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13. ABSTRACT (Maximum 200 words) This mid-term report describes a long-term (27.5 years) follow-up study of Vietnam amputees treated at Valley Forge Army General Hospital. Records of 484 battle amputees were reviewed; data were collected with mail or telephonic survey of education, employment, marriage and family life, prosthetic use, and psychological care. Participants also answered questions from the SF-36 of the National Survey of Functional Health Status. Bilateral-above-knee amputees - 23/30 patients were available for follow-up. Only physical function scores were significantly less than the SF-36 control group. Below-knee amputees - 69/141 patients were available for follow-up, and were classified as Group 1 for no other major injury and Group 2 one other major injury." Self-assessment scores for Role-Physical and Role-Emotional were significantly less in the combined amputee group than controls ($P < 0.05$). Comparing Group 1 with controls showed no statistically significant differences in all SF-36 areas. Comparing Group 2 with controls showed statistically significant decreases for all SF-36 areas except vitality. Conclusion - This study suggests that patients with bilateral-above-knee or a below-knee amputation can lead relatively normal, productive lives within the context of their physical limitations if they are provided intensive rehabilitation at a specialty center.				
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FOREWORD

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PART I**LONG-TERM FOLLOW-UP STUDY OF BILATERAL-ABOVE-KNEE
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Introduction

"A bilateral traumatic amputation of the thigh is the most massive injury seen in battle."¹ (Fig. 1) The most challenging patients in both the acute and long term phases of recovery are those with bilateral-above-knee amputations due to battle injury. Initial resuscitation requires a team effort from the anesthesia service as well as both general and orthopedic surgery services. Once the initial lifesaving measures are accomplished, patients face considerable challenges that require lengthy hospitalization such as other injuries, stump healing, and rehabilitation.²⁻⁸ (Bellamy RF. Personal communication to the author, 1990)

During the Vietnam War, amputees received initial rehabilitation and prosthetic fitting at general hospitals where they were assigned as they arrived in the United States after they had been injured. Treatment and rehabilitative services were not necessarily consistent among all the facilities that treated the amputees. At some hospitals, amputees were assigned to a general orthopaedic service that treated all categories of orthopaedic patients.

Recognizing the need to provide consistent treatment and rehabilitative services to amputees, Valley Forge Army General Hospital was the only United States Army facility that organized a separate amputee service consolidating the resources of physicians, nurses, physical and occupational therapists, and prosthetists. Whereas amputee care at Valley Forge Army General Hospital had previously been uncoordinated and fragmented, establishing the amputee service provided the opportunity to develop each aspect of amputee treatment and rehabilitative services. In addition to emphasizing stump healing and physical therapy, the administration, physicians, and staff focused attention on the psychological and social aspects of the patients' care as well. As a result, the amputee service created a milieu that fostered camaraderie and teamwork among the amputees.^{4,5,7,8}

Although popular literature portrays these patients with insurmountable emotional and physical scars⁹, the accuracy of this portrayal could be questioned. This is the first study to document the long-term outcome of patients with battle-incurred bilateral-above-knee amputations who were treated at a United States Army general hospital that provided specialty care for amputees.

Materials and Methods

A review of the records of 484 battle amputees who were patients at Valley Forge Army General Hospital during the Vietnam War yielded records of thirty (6.2%) patients who sustained bilateral-above-knee amputations. Records were reviewed for information regarding: mechanism of injury (land mine/booby trap, artillery, mortar or small arms fire), indications for surgery (partial/complete traumatic amputation, vascular or sepsis), presence of other significant injuries, evidence of shock upon arrival at the initial surgical hospital in Vietnam, the number of blood units transfused, and success at using a prosthetic prior to discharge from Valley Forge Army General Hospital.

Informed consent was obtained either over the phone or through the mail, then two questionnaires were administered. First, data were collected on education and employment, marriage and family life, prosthetic use, and psychological care including Alcoholics Anonymous and marriage counseling. Second, the participants were asked to answer questions from the SF-36.¹⁰ Responses were compared with an age- and sex-matched control population who were surveyed with the same questionnaire by the National Survey of Functional Health Status in 1990. Patients in the control group are thought to represent a cross section of the American male population between forty-five and fifty-four years of age (n=145). Mean-scaled scores for the SF-36 were calculated in each of the following areas: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. Comparison of the scaled scores for each group was performed using a Student's *t*-test (two-tailed).¹⁰

This study was approved by the Human Use Committees at the organization providing funding and at the organization where the research was conducted.

