligence, aptitude, and training make him most suitable. Temperament, intelligence, aptitude, and training are covered by the personnel selection procedure which is organized by a special branch of the Adjutant General's department. Personnel selection officers can readily refer soldiers to Army psychiatrists when this is thought to be advisable. As far as physique is concerned the Pulheems system of medical classification has been evolved. This important subject has already been covered by Campbell.³ This system aims at the production of a medical standard for each soldier which is based on the correlation of his actual physical condition with the physical attributes required in his particular Army trade or employment.

RESEARCH

Research is carried out at the Royal Army Medical College and at the Army School of Health. In addition, more particularly for personnel research problems, a pool of physiologists is maintained who can be attached to service research institutions carrying out investigations which require the service of physiologists. Committees are in existence which link the Army Health Organization with the Medical Research Council and other civilian research bodies. Another committee links the Industrial Health Organization in the services with the medical staff of the Factory Department of the Ministry of Labour.

ORGANIZATION IN WAR

The organization in war follows the same general principles as in time of peace. At all levels senior administrative medical officers have specialists in Army health on their staffs. An important feature of the organization in war is that in areas where there are special health hazards the divisional staff may be augmented to include a Deputy Assistant Adjutant General, Health. This appointment is filled by an executive staff officer not a member of the Royal Army Medical Corps. His duty is to insure that all personnel within the formation comply with orders relating to the maintenance of health. Forces in the field are provided with an appropriate quota of field hygiene sections commanded by nonmedical hygiene officers and field hygiene companies commanded by Army health specialists. Laboratory facilities are supplied by mobile hygiene laboratories. When the area of operations is malarious, malaria field and base laboratories are provided. These are commanded by Army

³ CAMPBELL, A. E.: Assessment of physical fitness for service in the British Army. U. S. Armed Forces Med. J. 1: 1527-1535, Dec. 1950.

health specialists and have a staff of malariologists and entomologists. Each can set up a central entomologic laboratory and provide two or three malaria survey teams. A malaria control company which is responsible for the control of local labor recruited for antimalarial work may also be provided.

CONCLUSIONS

The approach to health in the British Army is directed toward the attainment of positive health in the widest sense of the phrase. The campaign to achieve this end is based on (1) intensive education at all levels; (2) health discipline to enforce measures essential to health; and (3) the provision of a corps of efficient, fully-qualified technical personnel continually striving to raise standards and always alert to ascertain new problems and suggest the means of dealing with them.



New Medical Set-up for Department of Defense

THE SECRETARY OF DEFENSE

WASHINGTON

2 January 1951.

Memorandum for The Secretaries of the Military Departments
The Assistant Secretaries of Defense
The Joint Chiefs of Staff
The Chairmen of Boards and Committees, OSD
The Directors of Offices, OSD

Subject: Establishment of the Armed Forces Medical Policy Council

The attached directive establishes, effective as of this date, within the Office of the Secretary of Defense an Armed Forces Medical Policy Council with the membership, authority, duties and relationships as set forth in the directive.

Effective this same date, the Office of Medical Services and the Armed Forces Medical Advisory Committee are abolished and all personnel, property, funds, records and unfinished business of such office and committee are transferred to the Armed Forces Medical Policy Council.

All duties and responsibilities of the Director of Medical Services and of the Chairman of the Armed Forces Medical Advisory Committee not provided for in, and not inconsistent with, the provisions of the attached directive, are assigned to the Chairman of the Armed Forces Medical Policy Council.

Secretary of Defense directives of 12 May 1949 and 20 July 1950 concerning the Office of Medical Services and directives of 9 November 1948 and 30 April 1949 concerning the Armed Forces Medical Advisory Committee are hereby rescinded. All other official action papers on medical and health matters executed by or in the name of the Secretary of Defense, the Director of Medical Services and the Armed Forces Medical Advisory Committee remain in full force and effect.

All agencies of the Department of Defense shall keep the Armed Forces Medical Policy Council informed of such of their programs and policies as will be of interest to the Council and shall furnish the Council such information and assistance as it may require in the discharge of its responsibilities.

G. C. MARSHALL.

Directive for the Armed Forces Medical Policy Council

2 January 1951.

Pursuant to the authority vested in the Secretary of Defense by the National Security Act of 1947, as amended, there is hereby established an Armed Forces Medical Policy Council (hereinafter called the "Council") which shall report directly to the Secretary of Defense; and in order to define the authority and duties of the Armed Forces Medical Policy Council and to define the relationships of the Council with the Military Departments and other agencies of the Department of Defense, it is hereby directed as follows, effective as of the date of signature:

I. MEMBERSHIP OF THE COUNCIL

The Council shall be composed of a civilian Chairman, who shall be a doctor of medicine, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Air Force, who shall act for and represent their respective Departments, and three civilian members who with the chairman shall be appointed by the Secretary of Defense having been selected from among national authorities in medical and health fields of endeavor. The Deputy Surgeons General of each Department shall serve as alternates for their respective principals with plenary powers. The Chairman, with the approval of the Secretary of Defense, may appoint a Vice Chairman who shall, in the absence or disability of the Chairman, act for and exercise the powers of the Chairman. In the absence of the duly appointed Chairman and Vice Chairman, the Secretary of Defense will designate a Council member to act as Chairman.

II. AUTHORITY

A. *Authority of the Council.*—Within its jurisdiction, as further defined in this Directive or as may be further directed by the Secretary of Defense, the Council shall be the principal agency of the Secretary of Defense responsible for performing the duties set forth in Section III below. As such, the Council, when majority agreement is obtained, except when formal appeal is presented as provided by Section II C, is authorized on matters within its jurisdiction, to issue directives in the name of the Secretary of Defense to implement the policies and decisions of the Council, and to supervise their execution.

B. *Authority of the Chairman.*—The Chairman shall have authority to take executive action in consonance with approved plans, programs and policies of the Council. The Chairman of the Council may, without being relieved of his responsibility therefor, perform any of his duties with or through the aid of such members or officials of the Council as the Chairman may designate.

The Chairman, after consultation with the Council and subject to the policies prescribed by the Secretary of Defense, is authorized to establish such continuing or temporary committees, as may be necessary to conduct studies, assemble information, make recommendations, and otherwise to assist in carrying out the responsibilities of the Council.

C. *Appeals from Decisions of the Council.*—With respect to any decisions of the Council, a dissenting Council member representing a Military Department may initiate for submission by the Secretary of the Department represented by the member in question, an appeal therefrom to the Secretary of Defense. Prior notification of any action shall be given to the Chairman and other members of the Council. In the event the Chairman, or a member not representing a Military Department, is not in agreement with a decision of the Council, after prior notification to other members of the Council he may present his recommendations to the Secretary of Defense. In event of the presentation of formal appeals final action will be taken by the Secretary of Defense.

III. DUTIES

A. *Duties of the Council.*—Subject to the authority and direction of the Secretary of Defense, the Council shall perform the duties listed below in support of strategic and logistic plans and in consonance with guidance in those fields provided by the Joint Chiefs of Staff; and in support of other Department of Defense programs. The Council will also perform such other duties as may be directed by the Secretary of Defense.

Specifically, the Council is charged with providing, within its jurisdiction, such broad basic policies, plans and programs as will provide guidance to other Department of Defense agencies and will enable the Military Departments to prepare and execute detailed policies, plans and programs: The Council shall not engage in administration or operations for which an agency already exists. The Council shall:

- (1) Develop basic medical and health policies for the Department of Defense in collaboration with appropriate agencies and departments.

(2) Review medical and health policies, plans and programs of each of the Military Departments, with respect to:

- a.* Conformity with approved policies.
- b.* Adequacy when unilaterally developed.
- c.* Consistency between the policies unilaterally developed.

As a result of these reviews, initiate appropriate action.

(3) Review the medical and health aspects of broad policies, plans and programs which other defense agencies (such as JCS, MB, R&DB, PPB, CCPB) are responsible for establishing, advising the Secretary of Defense of substantial differences of opinion on specific medical and health aspects of any given policy, plan or program, and recommend appropriate action. Assist in developing as requested, the medical and health aspects of such broad policies, plans and programs.

(4) In collaboration with the Military Departments concerned, develop, coordinate and establish, when appropriate and necessary in support of approved policy, medical and health plans providing for:

- a.* Uniform programs within two or more separate Departments.
- b.* Joint programs by two or more Departments.
- c.* Cross-servicing and joint utilization of facilities.

(5) Develop the maximum degree of continuing cooperation and mutual understanding between members of the civilian medical and allied professions and the Armed Services.