Results**Review of Records**

Some patient records did not contain documentation on every aspect of injury and treatment, so patient summary data vary. Review of the records revealed that twenty-six patients (87%) were injured by improvised land mines or booby traps. These devices were usually fashioned locally or from a piece of other ordnance, such as an artillery round. Other causes of injuries included artillery/mortar fire (three patients) and multiple hits from a machine gun (one patient). Of the sixty lower extremities that were amputated, fifty-three (88%) were partial/complete traumatic amputations with debridement and completion of the stump as the initial surgical procedure in Vietnam. Due to infection, seven limbs were amputated secondarily. The recommended surgical technique was the open circular method in which maximum length is preserved. Skin traction, applied on the operating table and continued throughout the evacuation chain was recommended, but was implemented in fewer than half the cases.⁶⁻⁸ (Fig. 2)

In addition to the traumatic bilateral amputation, some patients incurred additional loss of limb. Additional amputations included three patients with a single upper extremity amputation, one wrist disarticulation, one below-elbow amputation, and one above-elbow amputation.

Documentation of units of blood transfused for resuscitation was inconsistent across patients. The fourteen patients with such documentation each required an average of 23.7 units of blood for resuscitation.

Once a patient became stable, he was usually transferred to a hospital in Japan where the wounds were reassessed and he was prepared for the long flight back to the United States and Valley Forge Army General Hospital to receive definitive care. Patients arrived at Valley Forge Army General Hospital an average of 4.5 weeks (range one to twenty weeks) after being wounded.

As best as can be determined from the records, twenty-six of sixty stumps (43.3%) were placed in skin traction for the long flight to the United States. Once at Valley Forge Army General Hospital, the patient was examined and skin traction was either initiated or continued. As soon as possible, the patient was fitted with pylons or stubbies to begin gait training. (Fig. 3)

Records of twenty-three patients showed that they were fitted about 8.3 weeks after injury (range three to twenty weeks). The staff encouraged the patients to bear increasing weight on the extremities. After the wounds had closed and the edema had subsided, the patients were fitted for a permanent prostheses. Records on seventeen

patients indicate that permanent prostheses were fitted an average of 6.5 months (range three to twelve weeks) after the patients had been wounded.

Results of Survey

Three of the thirty patients have died since they were discharged from Valley Forge Army General Hospital. Cause of death was described as "natural causes" for one patient, and "cause unknown" for the remaining two. Phone or mail consent and questionnaires were obtained from twenty-three (85.2%) of the twenty-seven surviving patients. Four patients could not be contacted. Average age at the time of follow-up was 47.8 years (range forty-six to fifty-one years), an average of 27.5 years after injury.

Sixteen of the twenty-three patients in the follow-up study found employment outside of the home even though the Veterans Administration provides adequate compensation to support a simple lifestyle. Twenty-one of twenty-three (91.3%) patients were married and twenty (87%) had children. One patient had post-traumatic stress disorder and four other patients had made use of such services as marriage counseling or Alcoholics Anonymous.

Five patients presently wear prosthetics for activities including walking for average wear of 7.7 hours per day. During the years since their initial fitting, individuals in this group have replaced their prostheses an average of 3.8 times. Additionally, four other patients use their prostheses for "going out". Although most patients had achieved a limited ambulatory status employing prostheses by the time they were discharged from Valley Forge Army General Hospital, the wheelchair is the primary means of ambulation for most of them (eighteen of twenty-three) today.

Table I compares the amputees' average-scaled responses to the SF-36 questionnaire with those of the age-matched control group described above. Student's *t* test comparing the amputees with the control group revealed that only the physical function scores were significantly different ($P < 0.001$).

Data from this study are archived in Excel for Windows at the funding organization.

Discussion

Nothing in civilian trauma surgery readily compares to the patient who has sustained bilateral-above-knee amputations due to explosive munitions.^{2-4,9} During the Korean War, the Surgical Research Team found that these patients were the most severely injured battle casualties.¹ In an effort to improve survival among patients with massive open wounds, military trauma teams at Edgewood Arsenal conducted research using a goat animal model. These post-Korean War studies confirmed that prompt wound excision, antibiotics, and fluid resuscitation were the most effective means of treating these injuries.^{11,12} The WDMET (Wound Data and Munitions Effectiveness Team) study of casualties during the Vietnam War found a 74% mortality among bilateral-above-knee amputees despite prompt medical care and timely evacuation. All deaths in the WDMET study occurred before hospitalization. Most of the patients had been wounded by improvised land mines or booby traps with explosive charges greater than conventional antipersonnel land mines. The same study listed mortality rates at 77.2% for isolated head wounds, 66.7% for isolated chest wounds, and 24.2% for isolated abdominal wounds.³ (personal communication with R.F. Bellamy, 1990).