(6) Advise the Assistant Secretary of Defense (Comptroller) in the review of budget estimates of the Military Departments for medical and health activities.

(7) Recommend to the Assistant Secretary of Defense (Legislative and Legal Affairs) regarding proposals for new legislation or changes in existing legislation affecting medical and health services.

(8) When appropriate and necessary, initiate and coordinate the development and use of standard medical nomenclature, reports, records, technical procedures and methods, and technical regulations within the Military Departments. Collaborate with agencies of the Department of Defense in similar efforts toward uniformity in such related fields as material specifications, budgeting and cost accounting.

EDITOR'S NOTE: Explanation of symbols used in paragraph (3): JCS, Joint Chiefs of Staff; MB, Munitions Board; R&DB, Research and Development Board; PPB, Personnel Policy Board; CCPB, Civilian Components Policy Board.

(9) Represent the Secretary of Defense in the coordination of matters of mutual interest and importance to the Department of Defense and other governmental and non-governmental organizations in the medical and health fields.

(10) Arrange for any member of the Council to place an item on the Council agenda.

B. Duties of the Chairman.—The Chairman of the Council shall be the principal advisor and assistant to the Secretary of Defense on medical and health matters with which the Secretary of Defense may be concerned and will be guided in such advice by the views of the Council.

The Chairman of the Council shall, with the advice and assistance of the staff, prepare policies, plans and programs for presentation to the Council.

The Chairman, in consonance with views of the Council, shall represent or arrange for representation of the Department of Defense before and with other governmental Departments and agencies on all matters for which the Council has responsibility under the provisions of this Directive.

In addition to participating as a member of the Council, in the performance of the duties assigned in Section III, the Chairman shall, subject to the authority and direction of the Secretary of Defense, perform the following duties:

1. Serve as the presiding officer of the Council.
2. Provide agenda for meetings of the Council and assist the Council in the prosecution of its business as promptly as practicable.
3. Inform the Secretary of Defense of those issues upon which agreement among the members of the Council has not been reached.

IV. ADMINISTRATION

The Secretary of Defense will provide the Chairman with such personnel, facilities, and other administrative services as he from time to time determines are required by the Chairman for the performance of the Council's functions. Military personnel in approximately equal numbers shall be provided by each of the three Military Departments, in accordance with the needs of the Chairman as approved by the Secretary of Defense. Such military personnel shall be acceptable to, and during their tours of duty with the Council, responsible to, the Chairman of the Council rather than to their own department with respect to performance of duty and efficiency ratings.

The Chairman, subject to the approval of the Secretary of Defense, shall provide for the internal organization and staffing of the Council and shall establish its rules of procedure. The staff of the Council shall be responsible to and shall function under the direction, supervision and control of the Chairman.

Committees operating within the jurisdiction of the Council will function under the authority, direction and control of the Chairman of the Council.

The Council shall meet at the call of its Chairman, or at such times as it may fix, and the presence of five members or their duly designated alternates, including one representative from each Military Department, shall constitute a quorum.

V. RELATIONSHIPS

The Chairman, the Council, and the staff of the Council are authorized and expected to communicate directly and expeditiously with other agencies of the Department of Defense and the Military Departments and appropriate sub-divisions thereof concerning any matter within its jurisdiction and in which there exists a mutual interest or responsibility.

The Council shall coordinate its efforts with all agencies within and outside the Department of Defense which have a mutual interest or responsibility with respect to any of its programs, and will determine what formal concurrences, if any, are required.

G. C. MARSHALL.

THE SECRETARY OF DEFENSE

WASHINGTON

2 January 1951.

Memorandum for The Secretaries of Military Departments
The Assistant Secretaries of Defense
The Joint Chiefs of Staff
The Chairmen, Boards, Councils and Committees,
OSD
The Directors of Offices, OSD

Dr. Richard L. Meiling is appointed Chairman of the Armed Forces Medical Policy Council, effective 2 January 1951.

G. C. MARSHALL.



About the Army Medical Service

Operation NavMed

FRED J. FIELDING, *Lieutenant Colonel, MC, U. S. A.*¹

ON 29 SEPTEMBER 1950, The Secretary of Defense directed that the United States Navy recall sufficient numbers of medical officers in their Volunteer Reserve who received their medical education at Government expense, to meet the immediate requirements of the United States Army and United States Air Force. At that time the Air Force was obtaining sufficient volunteers so that they did not require these officers. On 30 September, the Army Chief of Staff requested the Chief, Naval Operations, to furnish 570 medical officers for duty with the Army on a temporary basis. In order properly to evaluate and process these doctors, it was decided to have them assemble at Brooke Army Medical Center, San Antonio, Tex. The Bureau of Personnel, Department of the Navy, issued orders on 2 October for the first group to report on 16 October, with subsequent groups to report on 17, 18, 21, and 25 October and 1 November.

The commanding general at Brooke Army Medical Center was requested to be prepared to receive these officers, process them for active duty, and to give them an intensive 3-day orientation course concerning basic Army matters during the 5- or 6-day period in which they would be temporarily assigned to his installation. The period from 2 to 14 October was used to prepare for this project.

The administrative procedures connected with these Navy officers presented many problems. From a series of conferences with representatives of G-1, the Adjutant General, the Surgeon General, and the Bureau of Personnel, Department of the Navy, administrative instructions covering 20 points were resolved. These were published in Department of Army, Adjutant General Letter, subject: "Administration of Naval Medical Officers Procured from the United States Naval Reserve for Assignment to Duty With the Army," dated 16 October 1950, file AGPA-A. The Bureau of Personnel, Department of the Navy, furnished the Personnel Division of the Surgeon Gen-

¹ Personnel Division, Office of the Surgeon General, Department of the Army.

eral's Office with copies of orders giving the names, file numbers, and addresses of the officers who were ordered to Brooke Army Medical Center for processing. The Navy orders indicated that officers would be temporarily assigned to Brooke, pending further orders. From this information, working rosters, status cards, and personnel files were prepared. Letters of welcome from the Army Surgeon General were also prepared and mailed to Brooke Army Medical Center to the individual medical officers. Identical rosters of the Navy physicians were prepared for the officers concerned in the Personnel Division, and for the Navy liaison representative who went to Brooke Army Medical Center to process the Navy medical officers as they arrived.

The final scheduling of reporting dates of the Navy officers was as follows: On 16 October, 20; on 17 October, 29; on 18 October, 29; on 21 October, 102; on 25 October, 135; on 26 October, 1; on 27 October, 2; on 28 October, 3; on 30 October, 3; on 31 October, 4; on 1 November, 240; and on 6 November, 2; a total of 570.

On 14 October the Assistant Staff Corps Liaison Officer, Bureau of Personnel, Department of the Navy, arrived at Brooke Army Medical Center for initial coordination with the Army finance officer for payments to the Navy physicians while at the Medical Field Service School, as well as final arrangements connected with the establishment of a temporary ships store from the Navy Air Station, Corpus Christi, Tex., which was stocked with navy uniforms to be available for the convenience of the incoming navy physicians. The Chief, Administrative Area Section, Assignment Branch, Adjutant General's Office, Department of the Army, also arrived on 14 October for initial coordination on the preparation of morning reports and other records as the Navy medical officers arrived.

On 15 October the Head, Surgery Branch, Professional Division, Bureau of Medicine and Surgery and the Staff Corps Liaison Officer, Bureau of Personnel, Department of the Navy, as well as the Special Assistant to Chief, Personnel Division, Surgeon General's Office, Department of the Army, arrived at Brooke. These officers represented the liaison group from Washington, D. C., who would assist in the processing of the Navy medical officers, who began to arrive on 16 October. Later, the Head, Distributions Control Section, Officer Personnel Division, Bureau of Personnel, Department of the Navy, replaced the Staff Corps Liaison Officer, Bureau of Personnel, Department of the Navy.

The Navy physicians, on their arrival at Brooke Army Medical Center, completed a questionnaire from which their professional classification was determined. They were next interviewed to clarify any questions concerning items of doubt which may have been entered on

the classification questionnaire. They were also questioned as to their choice of location of geographic assignment and also as to any specific personal reasons, such as family illness, which might indicate initial assignment to a location near their home. During this initial interview, the officers were advised of the availability of the representatives from the Bureau of Personnel and the Bureau of Medicine and Surgery, Department of the Navy, to assist in the solution of any problems connected with their current Navy orders or other purely Navy problems. They were advised of their schedule while at Brooke Army Medical Center and of their departure date of 5 to 6 days later. They were also advised concerning the professional records which they should maintain, while on active duty, in order to obtain the proper specialty board evaluation of their military service. They were given their professional classification number with an explanation of its meaning. Finally, they were told that on a second interview, 24 hours later, they would be informed of the location of their new Army assignment, with their actual orders forthcoming some 72 hours later.