The goal of initial care is to ensure patient survival. Initial treatment of bilateral-above-knee amputees is resuscitation in the broadest sense of the word, including the initial surgical procedure. This effort requires coordination among general surgery, orthopaedic surgery, and anesthesia to assess all of the patient's injuries, and to provide initial surgical management including surgical debridement, fluid replacement, and initial antibiotics. The patients in this study had most often sustained partial or complete traumatic amputations that were grossly contaminated with debris present not only on the tissue surface, but that had also been driven up along fascial planes by the explosion. But once the hurdle of providing initial care has been met, the medical team must look toward rehabilitation and the patient's quality of life.

Amputation is carried out in two stages, an aspect of caring for battle amputees that is not commonly discussed. The goal of the first stage is to prepare the patient for the safest means of transport by removing dead tissue, preventing complications, and preserving length. The goal of the second stage is to prepare the stump for a prosthesis, assuring appropriate length and shape. Almost half of the patients in this study were placed in skin traction for transport, and all of them were placed in skin traction once they reached Valley Forge Army General Hospital.

Unfortunately, the International Committee of the Red Cross guidelines omit this important step.¹³ In a report of 111 below-knee amputations performed at a Red Cross hospital in Pakistan, the author discusses delayed primary closure and the fact that skin traction was not used.¹⁴ Entirely missing from the article is any discussion of fitting prostheses for the patients. A dedicated program such as the one at Valley Forge Army

General Hospital is probably not possible in the setting of a Red Cross hospital in a strife-torn region. However, before we disregard proven practices with regard to skin traction, we should remain mindful of the amputee's long-term outcome and quality of life. In this study of bilateral-above-knee amputations, more than a third of the patients use their prostheses with some regularity. Including skin traction in the treatment provides the means to help fashion a stump that can function well with a prosthesis.

It is unlikely that the quality of rehabilitation at Valley Forge Army General Hospital could be equaled today. Caring for patients with battle-incurred amputations is a discontinuous practice in the military that must often be (re)learned by a new group of surgeons during each conflict. Increasing the gap in learning, graduate medical education programs in orthopaedic surgery have de-emphasized amputee care. Two courses of action could help to minimize the "learning curve" during future conflicts. The first component is assignment of military medical personnel to Veterans Administration hospitals so that they can gain experience working with amputees. The second component is rotation of military medical personnel to hospitals in Asia, Africa, and the Balkans that treat a number of amputees who are victims of residual landmines so that military surgeons can gain experience in treating amputations.

Future research should be directed toward preventing death on the battlefield by improving local resuscitative measures that can be applied immediately after the soldier is wounded. Recent efforts at developing a field dressing impregnated with dry fibrin to help reduce bleeding shows promise for both the pre-hospital phase and hospital care of these patients.¹⁵ Because most bilateral-above-knee amputees use wheelchairs for ambulation, prosthetics research should be directed toward providing a more energy-efficient means of locomotion that duplicates normal gait as much as possible.

Wartime amputations remain an important clinical problem for the US Army Medical Department (AMEDD). Bilateral-above-knee amputees are the most challenging patients of the amputee group. Nothing can compensate these patients for the severe injuries that they have sustained in the service of their country. This study provides evidence that bilateral-above-knee amputees who survive the battlefield are not automatically condemned to live with severe physical and emotional difficulties. In fact, these patients can lead relatively normal, productive lives within the context of their physical limitations if they are provided intensive rehabilitation at a specialty center.

Figure 1

Traumatic bilateral-above-knee amputation caused by a command-detonated cannon shell. Note widespread contamination by dirt and straw. The patient had "air hunger" and required 43 units of blood for resuscitation. (This patient is not a member of the study group.)

SF-36 Control/BAK

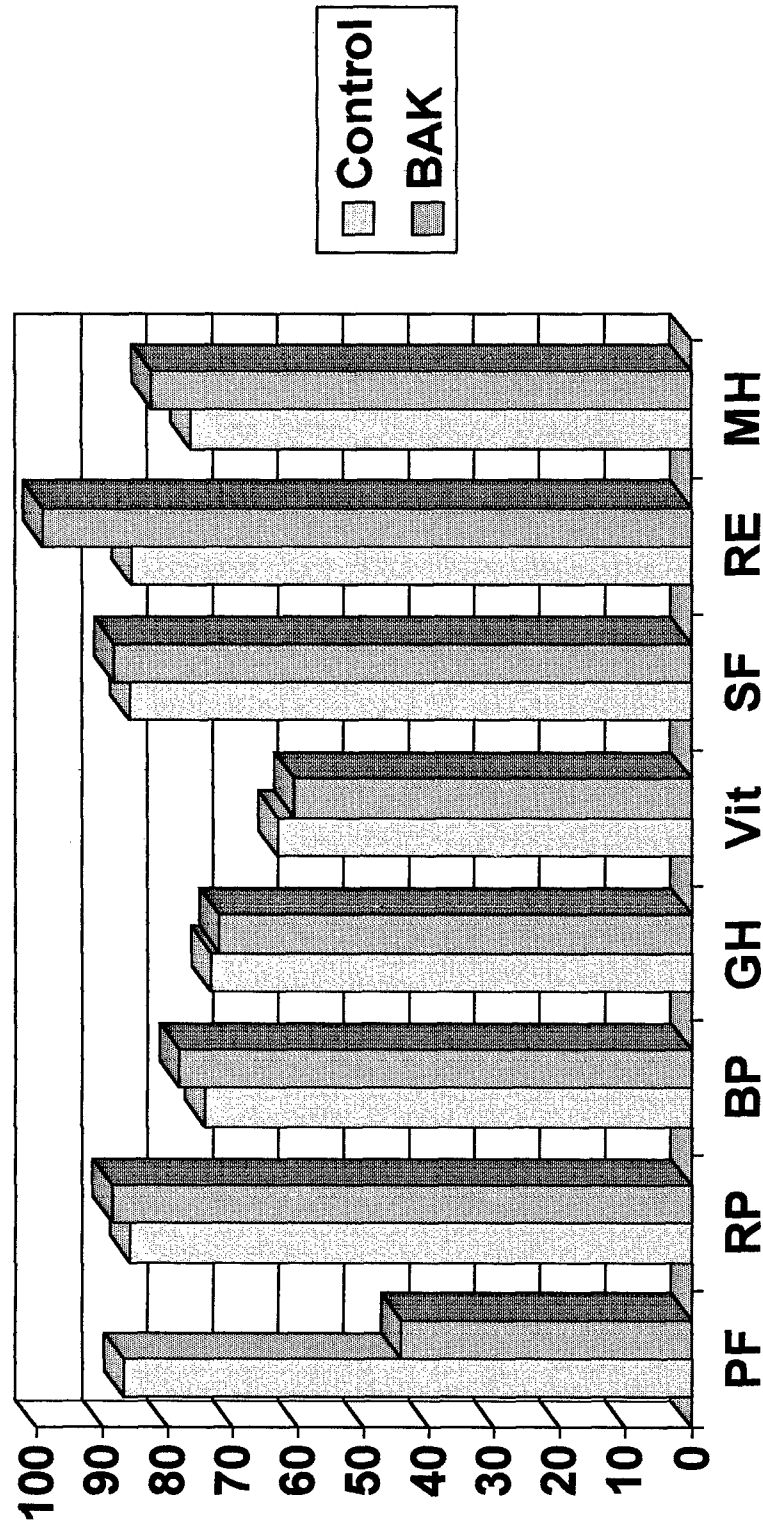


Figure 2

Skin traction applied for transportation.

Figure 3

Stubbies for ambulation training.

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PART II

**TWENTY-EIGHT YEAR FOLLOW-UP OF BELOW-KNEE AMPUTEES INJURED
DURING THE VIETNAM WAR**

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Introduction

Traditionally, the treatment of battle casualties is (re)learned by each new generation of surgeons, often at the patient's expense. Techniques that have been learned in civilian practice are not usually directly applicable to patients on the battlefield and are discarded or modified as experience increases. Surgeons in World War I, World War II, Korea, and Vietnam all documented the lack of preparedness that they felt when treating both amputees and battle casualties in general. Although few casualties were sustained by US troops in Grenada, Panama, SW Asia (Desert Storm), and Somalia, this trend may not continue in future conflicts. Future wars may come suddenly and with great intensity. Military surgeons may find themselves unprepared to care for a large number of battle casualties.¹⁻¹⁸