On completion of the initial interview, if this had been completed prior to 10 a. m., the officers would proceed with the first day's processing. Officers who arrived after that time, were interviewed, then sent to the uniform store on the first day and their major processing was started on the following day. The first day's processing consisted of general administrative actions. Pay vouchers, income tax forms, allotments, personnel records, insurance applications, et cetera, were prepared and completed. Immunizations, blood typing, identification tags, identification cards, etc., were initiated. Class lectures were given by Navy liaison representatives on Navy matters as well as lectures by Army representatives on Army matters of immediate interest to these Navy doctors embarking on their duty with the Army.

Following the first day of processing, the doctors were given 3 days of intensive Army orientation, which covered Army Medical Service in the field, and in fixed hospitals; radiologic defense; military correspondence, law, and courtesies; medical supply procedures; military preventive medicine and neuropsychiatry; and legal and personal affairs. This orientation course was conducted by the instructors of the Army Medical Field Service School at Brooke Army Medical Center and was so designed that the naval officers could start on any one of the 3 days, since the course was continuous and cyclic. In addition, on 5 November a special class was given to 100 of the doctors who were given overseas assignments. This included talks by the Director of Combined Arms Training at the School, who was a combat line leader in both the European and Far East Theaters during World War II, and a talk by a wounded Medical Service Corps officer, formerly assigned with the 24th Division in Korea. Additional reorien-

tation was given this final group on travel problems, pay allotments, insurance, and execution of powers of attorney and wills.

The majority of the Navy officers received their orders for their new assignments 1 to 2 days before the end of their orientation period. The orders were timed to permit travel by automobile to their new station, as well as authorizing 3 days' delay chargeable as leave, if the officer desired to take advantage of this provision. All officers received a cash payment before their departure, which included \$150 of their uniform allowance, and advance of 1 month's base pay, and travel pay for all travel they had completed on their arrival at Brooke Army Medical Center. For most of them the cash payment was exceedingly welcome and in some cases was absolutely essential to the officer concerned.

In processing for permanent assignment, daily telephone calls were made by the Army liaison representative to the Chief, Career Management Branch, Personnel Division, Surgeon General's Office. On this call, information was given on the individual Navy medical officer's professional classification and choice of assignment area with any other special remarks. Information was received on this same phone call as to the permanent station assignment of the officer concerned, who had been previously reported. This procedure was followed until the entire group had been reported and assignments received back. In the Office of the Surgeon General when the professional classification had been reported, stations were selected according to vacancies within the geographic area of choice as near as possible. Home address was taken into consideration in order to place an officer as near home as possible, as well as to avoid long moves in the case of families and to prevent unnecessary expense to the Government. After selection of permanent stations, request for issuance of orders was made to the Adjutant General in the normal manner for telegraphic orders. The orders so telegraphed to the officers at Brooke Army Medical Center were reproduced locally so that each officer would have sufficient copies and were then given to him there.

In several instances, the fact that an officer was engaged in research activities was brought out from the professional classification questionnaire during the initial interview. Selected officers from this group prepared a special research questionnaire with further selected officers then being sent for special interview with a representative of the Research and Development Division of the Surgeon General's office. Later, after departure from the liaison group of this special representative, officers selected for research interviews were sent to the Surgical Research Unit at Brooke Army Medical Center. About 10 officers from the entire group were given assignments in which they would continue in research activities. The special research ques-

tionnaires were all retained and were returned for file in the Research and Development Division of the Surgeon General's office.

Copies of all professional questionnaires were made by the members of the Navy liaison group for return and filing in the Bureau of Medicine and Surgery of the Department of the Navy. Because these 570 Navy medical officers were formerly in the V-12 program and were without prior service, they represent a cross section of the type of officers who may be expected to enter the Armed Forces under the provisions of Public Law 779, 81st Congress, in the Priority One group. A large number of them were in residency training. It was necessary to issue orders to about 35 percent more than the number required in order to permit deferment of those whose call to active duty would have created undue hardship in individual hospitals. (Statistical studies show that of these Priority One officers, 87 percent are in residency training.) Data as to their professional classification is shown in table 1.

TABLE 1.—*Distribution of Naval Reserve officers by professional classification*

<i>Classification</i>	<i>Percent</i>	<i>Classification</i>	<i>Percent</i>
General practice.....	28.3	Otolaryngology.....	1.2
Internal medicine.....	18.3	Radiology.....	1.2
General surgery.....	16.5	Pulmonary diseases.....	.9
Pediatrics.....	8.6	Neurology.....	.9
Obstetrics and gynecology.....	6.9	Neurosurgery.....	.5
Psychiatry.....	4.9	Dermatology.....	.3
Anesthesiology.....	2.4	Clinical laboratory.....	.3
Orthopedic surgery.....	2.1	Industrial medicine.....	.2
Tissue pathology.....	1.8	Radiologic defense.....	.2
Ophthalmology.....	1.6	Cardiology.....	.2
Miscellaneous (research).....	1.5		
Urology.....	1.2	Total.....	100.0

Assignments of these officers were made to Army stations throughout the continental United States as well as to the Far East and European Commands. Except for the overseas assignments, where some of the officers were not volunteers, 90 to 95 percent of the geographic requests for station assignments were granted. The officer's home address was considered and assignments were made as close as possible to their homes. Professional classification of the officer and use of his ability took precedence over choice of assignment area when assignments were made. When it was necessary to take nonvolunteers for overseas assignments, single officers and married officers without children were selected. The assignment distribution is shown in table 2.

TABLE 2.—*Distribution of Naval Reserve officers by area of assignment*

<i>Area</i>	<i>Number</i>	<i>Area</i>	<i>Number</i>
Far East Command.....	98	Third Army area.....	50
European Command.....	17	Fourth Army area.....	40
T/O Units (evacuation and mobile surgical hospitals).....	15	Fifth Army area.....	69
Surgeon General's Command (gen- eral hospitals, et cetera).....	74	Sixth Army area.....	53
First Army area.....	41	Military District of Washington..	11
Second Army area.....	93	Miscellaneous.....	9
		Total.....	570

Aside from the officers selected for overseas assignments, only 43 of the remaining 455 officers received assignments which were not directly under the commander of a hospital. It can be said that this project of working unification was a complete success, with the Army receiving a fine group of physicians, well qualified professionally whose morale was excellent when they departed for their permanent duty station.



BOOKS RECEIVED

- The Neurologic Examination**, Incorporating the Fundamentals of Neuroanatomy and Neurophysiology, by *Russell N. DeJong*, M. D., Professor of Neurology and Chairman of the Department of Neurology, University of Michigan Medical School. 1,079 pages; 368 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price \$15.
- Therapeutics in Internal Medicine**, edited by *Franklin A. Kyser*, M. D., M. S., F. A. C. P., Associate in Medicine, Northwestern University Medical School, Chicago; Attending Physician, Evanston Hospital, Ill. 715 pages; illustrated. Thomas Nelson & Sons, New York, N. Y., publisher, 1950. Price \$12.
- Basic Principles of Clinical Electrocardiography**, by *Hans H. Hecht*, M. D., Associate Professor of Medicine, University of Utah School of Medicine, Salt Lake City, Utah. 88 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.
- The 1950 Year Book of Pediatrics**, edited by *Henry G. Poncher*, M. D., Professor and Head, Department of Pediatrics, College of Medicine, University of Illinois, with the collaboration of *Julius B. Richmond*, M. D., Associate Professor, Department of Pediatrics, College of Medicine, University of Illinois. *Isaac A. Abt*, M. D., editor emeritus. 504 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1950. Price \$5.
- Newer Concepts of Inflammation**, by *Valy Menkin*, M. A., M. D., Associate Professor of Experimental Pathology, Head of Experimental Pathology, Agnes Barr Chase Foundation for Cancer Research, Temple University School of Medicine; Formerly, Assistant Professor of Pathology, Duke University School of Medicine; Formerly, Assistant Professor of Pathology, Harvard University Medical School. Presented before the Midwest Seminar of Dental Medicine, Maxwellton Braes, Bailey's Harbor, Wis., September 19-23, 1948. 145 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$3.50.
- Bacterial Polysaccharides**, Their Chemical and Immunological Aspects, by *Martin Berger*, formerly Organic Chemist to the Bureau of Laboratories, New York, N. Y. 272 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$6.
- Regional Orthopedic Surgery**, by *Paul C. Colonna*, M. D., Professor of Orthopedic Surgery, University of Pennsylvania Medical School. 706 pages; 474 illustrations. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price \$11.50.
- Child Psychiatry in the Community**, a Primer for Teachers, Nurses, and Others Who Care for Children, by *Harold A. Greenberg*, M. D., Senior Staff Psychiatrist, Institute for Juvenile Research, Chicago; Assistant Professor of Criminology, College of Medicine, University of Illinois, Chicago; in collaboration with *Julian H. Pathman*, Ph. D., Chief Psychologist, Downey Veterans' Administration Hospital, Downey, Ill.; formerly Assistant Professor of Psychiatry and Psychologist, Illinois Neuropsychiatric Institute, College of Medicine, University of Illinois, Chicago; formerly Senior Staff Psychologist, Institute for Juvenile Research, Chicago; *Helen A. Sutton*, R. N., B. A., B. S., formerly Psychiatric Nursing Instructor, Illinois Neuropsychiatric Institute, College of Medicine, University of Illinois, Chicago; *Marjorie M. Browne*, B. A., M. A., Instructor, School of Social Service Administration, University of Chicago. 296 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publisher, 1950. Price \$3.50.
- Advances in Internal Medicine**, Vol. IV, edited by *William Dock*, M. D., Long Island College of Medicine, Brooklyn, N. Y., and *I. Snapper*, M. D., The Mount Sinai Hospital, New York, N. Y., with four associate editors. 549 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$10.
- Electrophoresis in Physiology**, by *Lena A. Lewis*, Ph. D., Research Division, Cleveland Clinic, Cleveland, Ohio. 66 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$1.85.