Care of battle amputees is important to military surgeons because these patients require considerable resources starting at the time of injury and continuing throughout their lives. As a group, amputees and patients sustaining comminuted open fractures require the most rehabilitation and hospital bed days of any battlefield casualties. Since World War II, the most common level of amputation has been below-knee amputation.^{3,17-19}

The treatment of below-knee battle amputees is traditionally a two-staged procedure. First, the initial amputation, which is most often a completion of a partial or complete traumatic amputation, is performed to provide a clean wound. The level of amputation is at the lowest possible level, with no attempt to provide a definitive level of amputation. The open circular amputation is performed at the lowest level of viable tissues to preserve as much length as possible. No attempt is made to close the wound. A patient is placed in skin traction to provide wide drainage of the wound and to prevent retraction of the soft tissues. Once stable and deemed ready for transport, the patient is transported by plane to a center that can provide the rehabilitative and surgical care for the amputee. After the patient arrives at a site of definitive care, efforts focus on wound closure, prosthetic fitting, and rehabilitation. A second, more minor procedure is performed to obtain a better stump. To ensure the consistency of care, the US Army and Navy have historically designated hospitals as amputee centers. During the Vietnam War, US Army amputees were provided care at Letterman, Brooke, Walter Reed, Fitzsimmons, and Valley Forge General Hospitals. The US Navy designated Philadelphia and Oakland Naval hospitals as amputee centers.

For the US Army, Valley Forge Army General Hospital provided the only designated amputee section within the orthopaedic surgery service. This facility consolidated the efforts of therapists, nurses, prosthetists, and surgeons rather than dispersing the patients and responsibilities throughout the entire service. The orthopaedic surgeons at Valley Forge Army General Hospital felt that this arrangement provided more

consistent care for the patient and established a milieu that fostered camaraderie among the patients and staff.^{3,20}

An interesting narrative of life for an amputee at Valley Forge Army General Hospital is found in LTG Frank's description of his own below-knee amputation following a grenade injury in Cambodia in 1970.²¹

A program of early ambulation was initiated at Valley Forge Army General Hospital for lower extremity amputees. Before this time, most amputees were treated in successive stages of wound healing, preprosthetic training, use of a "practice prosthesis" (pylon), and finally fitting with a permanent prostheses. At VGAGH these stages were compressed or overlapped so that ambulation began before the open wound had healed. As soon as patients arrived at Valley Forge Army General Hospital, they were placed in skin traction with daily local wound care and dressing changes. The patients were taught how to change their own dressings. The extremity was then fitted with a plaster pylon and intermittently ambulated. As the wound healing progressed, the patient ambulated for longer periods in the pylon and spent less time in skin traction.³

There were several benefits to this program. First, using a hard plaster socket, rather than the usual soft wrappings, for the pylon decreased the edema by bearing weight on the stump. Second, the patient relearned proprioception earlier in the rehabilitative process. Third, patients achieved an upright position faster and obtained independence more quickly than if they had waited for the wound to heal before being fitted with a pylon.³

The long-term outcome of battlefield amputees who were treated at a specialty center has not been investigated. To the author's knowledge, this is the first study that addresses the outcome of these patients more than two decades after they were injured.

Materials and Methods

Records of 484 battlefield amputees who were treated at Valley Forge Army General Hospital from 1968-71 were reviewed. Of these patients, 183 (37.8%) were identified as sustaining unilateral below-knee amputations. To match the control group, only patients whose ages at follow-up ranged from 46 to 54 years were included in the study, thus leaving 141 study subjects. Information was obtained on mechanism of injury, indications for surgery in Vietnam, procedure performed, whether the patient arrived at Valley Forge Army General Hospital with skin traction, care at Valley Forge Army General Hospital, time to Valley Forge Army General Hospital, time to pylon, and time to permanent prosthesis. According to Veterans Administration records, eighteen of the patients are known to have died, with causes listed as "natural" for six, and "unknown" for the remaining twelve. Of the remaining 123 below-knee amputees in the designated age range, sixty-nine (56.1%) agreed to participate in the study. The other fifty-six were lost to follow-up.

After giving informed consent, study participants responded to a two-part questionnaire. One part obtained information about how the initial injury occurred, number and type of subsequent surgeries, other medical problems, marriage, children, employment, prosthetic usage (type of prosthesis, number of hours worn per day, and whether the present prosthesis is a change from the original prescription). Information was also obtained about psychological care, including marriage counseling and Alcoholics Anonymous.

The second part was the SF-36 health survey. The SF-36 is a standardized test divided into eight areas (Physical Function-PF, Role-Physical-RP, Bodily Pain-BP, General Health-GH, Vitality-Vit, Social Function-SF, Role Emotional-RE, and Mental Health-MH). A control group of males between 45 and 54 years old was used to compare the SF-36 scores of the below-knee amputees. The control group consisted of 145 patients from a New England Health Group (The Health Institute, New England Medical Center, Boston Mass) who answered the questionnaire in 1990. The amputees were divided into two groups. Group 1 consisted of below-knee amputees who had no other major injury. Group 2 consisted of soldiers who sustained one other major injury (lower extremity long bone fractures, chest wounds, abdominal wounds, burns over more than 20% body surface area, face or head wounds) in addition to their below knee amputation. The control group was compared to Group 1 and Group 2 using a two-tailed Student's t-test. Data are stored and statistical computations were made in Microsoft Excel.²²⁻²⁴

Results of Record Review

Average age at follow-up was 48.4 years: Group 1 - 48.9 years and Group 2 - 48.1 years. Average age at injury was 21.7 years. Follow-up took place an average of 28 years after the injury. Land mines and booby traps caused 65.3% of the injuries; mortar artillery fragments, 17%; small arms, 8.5%; injuries involving vehicles, 5.5%; and rocket-propelled grenades, 3.9%. Indications for surgery were a partial or complete amputation in 82% of the patients, infection in 13%, and failed vascular repair in 5%.

Evacuation time from point of injury to Valley Forge Army General Hospital averaged 3.5 weeks (range one to eleven weeks). Time to pylon fitting was 5.3 weeks (range two to sixteen weeks), and time to permanent prosthesis 6.8 months (range one to fourteen months). Most patients elected to have a second procedure to obtain closure of the stump. This procedure was performed between the initial pylon training and fitting of the permanent prosthesis.

During this period, physicians at Valley Forge Army General Hospital were also investigating the use of the Ertl osteoplastic amputation for the below-knee amputee. The Ertl procedure creates a bony synostosis between the distal tibia and fibula by either placing bone graft or creating a periosteal tube between the two bones. This procedure was thought to provide a more "end bearing" below-knee amputation stump.^{6,25}

Results of the Questionnaire

The chi-square test was used to compare isolated injury patients with multiply injured patients (Group 1 and Group 2) for age at follow-up, marriage, family, employment, psychological care, prosthetics usage, and change in prosthetic prescription. (Table 1) Only the difference in the incidence of psychological care was statistically significant, Group 1 – 21% and Group 2 – 51% ($P < 0.001$).

All respondents are presently wearing prostheses: Group 1 averaging 16.3 hours per day and Group 2 averaging 15.4 hours per day. Most respondents reported a change from their original permanent prosthetic prescription: Group 1 – 78.5% and Group 2 – 72%. The most commonly reported changes to the prosthesis are foot (22), suspension (20), liner (18), and socket (8). Average number of prostheses used since the first permanent prostheses was Group 1 – 7.9 (range three to thirty) and Group 2 – 9 (range four to thirty). The patients have reported an average of 1.7 operations (range zero to thirteen): Group 1 – 1.35 and Group 2 – 1.98 since their initial amputation. The Ertl procedure was performed on forty-two patients (63%): Group 1 – nineteen and Group 2 – twenty-three. One patient reported that he had the bone block removed because of pain.

Mean-scaled scores were calculated for each SF-36 area to compare the control group with Group 1 and Group 2.²⁴ When Group 1 and Group 2 were combined and compared with the control group, the self-assessment scores for Role-Physical and Role-Emotional were less in the amputee group and the differences between the groups were statistically significant ($p < 0.05$). Comparison of Group 1 mean-scaled scores with the control group showed no statistically significant difference in all SF-36 areas. Comparison of Group 2 with the control group showed statistically significant decreases in scores for all SF-36 areas except vitality (Group 2 – 54.1 and Controls – 63.05).