Orthopaedic Surgery, by *Walter Mercer*, M. B., Ch. B., F. R. C. S. (Edin.), F. R. S. (Edin.).

Professor of Orthopaedic Surgery, University of Edinburgh; Director of Orthopaedic Services to the South-Eastern Regional Hospital Board, Scotland. Formerly, Surgeon, Royal Infirmary, Edinburgh; Lecturer in Clinical Surgery, University of Edinburgh; Surgeon in Surgical Tuberculosis to the South-Eastern Counties of Scotland Joint Sanatorium, East Fortune; Surgeon, Ministry of Pensions Hospital, Edenhall; Consultant Surgeon, Clinic for Limbless Pensioners, Edinburgh; Consultant Surgeon in Orthopaedics, Emergency Medical Services, Department of Health for Scotland; Consultant Surgeon, Chalmers Hospital for the Sick and Hurt, Edinburgh; Surgeon to Selkirk and Galashiels Cottage Hospitals; Surgeon-in-Charge, Tynecastle Orthopaedic Clinic; Specialist in Operative Surgery, Edinburgh War Hospital, Bangour; Examiner in Medical Electricity, Chartered Society of Physiotherapy; Consultant Surgeon, Tynecastle Orthopaedic Clinic, Ministry of Pensions; President, Scottish Local Board Chartered Society of Physiotherapy; with a foreword by *Sir John Fraser, Bart.*, K. C. V. O., M. C., F. R. S. Ed., F. R. C. S. Ed., M. D., Ch. M., F. R. A. C. S., F. A. C. S., Regius Professor of Clinical Surgery in the University of Edinburgh. 4th edition. 1,016 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1950. Price \$10.

When Minds Go Wrong, A Simple Story of The Mentally Ill—Past, Present, and Future, by *John Maurice Grimes*, M. D. Twenty years a psychiatrist. Four years a staff-member of the Council on Medical Education and Hospitals of the American Medical Association. Author of "Institutional Care of Mental Patients in the United States." 237 pages; illustrations by *K. Alexandra White*. Published and distributed by the author, 5209 South Harper Ave., Chicago 15, Ill., 1950. Price \$5.

The Clinical Use of Testosterone, by *Henry H. Turner*, M. D., F. A. C. P., Clinical Professor of Medicine, School of Medicine, University of Oklahoma, Oklahoma City, Okla. 69 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

Essentials of Urology, by *J. C. Ainsworth-Davis*, M. A., M. D., B. CH. (Cant.), F. R. C. S. (Eng. and Edin.), Urological Surgeon, The Bolingbroke Hospital, London; Visiting Urologist, Kettering and District General Hospital and the Lord Mayor Treloar's Hospital, Alton; Hon. Consulting Urologist, Royal Waterloo Hospital, London; Late Wing-Commander i/c Surgical Division, Royal Air Force Medical Services; Secretary to Council, Royal Society of Medicine. 734 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$10.

The 1950 Year Book of Obstetrics and Gynecology (August 1949–July 1950), edited by *J. P. Greenhill*, B. S., M. D., F. A. C. S., Professor of Gynecology, Cook County Graduate School of Medicine; Attending Obstetrician and Gynecologist, Michael Reese Hospital; Associate Staff, Chicago Lying-In Hospital; Author of Office Gynecology and Obstetrics in General Practice; Co-author of the DeLee-Greenhill Principles and Practice of Obstetrics. 570 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$5.

Problems in Cerebellar Physiology, by *G. Moruzzi*, M. D., Professor and Head of the Department of Physiology, University of Pisa, Pisa, Italy; Annual Research Professor of Neurology, Northwestern University Medical School, Chicago, Ill. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$3.25.

Skull Fractures and Brain Injuries, by *Harry E. Mock*, M. D., Consulting Surgeon, St. Luke's Hospital, Chicago; Associate Professor Emeritus of Surgery, Northwestern University Medical School, Chicago. 806 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1950. Price \$13.50.

Visual Anatomy: Head and Neck, by *Sydney M. Friedman*, M. D., Ph. D., Professor of Anatomy, University of British Columbia, Vancouver, Canada; Formerly, Associate Professor of Anatomy, McGill University, Montreal, Canada. 217 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$6.50.

Methods of Medical Research, Volume 3. Governing Board: *Irvine H. Page*, Chairman; *A. C. Ivy*, *Colin M. MacLeod*, *Carl F. Schmidt*, *Eugene A. Stead*, *David L. Thomson*, *Ralph W. Gerard*, Editor in Chief; *S. E. Luria*, Editor, Genetics of Micro-organisms; *J. H. Gaddum*, Editor, Assay of Neurohumors; *Walter R. Miles*, Editor, Selected Psychomotor Measurement Methods; *Choh Hao Li*, Editor, Methods for Study of Peptide Structure. 312 pages. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$7.

BOOK REVIEWS

A Textbook of X-ray Diagnosis, by British authors, Volume IV of four volumes.

Edited by *S. Cochrane Shanks*, M. D., F. R. C. P., F. F. R., Director, X-ray Diagnostic Department, University College Hospital, London; and *Peter Kerley*, M. D., F. R. C. P., F. F. R., F. M. R. E., Director, X-ray Department, Westminster Hospital; Radiologist, Royal Chest Hospital, London. 2d edition. 592 pages; 553 illustrations. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$15

This is an outstanding work on radiology of the bones and joints. It begins with descriptions of the normal as viewed in the standard radiographic positions. Ossification times are given, and both the common and rare sesamoids are described, followed by a discussion of the general pathology of bone, with consideration of the types of bone structure, the mechanisms of bone deposition and absorption, the effects of inflammatory conditions and tumors on bone, and the general factors affecting calcium metabolism. There are excellent chapters on traumatic lesions, inflammatory diseases, the osteochondritides, constitutional diseases, and bone tumors. The material is well organized and written in a clear, concise manner. The reproductions are positives, but are of unusually good quality.—*Col. D. S. Kellogg, MC, U. S. A.*

Radiation Therapy in the Management of Cancer of the Uterine Cervix, by

Simeon T. Cantril, M. D., Director, Tumor Institute of the Swedish Hospital, Seattle, Wash. Publication No. 55, The American Lecture Series. 196 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$5.

This excellent monograph on the radiation management of cancer of the cervix has been compiled from the author's extensive experience and from the voluminous world literature on the subject. The author has concentrated into a small and compact volume all of the important thoughts, experiences, and conclusions of experts in the field of radiation therapy. In 11 chapters and 2 appendixes he discusses clinical considerations, pathology, complications, staging, biopsy, radiation therapy, cancer of the cervical stump, cancer of the cervix in pregnancy, and the place of surgery in the management of cancer of the cervix. All are well written and of absorbing interest. In the chapter on radiation therapy he discusses in detail the Stockholm, Paris, and Manchester techniques of radiation therapy, and emphasizes the importance of the art of medical practice by reference to and quotations from the masters of the art and experts in technic. A comprehensive tabulation of the results of therapy as reported by North American and European clinics and hospitals has been included in this chapter. Appendix A contains extracts from the League of Nations 1937 clinical staging of cervical cancer. Appendix B outlines briefly the principles of dosimetry in intracavity radium therapy. There is an excellent and complete bibliography of world literature on the subject of uterine cancer. The index is simple and complete.—*Col. E. A. Lodmell, MC, U. S. A.*

Immortal Magyar, Semmelweis, Conqueror of Childbed Fever, by *Frank G. Slaughter*, M. D. 211 pages; illustrated. Henry Schuman, New York, N. Y., publisher, 1950. Price \$3.50.