Discussion

The below-knee amputation is the most common level of amputation in war or peace. Amputations in the civilian setting are most often due to diseases such as diabetes or vascular ischemia.²⁶ Wartime amputations are most often the direct result of trauma. Since World War II this trauma has often been due to land mines which produce a particular pattern of injury. In this study, land mines and booby traps were the causative agent for two-thirds of the below-knee amputations that were treated in Vietnam. Most land mines and booby traps used against US troops during the Vietnam War were fabricated from local materials or another piece of ordnance, such as a cannon shell.

The International Committee of the Red Cross (ICRC) recommends that the stump be treated with delayed primary closure; flaps are to be fashioned at the first surgery to facilitate closure at a later date. A recent report by L.B. Simper on the treatment of 111 below-knee amputees in Pakistan recommends this treatment of the below-knee amputation due to war wounds. The patients in the Simper series had survived transport to the hospital. The more severely injured patients reported in our series could not have survived the long evacuation (median fourteen hours) time. In the Simper series, delayed primary closure of the stumps was performed a median time of 6.4 days after the initial surgery. Furthermore, 13% of these amputations failed. Entirely absent from this article is any discussion of fitting prostheses for the patients. A dedicated program similar to the one at Valley Forge Army General Hospital is probably not possible in the setting of a Red Cross Hospital located in a strife-torn region.²⁷

Alcide M. LaNoue reported previously on this group of below-knee amputees, comparing those whose stumps were closed in-theater to those whose stumps were left open and maintained in skin traction. He evaluated 230 patients with below-knee stumps, some who were multiple amputees. He found that 41% of the stumps had closed in-theater and 59% had been left open. Of those closed in-theater, 56% failed due to gross infection. Time to permanent prostheses was also increased if the wounds had been closed in-theater: thirteen months as opposed to eleven when the stump had been left open.³

Skin traction is essential to prevent complications that occur in patients wounded during war, especially those who are transported by airplane to the site of definitive care. Skin traction preserves stump length and prevents infection.^{3,4,7,9-11}

The early care of US patients who sustain a below-knee amputation due to war wounds should remain similar to the guidelines of the Vietnam War. During future scenarios, the patient will likely undergo initial surgery in-theater. When stable, the patient should be evacuated to the United States where definitive care should be provided. The open circular amputation should be performed at the lowest viable level of soft tissues and skin traction should be provided at the time of operation. The patient should be placed in a

long leg transportation case with a traction outrigger incorporated during the conclusion of the last surgery in-theater. Skin traction should be maintained throughout the entire evacuation chain until the patient is admitted to the amputee center.

The treatment of amputees on a service that specifically treats amputees seems beneficial for both the patient and providers. The patient has the benefit of being with individuals who have similar medical problems. Most of the patients contacted in this study praised such informal "group therapy." An amputee center provides more consistent care for the patients by concentrating surgeons, nurses, prosthetists, and physical therapists.

Early ambulation of below-knee amputees is not a new idea, but its implementation on open stumps had not been previously documented as well as it was at Valley Forge Army General Hospital. Several benefits come from this program of early ambulation. First, the patient's psychological outlook improves by achieving an upright position earlier. Bearing weight on a plaster hard socket creates a pump that reduces edema in the stump. This function cannot be duplicated by soft dressings. Proprioception improves when a patient begins to walk earlier.^{3,8}

This study suggests that a patient with a below-knee amputation can live a relatively normal life. Patients who sustained one other major injury in addition to the amputation showed an increased incidence of psychological intervention and markedly decreased mean-scaled scores on the SF-36. Other markers, such as marriage, family, work, and prosthetic usage were similar in both groups.

Table I

	Working	Married	Children	Psych Tx
Isolated Injury Group 1	100%	96.4%	82%	21%
Multiple Injuries Group 2	97.6%	97.6%	90.6%	51%

Table 2**Comparison of SF-36 Scores**

	Physical Function	Role Physical	Bodily Pain	General Health	Vitality	Social Function	Role Emotional	Mental Health
SF-36 Control (45-54 yrs)	86.5	85.5	74.2	73.2	63	85.5	85.4	76.4
Isolated Injury Group 1	83.5	85.6	84.5	75.9	70.8	90.8	91	80.3
Multiple Injuries Group 2	62.3	31.3	50.5	62	54.1	70.6	55.7	64.1

UNPUBLISHED DATA

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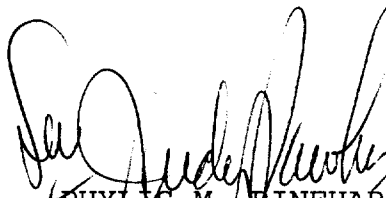
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