This is an unusually well-written biography which portrays the tragic professional life of Ignaz Philipp Semmelweis. The book gives, in popular language, a vivid description of the times in which he lived. It demonstrates how medical progress and history can be altered by self-centered persons and is recommended to those interested in medical history and particularly to those interested in the battle against "childbed fever."—*Lt. Col. H. L. Riva, MC, U. S. A.*

Enzymes, Growth and Cancer, by *Van R. Potter*, Ph. D., Professor of Oncology, University of Wisconsin Medical School, Madison, Wis. Publication No. 75, American Lecture Series. 64 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$1.85.

This book provides an interesting introduction to investigation into enzyme research. It is relatively nontechnical and presents a field in which much investigative work is being done. It is written to acquaint medical practitioners with one means of attack on cancer, the basis for this method of attack, and some of its accomplishments to date.—*Col. W. S. George, MC, U. S. A.*

The Closed Treatment of Common Fractures, by *John Charnley*, B. Sc., M. D. F. R. C. S., Assistant Honorary Orthopaedic Surgeon, Manchester Royal Infirmary; Visiting Orthopaedic Surgeon, The Park Hospital, Davyhulme; Lecturer in Orthopaedics, Manchester University; Latex Hunterian Professor, Royal College of Surgeons. 190 pages, 133 illustrations. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$7.

The author is one of the outstanding younger British orthopedists and traumatologists. He has written this book for the "resident casualty surgeon," stating that he believes that the details of manipulative closed treatment of fractures are inadequately taught. He also believes that the operative treatment of fractures is overemphasized—that many open reductions are needlessly performed. The basic mechanics of fracture treatment are lucidly discussed and illustrated. There is a valuable study of the various types of modern plaster of paris technic. Anyone who may ever have to apply plaster should read this and re-examine his own technic in its light. There are well-written chapters on the common fractures of each of the long bones. Each discussion is accompanied by excellent diagrams of the mechanical principles and by illustrative roentgenograms. A detailed discussion of the rationale and technic of the use of the Thomas splint in fractures of the long bones of the lower extremity is given. This is especially useful in the military services in instances in which patients must be transported and more elaborate equipment is not available. Because this method is not taught in the United States, the author's description is especially valuable. The author does not invariably advocate the closed treatment of fractures; he includes indications for open reductions and lists the types of fixation he prefers.—*Lt. Comdr. A. B. Dickson, MC, U. S. N.*

The Prostate Gland, by *Herbert R. Kenyon*, M. D., Associate Clinical Professor, Department of Urology, New York University, Bellevue Medical Center. 194 pages. Random House, New York, N. Y., publisher, 1950. Price \$2.95.

The need for accurate, authoritative information on the prostate gland, in particular, and the male genitourinary system, in general, has existed for many years. The profusion of commercial advertising in the cheaper magazines and

newspapers urging the purchase of quack remedies and devices for the relief of the symptoms of "prostate trouble" manifests the long-existing need for just such a book as Dr. Kenyon has written. As evidenced by the innumerable books on sex-life, "diseases of men," the physiology of reproduction, and allied subjects, the interest in the topic is tremendous. Because millions of dollars are mulcted from the public annually by self-styled specialists in diseases of men, sexologists, and other charlatans, the economic consideration is equally impressive.

The increase in life expectancy in the United States since 1900 has been spectacular and it has been predicted that in about 30 years, 21 million people in this country will have attained the age of 65 years. Thus, gerontology has assumed great importance. Inasmuch as the incidence of prostatic enlargement—both benign and malignant—is high in men over 60 years old, the problem of relief of the symptoms of urinary obstruction is one of increasing moment.

The term "prostatism" is used to include all types of urinary obstruction which occur at the bladder neck. In lucid, nontechnical language, the author has succeeded admirably in explaining these conditions so that the average reader will have no difficulty in understanding them. The book, which is surprisingly complete, may easily be read in a single evening. The extremely readable text, most attractively printed and illustrated by four simple line drawings and a single graph, is not interrupted by distracting references to footnotes, appendixes, or technical articles. In nine brief chapters, the author has developed his subject in such manner that the interested, intelligent layman will have no difficulty understanding the subject. Functional disorders, infectious diseases, and numerous other affections of the prostate are discussed. The cause of prostatism and its treatment by nonsurgical methods are fully considered and explained before the various methods of surgical correction are described. Although the author makes no false claims as to the safety of prostatic operations, his revealing graph and text relative to the impressive decline in mortality following such operations since 1920 will go far to allay the fears of many potential candidates for one of the several types of operative procedure.

This book, written by a urologist of wide experience, may be recommended not only to the patient but to his family as well. Thus the reasons for the careful preoperative preparation and study, the choice of operation, and the functional results to be expected may be more readily comprehended and the efforts of the urologist more fully appreciated. The author has presented these problems in such a way as to insure the understanding and confidence of the interested, intelligent layman, even if the scientific and medical knowledge of the reader is limited.—*Capt. S. Johnson, MC, U. S. N.*

Methods of Tissue Culture, by *Raymond C. Parker*, Ph. D., Research Associate, Connaught Medical Research Laboratories, and Associate Professor of Experimental Cytology, School of Hygiene, University of Toronto; with a chapter by *Joseph F. Morgan*, Ph. D., Research Associate, Connaught Medical Research Laboratories, University of Toronto. 2d edition. 294 pages; 113 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1950. Price \$7.50.

This volume describes and illustrates various phases of tissue culture, types of apparatus, and technical layouts. Photomicrographs showing the results of the technic used are included. The introduction dealing with the historical background of tissue culture makes fascinating reading. Each phase of tissue culture is discussed in detail. Equipment, media, and application of methods

receive special attention which is invaluable to the novice. By profiting from the experience of the author, one may avoid many errors in technic. The chapter on photomicrography and microcinematography is especially informative and clearly written. There is an extensive bibliography at the end of the book.

• —*Commander T. W. Bennett, MC, U. S. N.*

The 1950 Year Book of Radiology (June 1949–June 1950). Radiologic Diagnosis edited by *Fred Jenner Hodges, M. D.*, Professor and Chairman, Department of Roentgenology, University of Michigan, and *John Floyd Holt, M. D.*, Associate Professor, Department of Roentgenology, University of Michigan. Radiation Therapy edited by *Isadore Lampe, M. D.*, Associate Professor, Department of Roentgenology, University of Michigan, and *Robert S. MacIntyre, M. D.*, Assistant Professor, Department of Roentgenology, University of Michigan. 480 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1950. Price \$6.75.

This book presents abstracts of the published radiologic articles of interest, from foreign and domestic journals, for the period from June 1949 to June 1950. The editors have presented a cross-section of the year's output in concise and understandable form, including numerous illustrations from the original articles. The year has yielded noteworthy progress in roentgen diagnosis and radiation therapy. This Year Book of Radiology is an excellent review of the radiologic publications for the year and should be studied by all physicians having an interest in roentgen diagnosis and radiation therapy.

—*Maj. A. Chartock, MC, U. S. A.*

Acute Head Injury, by *Joseph P. Evans, M. D., Ph. D.*, Associate Professor of Surgery; Director of Neurological Surgery, University of Cincinnati College of Medicine, Cincinnati, Ohio. Publication No. 60, American Lecture Series. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

This recent contribution to the American Lectures in Surgery Series is a timely, concise, and highly instructive monograph. Dr. Evans has divided his material "arbitrarily and artificially" into four chapters dealing with scalp injuries, skull fractures, meningeal hemorrhage, and cerebral trauma. The subject of gunshot wounds was purposely omitted. The author exhibits an uncanny ability to answer the questions which come to mind as one reads along, only a short space from the point where the question arises. Promising advances are being made in the study of the circulatory changes secondary to intracranial clots. Excellent representative case histories with photographs of specimens are included. A selective bibliography enhances the value of this volume. This book is recommended as a quick reference to the medical officer who, faced with a head injury problem, finds himself without the benefit of a neurosurgical consultant.—*Commander R. C. Speir, MC, U. S. N.*

Bronchoesophagology, by *Chevalier Jackson, M. D., Sc. D., LL. D., F. A. C. S.*, Honorary Professor of Bronchoesophagology and Laryngeal Surgery, Temple University, Philadelphia, and *Chevalier L. Jackson, M. D., M. Sc., F. A. C. S.*, Professor of Bronchoesophagology and Laryngeal Surgery, Temple University, Philadelphia. 366 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price \$12.50.

This is a completely new version of the classic "Bronchoscopy, Esophagoscopy and Gastroscopy" which was published in three editions, beginning in 1922, by these same authors. This new volume is improved by a more complete and beautifully illustrated chapter on the anatomy of the tracheobronchial tree and

the lungs, a greater use of natural appearing color illustrations and a more easily readable text. Every bronchoscopist and esophagoscopist, whether he be primarily a laryngologist, thoracic surgeon, or medical chest specialist, will want to read this book and have it available for a ready reference.

—*Commander T. C. Ryan, MC, U. S. N.*

Pediatric X-ray Diagnosis, A Textbook for Students and Practitioners of Pediatrics, Surgery and Radiology, by *John Caffey, A. B., M. D.*, Professor of Clinical Pediatrics, College of Physicians and Surgeons, Columbia University; Attending Pediatrician and Roentgenologist, Babies Hospital and Vanderbilt Clinic, New York City; Consulting Pediatrician, Grasslands Hospital, Westchester County, N. Y., and New Rochelle Hospital, New Rochelle, N. Y.; Consulting Roentgenologist, Orange Memorial Hospital, Orange, N. J.; Consultant in Pediatric Roentgenology, The New York Hospital, New York City. 2d edition. 862 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1950. Price \$22.50.

This is the second edition of the authoritative text which was first published in 1945. Like the first edition, it is easy to read. The clear print, the beautiful reproduction of roentgenograms, the excellent line drawings, and the well-written text make it a reference book which has not been equaled in the difficult field of x-ray diagnosis in children. Although fewer than 50 pages are without one or more illustrations, this book is more than an x-ray atlas. It is divided, like the first edition, into sections which cover the development of the normal, the variants from normal, and the diseases of all the systems of the body. The author has expanded the sections on prenatal depressions of the skull, pulmonary arteriovenous fistulas, pulmonary reactions to chemical poisons, pulmonary histoplasmosis, meconium peritonitis, cortical defects of tubular bones, infantile cortical hyperostosis, and hypervitaminosis A, and has added much new material.—*Col. E. M. DeYoung, MC, U. S. A.*

Renal Diseases, by *E. T. Bell, M. D.*, Professor of Pathology in the University of Minnesota, Minneapolis, Minn. 2d edition. 448 pages; 123 illustrations and 4 color plates. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$8.

Dr. Bell has revised the first edition of this excellent reference book, incorporating therein data from about 18,000 additional autopsies and opinions from recent literature concerning the various disease entities. He has included his own comments and conclusions from studies in many of the subjects which have been discussed in the literature and gives both sides of controversial questions. This compilation of clinical and pathologic aspects of a most important disease group is a valuable reference for pathologists, clinicians, and teachers alike. The illustrations are commendable for their excellent detail, the clarity with which they illustrate the subject matter, and their proximity to the related text. An excellent bibliography is given in connection with each subject.

—*Col. V. H. Cornell, MC, U. S. A. (ret.)*

The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence, by *Lawson Wilkins, M. D.*, Associate Professor of Pediatrics, The Johns Hopkins Hospital, Baltimore, Md. 408 pages; 411 illustrations, 6 in full color. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$13.

This is a new book long awaited by clinical pediatricians who have followed the author's works in the literature and at various medical meetings. Dr. Wilkins, a recognized authority in endocrine and metabolic research who has also engaged in the practice of clinical pediatrics, presents his material from

the standpoint of the diagnostician faced with the problem of deciding whether a particular symptom complex is caused by a congenital anomaly, a constitutional variation in pattern of development, or an endocrine disorder which may be helped by treatment. Tables, diagrams, illustrations, photographs, and abstracts of cases are widely used to make the text as clear as possible. One very practical chapter is devoted to the wide variations in the pattern of adolescent development and a warning against overenthusiastic hormonal therapy during this period. Methods of study and diagnosis and tests for hormonal function and assay methods are found in other chapters. At the end of each chapter there is an extensive bibliography.—*Col. O. C. Bruton, MC, U. S. A.*

Urgent Diagnosis Without Laboratory Aid, A Discussion of the External Signs of Conditions Which Threaten Life, by Prof. Dr. *Hanns L. Baur*, a. o. Professor of Internal Medicine, University of Munich; formerly, Medical Director and Physician-in-chief, Hospital Munich-Schwabing. Publication No. 66, American Lecture Series. 89 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.

The subject-matter in this book, is devoted to what the physician can see, hear, smell, and feel in practically every disease and condition that might affect the human body, is presented under the following headings: (1) nervous manifestations, (2) facies, position, and attitude, (3) abnormal odors, (4) cutaneous manifestations, (5) disorders of respiration, (6) urinary symptoms, and (7) gastrointestinal manifestations. This monograph would be of particular value to the physician who wished quickly to review physical findings as an aid in differential diagnosis.—*Col. A. E. White MC, U. S. A.*

Therapeutics in Internal Medicine, edited by *Franklin A. Kyser*, M. D., M. Sc., F. A. C. P., Associate in Medicine, Northwestern University Medical School, Chicago; Attending Physician, Evanston Hospital, Evanston, Ill. 715 pages; illustrated. Thomas Nelson & Sons, New York, N. Y., publisher, 1950. Price \$12.

This work on therapeutics reflects the latest in this field of medicine. The editor, fully cognizant of the progress which has been made in the diagnosis and treatment of medical conditions and the impossibility of any single person possessing intimate knowledge of all forms of therapy, has elicited the collaboration of 80 well-qualified physicians in the preparation of this treatise. The material in general is confined to treatment. Etiology, clinical descriptions, et cetera, are not included as these are available in many other works. In order, however, that the therapy may be properly correlated for certain diseases the physiologic principles, classifications, and etiologic factors must be included and are found in certain sections. As the title implies, only therapy for medical conditions is presented, and those "conditions which are treated primarily by surgical procedures are not included." The book includes chapters on: (1) infectious diseases, (2) parasitic diseases, (3) diseases of metabolism, (4) diseases of the glands of internal secretion, (5) deficiency diseases, (6) diseases of the digestive tract, (7) diseases of the respiratory tract, (8) diseases of the cardiovascular system, (9) diseases of the blood and blood-forming organs, (10) diseases of the urinary tract, (11) diseases of the locomotor system, (12) diseases caused by allergy, (13) the role of adrenocorticotrophic hormone and cortisone in present day therapy, (14) disease caused by physical agents, (15) diseases caused by intoxications, (16) diseases of the nervous system, and (17) skin diseases. Many presentations are followed by excellent up-to-date references. A large and complete index is found at the close of the volume.

—*Col. C. R. Mueller, MC, U. S. A.*

Proctology in General Practice, by *J. Peerman Nesselrod*, B. S., M. S., M. Sc. (Med.) F. A. C. S., F. A. P. S., Associate in Surgery, Northwestern University Medical School; Associate Surgeon, Division of Proctology, Evanston Hospital, Evanston, Ill.; Certified by the Central Certifying Committee in Proctology (Founders' Group) of the American Board of Surgery; Commander, MC, USNR. 276 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$6.

The subject is presented in a scholarly, interesting, and lucid manner. The book, although intended for use in general practice, is suitable for the student and practitioner of minor proctology in the military service where anorectal work is such a large part of the general surgeon's total work-volume. The first chapter deals with basic science relative to proctology. It is adequate and not in too much detail for the busy practitioner to read. The treatment of the subject of hemorrhoids is excellent. There is a brief but interesting chapter on malformations of the rectum and anus which is of more interest to military surgeons than formerly because of the increased number of dependents now being treated in service hospitals.

Many valuable suggestions regarding the diagnoses and treatment of various anorectal conditions are given. There are, however, no radical departures from the technics used by most proctologists today but all the methods discussed are highly practical. The last chapter contains a discussion of that great time-consuming surgical affliction of the military man, pilonidal cyst disease. The author has had personal experience with the military aspects of the pilonidal cyst problem during the recent war, while on duty as a naval medical officer. He states his preference for the Buie saucerization operation for the care of pilonidal cyst conditions, for several reasons, one of which is a compromise in the time required for hospitalization. Although his stand on this question is definite, I doubt if his preference for this procedure will find favor with a majority of military surgeons. The style of writing and the legibility of the type make for facility and pleasure in reading.—*Commander W. Fry, MC, U. S. N.*

Basic Principles of Clinical Electrocardiography, by *Hans H. Hecht*, M. D., Associate Professor of Medicine, University of Utah School of Medicine, Salt Lake City, Utah. Publication No. 87, American Lecture Series. A Monograph in American Lectures in Circulation. 88 pages; illustrated. Charles C Thomas, publisher, Springfield, Ill., 1950. Price \$2.

In recent years a change has occurred in the approach to the interpretation of clinical electrocardiography from empiricism to a more rational one, based on factual evidence. The author has sensed the need in this transition period for clarification based on a more definitive separation of factual evidence from theoretic assumption. This well-organized, clearly written monograph will prove of assistance to many by leading to an understanding of the relationships of the various leads. Following a short introduction separate chapters are devoted to unipolar semidirect, unipolar limb, and bipolar limb leads. Their relationships are clearly delineated. Explanation of the ventricular gradient, spatial relationships, and vectorcardiographic curves is properly, though briefly, included. The inter-relationship of direct, semidirect, unipolar, and bipolar leads is clearly defined and the simple reduction of many curves to combinations of three fundamental patterns is made easy. The text is well summarized in the last chapter. The list of references for supplemental reading is adequate; the glossary may be of value to the beginner. The illustrations are more than adequate, are clearly reproduced, and the book reflects credit on the publisher as well as the author.—*Col. J. S. Taylor, MC, U. S. A.*

Thoracic Surgery, by *Richard H. Sweet*, M. D., Associate Clinical Professor of Surgery, Harvard University Medical School. Illustrations by *Jorge Rodrigues Arroyo*, M. D., Assistant in Surgical Therapeutics, University of Mexico Medical School. 345 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price \$10.

The great advances which have been made in thoracic surgery in recent years and the increasing interest in and importance of this surgical specialty has created the need for an up-to-date and authoritative textbook of thoracic surgery. To cover the subject adequately from all aspects would be a monumental task, perhaps beyond the capabilities of any single author. It is not one which Dr. Sweet has attempted. His book is, rather, a manual of thoracic surgical technic and as such will prove a useful addition to the library of those properly qualified general surgeons who wish to acquire a basic knowledge of the various technics employed in intrathoracic operative procedures. The book will also be valuable to students and practitioners who seek to familiarize themselves in a general way with the common thoracic surgical operations without going into the minutiae of technical detail.

The opening chapter dealing with the surgical anatomy of the thorax is sufficiently detailed to make the operative procedures described in later chapters clearly understandable. There follows a discussion of general technical considerations and a description of the standard thoracic operative incisions. The remainder of the book is devoted to specific operative procedures involving the chest wall, the pleural cavity, the lung, the mediastinum, the esophagus, the diaphragm, and abdominal operations performed through thoracic incisions. Operations on the esophagus, a field in which Dr. Sweet is an acknowledged master, are particularly well covered. The section dealing with abdominal operations performed through thoracic incisions will be especially interesting and helpful to general surgeons.

The surgical principles set forth in this text are so sound and so well accepted that one hesitates to mention those few technical procedures the acceptance of which may be seriously questioned by those particularly interested in this field. It is only fair, however, to state that examples of such procedures occasionally appear in this book. In performing temporary phrenic nerve paralyzing operations, Dr. Sweet advises that the nerve be "crushed thoroughly with a hemostatic forceps for a distance of about $\frac{1}{2}$ inch along its length." Many thoracic surgeons are convinced that such a technic will lead to an unacceptably large number of unintentional and undesired permanent paralyses and believe that the nerve should be crushed over a distance of only 1 mm. with a specially designed crushing clamp. Such controversial points arise but rarely, however, and the procedures described are for the most part widely accepted among thoracic surgeons. The book is logically arranged, adequately indexed, and well printed. The illustrations, chiefly original drawings by Dr. J. R. Arroyo, are adequate and in some instances excellent.

—*Capt. C. F. Storey, MC, U. S. N.*

Researches in Binocular Vision, by *Kenneth N. Ogle*, Ph. D., Section on Biophysics and Biophysical Research; Research Consultant in the Section on Ophthalmology, Mayo Foundation and Mayo Clinic, Rochester, Minn. 545 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price \$7.50.

The world of ophthalmology is and will continue to be indebted to the men of the renowned and too short-lived Dartmouth Eye Institute at Hanover, N. H., for their research in binocular vision. The subject matter of this book is a sum-

marization of a large part of the significant work of this Institute and the integration of this research with the general information on the visual processes. The bulk of this data is nonclinical and represents for the most part pure science. To appreciate this book one should already be conversant with the present concepts of normal and abnormal retinal correspondence, the Vieth-Muller theoretical horopter, the Hering-Hillebrand empiric horopter, the cyclopean eye, Panum's area, stereopsis, the schematic eye of Gullstrand, the relative image sizes in curvature and axial ametropia, and Knapp's law for correcting lenses. Anyone with such a background will find this presentation beautifully clear and logical. The experiments are graphically presented. The deductions and inductions are gems of scientific analysis. The data is authoritative, provocative, accurate, and enlarges our fundamental concepts of binocular vision. The subject of aniseikonia is especially well presented.

—*Lt. Comdr. R. P. Nadbath, MC, U. S. N.*

Cranioplasty, by *David L. Reeves, A. B., M. D.*, Consultant in Neurological Surgery, Santa Barbara Cottage Hospital, St. Francis Hospital, Santa Barbara General Hospital, Santa Barbara, Calif.; formerly Instructor in Neurological Surgery, University of Southern California School of Medicine; Colonel, Medical Corps, A. U. S. 119 pages; illustrated. Publication No. 29, American Lecture Series. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$3.

In this monograph from the neurosurgical division of American Lectures in Surgery the author reviews the history of skull trepanation and then describes the materials, methods, and indications for cranioplasty. The operative procedures, including the method of forming the mold and tantalum plate, are well described. Most of the case reports are of patients seen while on military duty and lack satisfactory follow-up. The increased number of cranial defects resulting from the present military operation will stimulate an interest in this subject. Four hundred and two references are listed.

—*Lt. Comdr. W. H. Boswell, MC, U. S. N.*

On the Experimental Morphology of the Adrenal Cortex, by *Hans Selye, M. D.*, Ph. D, D. Sc., F. R. S. (C), Professor and Director of the Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, Canada, and *Helen Stone, B. Sc.*, Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, Canada. Publication No. 74, American Lecture Series. 105 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

This experimental study on rats by two authorities in the field of adrenal cortical morphology includes a discussion of (1) atrophy, (2) hypertrophy, (3) hyperplasia, (4) capsular adenomas, (5) storage and discharge of lipid, cholesterol, plasmal, and ascorbic acid granules, (6) fatty metaplasia, (7) colloid formation, (8) fibrinoid degeneration, (9) cytolysis, (10) chromidiosis, (11) lymphoid and myeloid metaplasia, (12) formation of lumina within the cortical parenchyma, (13) holocrine secretion, (14) hyperemia, (15) hemorrhagic infarction, (16) focal necrosis, and (17) toxic involution. It is interesting to note that following testosterone therapy there was pronounced sclerosis of the capsule and fatty metaplasia. The authors again demonstrated the reaction of ascorbic acid granules to alarming stimuli. They also found that the increase in adrenal weight caused by lyophilized anterior pituitary tissue was directly proportional to the protein content of the diet in the experimental animal. They concluded that the adrenal cortex could respond to certain stimuli with various highly specific reactions.—*Col. F. W. Pruitt, MC, U. S. A.*

McClung's Handbook of Microscopical Technique, for workers in animal and plant tissues, by 35 authors. Edited by *Ruth McClung Jones*, Professor of Biology, Winthrop College, South Carolina. 3d edition, revised and enlarged. 790 pages; 157 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price \$12.

"There have surely been more changes in the field of microtechnic in the last decade than in any previous similar period." To incorporate these changes in the third edition of this well-known book has been the task of its editor. To cover these fields fully would have resulted in an encyclopedic work. Part I, "General Procedures and Information," requires no introduction and no comment. It is well written and includes references to the newer reagents. Part II, "Special Procedures with Limited Application," is also familiar. The continued inclusion of various procedures for the enumeration of erythrocytes and other clinical pathologic technics without a discussion of their inherent errors might be questioned. Part III contains much of the new material, and here editorial prerogative has been exercised. There is an 86-page discussion of polarization microscopy by H. Stanley Bennett, with exhaustive treatment of certain phases of this method. Phase microscopy and fluorescence microscopy are considered briefly, but the principles and technics of electron microscopy are mentioned only in a brief chapter concerned with the preparation of tissues for study by this method. There is no consideration of ultraviolet microscopic methods or of various other research technics used in the field of submicroscopic morphology. These comments are not intended to detract in any way and merely represent segments which the reviewer wishes could have been included. The book will continue to be a standard reference in all laboratories where any but the simplest types of histologic examinations are made.—*Lt. Col. W. D. Tigertt, MC, U. S. A.*

Thromboembolic Conditions and Their Treatment With Anticoagulants, by *Charles D. Marple*, M. D., Assistant Clinical Professor, Division of Medicine, University of California Medical School, San Francisco, Calif.; formerly, Research Fellow, Department of Medicine, Cornell University Medical College, and Assistant Physician to Out-Patients, The New York Hospital, New York City, and *Irving S. Wright*, M. D., professor of Clinical Medicine, Cornell University Medical College, and Attending Physician at The New York Hospital, New York City. 418 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$8.50.

This is a complete and up-to-date presentation of thromboembolic conditions and their treatment with the anticoagulant agents. The senior author was a director of an anticoagulant study made by the American Heart Association. The subject is discussed comprehensively from the physiologic, therapeutic, and laboratory viewpoints. The incidence and occurrence of thromboembolic phenomena in various abnormal conditions, the mechanisms of intravascular clotting, the theories of clotting, and the morphologic development of thrombi are considered. There follows an excellent discussion of the rationale and clinical use of the anticoagulants, the methods of administration of heparin and dicumarol, the reasons for therapeutic failures, and the physiologic effects of the anticoagulant agents. The abuses of therapy resolve themselves mainly into poor or no clinical laboratory control with the use of the anticoagulant drugs. The last section of the book describes the laboratory procedures used in the determination of the coagulation and prothrombin times, and protamine titration. Throughout the book extensive reference is made to the literature. Both sides of controversial subjects are presented.

The use of the anticoagulants in the treatment of pulmonary embolism, venous thromboses, sudden arterial occlusion, coronary occlusion, myocardial infarction, rheumatic heart disease with auricular fibrillation, and retinal venous occlusion is evaluated. The prolonged administration of anticoagulants is discussed and the newer anticoagulants are described. A section is devoted to recent developments since the preparation of the original manuscript. In this section the authors have gathered all the latest facts culled from the most recent publications.

This is the most comprehensive and inclusive treatise on the subject of thromboembolism now available. It contains not only fundamental information but also appraises the most recent developments in this field. It is gratifying to see a masterful work on this timely topic which enters the realm of every practitioner of medicine. A complete bibliography is printed at the end of the book.

—*Commander H. A. Lyons, MC, U. S. N.*

The Nose, An Experimental Study of Reactions Within the Nose of Human Subjects During Varying Life Experiences, by *Thomas H. Holmes, M. D.*, *Lester N. Hofheimer*, Research Fellow in Medicine; *Helen Goodell, B. S.*, Research Fellow in Medicine; *Stewart Wolf, M. D.*, Associate Professor of Medicine, and *Harold G. Wolff, M. D.*, Professor of Medicine (Neurology), Cornell University Medical College, New York, N. Y. With a foreword by *Warfield T. Longcope, M. D.*, Professor Emeritus of Medicine, The Johns Hopkins Medical School, Baltimore, Md. 154 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$4.50.

The purpose of this monograph is to report and interpret results of an experimental study of disturbances in nasal physiology occurring in response to a variety of situational threats. The authors review nasal physiology and its range of normal variation. The responses to various physical stimulants is described and the correlation of these changes to changes resulting from interpersonal relations is drawn. In reactive persons with conflicts and with feelings of humiliation, frustration, and resentment, the mucous membranes of the nose showed initial redness with marked swelling of the conchas and nasal mucosa, profuse secretion and obstruction. Situations productive of fear with minimal conflict, of dejection and disgust and of erotic feelings accompanying sexual activity when conflict was absent were associated with vasoconstriction and pallor in the nasal mucosa, decreased secretion, and shrunken conchas. Situations involving interpersonal and social adjustment may modify the course of nasal morbid processes regardless of the precipitating incident.

—*Lt. Comdr. W. H. Boswell, MC, U. S. N.*

The 1950 Year Book of Pediatrics, edited by *Henry G. Poncher, M. D.*, Professor and Head, Department of Pediatrics, College of Medicine, University of Illinois, with the collaboration of *Julius B. Richmond, M. D.*, Associate Professor, Department of Pediatrics, College of Medicine, University of Illinois. *Isaac A. Abt, M. D.*, editor emeritus. 504 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1950. Price \$5.

The 1950 printing marks the fiftieth anniversary of this Year Book, which first appeared in the Practical Medicine series. The present volume includes sections by Julius Hess, Meredith Campbell, Albert Sabin, Leo Taran, Helen Taussig, Harold Dargeon, and others. Guest editorials, including a discussion of pediatric progress in the United Kingdom, are presented. The sections on the newborn, nutrition, metabolism, the gastrointestinal tract, infectious diseases and immunity, the cardiovascular system and neurology and psychiatry are excel-

lent. That on urology is disappointingly brief. An excellent review of chemotherapy in tuberculosis in children is provided by Edith Lincoln. A short section on poliomyelitis is presented. Unfortunately a minimum of space is allotted to the problem of Rh sensitization in the section on the blood. Foot problems and the prevention of acquired gait abnormalities receive appropriate attention under orthopedics. Therapeutics and toxicology are suitably covered.

—*Commander M. Kurzrok, MC, U. S. N.*

A Textbook of Histology, Functional Significance of Cells and Intercellular Substances, by *E. V. Cowdry*, Professor of Anatomy, The School of Medicine, Washington University, St. Louis, Mo. 4th edition, thoroughly revised. 640 pages. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$8.50.

In this fourth edition of one of the recognized textbooks of histology the author has correlated many of the biochemical and physiologic aspects of microscopic anatomy. This book facilitates the modern teaching of histology by its inclusion of data on teaching films of histologic interest, data on books relating to the basic medical sciences which are yet in press, and an extensive bibliography. Each chapter is summarized and sample questions are included relating to the data it covers. A list of National Board questions in the field of histology is given. Staining formulas and tissue fixing technics are discussed and new advances in microscopy are illustrated by excellent photomicrographs.

—*Lt. (jg) D. B. Carmichael, Jr., MC, U. S. N.*

Principles and Practice of Surgery, by *Jacob K. Berman*, A. B., M. D., F. A. C. S., Associate Professor of Surgery, Indiana University School of Medicine; Associate Professor of Oral Surgery, Indiana University School of Dentistry; Chief Consultant in Surgery, Billing's Veterans' Administration Hospital, Fort Benjamin Harrison, Ind.; Director of Surgical Education and Surgical Research, Indianapolis General Hospital. 1378 pages; 429 illustrations. The C. V. Mosby Co., St. Louis, Mo., publisher, 1950. Price \$15.

Although this textbook is written primarily for the medical student, it will be found helpful by surgical interns, residents, and surgeons. The author lists a number of maxims or aphorisms such as "A good surgeon is an internist who performs operations," which if followed by all surgeons would elevate the level of surgical practice. His emphasis on etiology, diagnosis, biochemistry, pathology, and physiology and his correlation of the basic sciences with clinical surgery makes this work an outstanding contribution. The chapters devoted to the interchange of body fluids, acid-base balance, hemorrhage, and shock are well written and readily applicable to practical surgery. Surgical technic is not dealt with in any detail. This book truly represents the physiologic era of surgery.

—*Lt. Comdr. R. L. May, MC, U. S. N.*

Differential Diagnosis of Internal Diseases, Clinical Analysis and Synthesis of Symptoms and Signs, by *Julius Bauer*, M. C., F. A. C. P., Clinical Professor of Medicine, College of Medical Evangelists, Los Angeles; Senior Attending Physician, Los Angeles County General Hospital; Consultant in Medicine, White Memorial Hospital, Long Beach Veterans' Administration Hospital, and Cedars of Lebanon Hospital, Los Angeles; formerly Professor of Medicine, University of Vienna. 866 pages; illustrated. Grune & Stratton, New York, N. Y., publishers, 1950. Price \$12.

This interesting, well-written book is a successful attempt on the part of the author to accomplish his mission, which is to set forth concisely a "clinical analysis and synthesis of symptoms and signs." The book is divided into two parts, the first dealing with leading symptoms referable to the various systems of the body, and the second with leading signs referable to the various systems, the general appearance of the patient, and the significance of deviations from normal commonly seen. The book is comprehensive and the remarks made are for the most part sound. The author has had a great deal of clinical experience which he has coordinated with current concepts of the disorders discussed.

—Col. W. C. Berry, MC, U. S. A.

