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SPONTANEOUS PNEUMOTHORAX IN U.S. ARMY AIRCREWMEMBERS: REVIEW, M--ETC(U)
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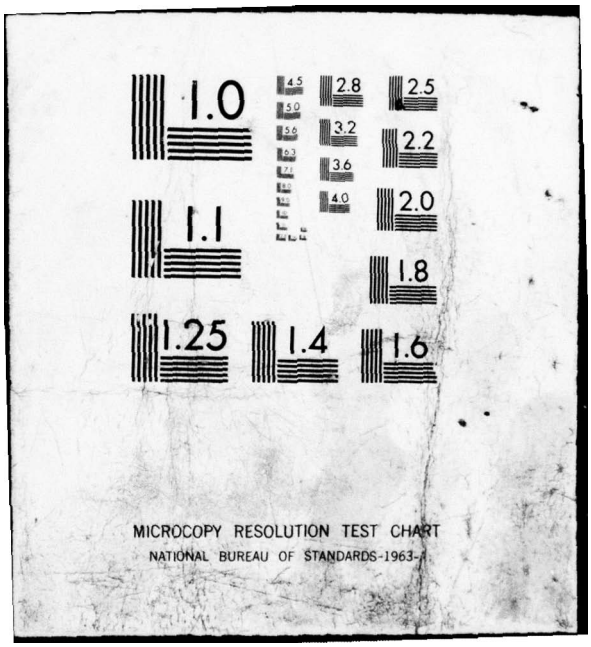
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SPONTANEOUS PNEUMOTHORAX IN US ARMY AIRCREWMEMBERS: REVIEW, MANAGEMENT, AND DISPOSITION

CLINICAL INVESTIGATION SERVICE
US ARMY AEROMEDICAL CENTER
FORT RUCKER, ALABAMA

September 1978

UNITED STATES ARMY
HEALTH SERVICES COMMAND

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Spontaneous pneumothorax is a common clinical entity with a reported incidence of 0.005 to 0.05% that occurs most often in healthy young adult (50% between 20 to 29 years of age) males (85%) as a result of ruptured subpleural blebs. A single episode of spontaneous pneumothorax is not usually considered a grave therapeutic problem (mortality <1%) in nonflying personnel. It raises immediate concern in aircrewmembers, however, where its occurrence can affect an individual's ability to control an aircraft, particularly during high altitude and night nap-of-the-earth flight. This takes on added significance in light

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of the reported high incidence (50%) of recurrence.

The US Army Aeromedical Activity Data Repository files were reviewed for the age, precipitating factors, recurrence rate, signs and symptoms, management, and disposition of the 12 identified cases of spontaneous pneumothorax on file in the data repository. The cases characteristically involved young (28.0 ± 1.7 years) tall (70.6 inches) males presenting with acute chest pain and dyspnea. The etiology, pathophysiology, signs and symptoms, incidence, recurrence, and management are reviewed. Recommendations for the management and disposition of US Army aviators with spontaneous pneumothorax are provided.

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USAAMC CLINICAL REPORT NO. 78-1

Spontaneous Pneumothorax in US Army Aircrewmembers: Review, Management, and Disposition

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September 1978

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SUMMARY

The US Army Aeromedical Center has the Department of the Army directed worldwide mission of review of flying physical examinations of the US Army Aviator and Air Traffic Control personnel. The mission requires the aeromedical evaluation of a wide range of clinical entities. This clinical report (CR 78-1) represents the critical review of the scientific literature and clinical experience of the US Army Aeromedical Review and Waiver in the management and disposition of spontaneous pneumothorax.

Spontaneous pneumothorax is of particular aeromedical risk in view of the operational employment of US Army aviation in critical flight phases which include nap-of-the-earth and night nap-of-the-earth combat flight. The significant incidence of recurrence of pneumothorax (up to 50%) provides a flight safety hazard. The current restriction from flying duties post-pneumothorax of six months was demonstrated to be less than the mean time of recurrence of (7.0 ± 3.1 months). A 12-month restriction is thus recommended to preclude this potentially hazardous event.

The recent establishment of the US Army computerized Aeromedical Data Repository will provide for data retrieval to follow the rapid advance in diagnosis and management of medical and surgical disease entities. Clinical research to establish the aeromedical significance/risk to US Army Aviation will continue utilizing this data base.

Daniel T. Sanders, MD

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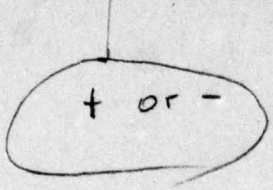
Colonel, MC, MFS
Commanding

ABSTRACT

Spontaneous pneumothorax is a common clinical entity with a reported incidence of 0.005 to 0.05% that occurs most often in healthy young adult (50% between 20 to 29 years of age) males (85%) as a result of ruptured subpleural blebs. A single episode of spontaneous pneumothorax is not usually considered a grave therapeutic problem (mortality <1%) in non-flying personnel. It raises immediate concern in aircrewmembers, however, where its occurrence can affect an individual's ability to control an aircraft, particularly during high altitude and night nap-of-the-earth flight. This takes on added significance in light of the reported high incidence (50%) of recurrence.

The US Army Aeromedical Activity Data Repository files were reviewed for the age, precipitating factors, recurrence rate, signs and symptoms, management, and disposition of the 12 identified cases of spontaneous pneumothorax on file in the data repository. The cases characteristically involved young (28.0 ± 1.7 years) tall (70.6 inches) males presenting with acute chest pain and dyspnea. The etiology, pathophysiology, signs and symptoms, incidence, recurrence, and management are reviewed. Recommendations for the management and disposition of the US Army aviators with spontaneous pneumothorax are provided.



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SPONTANEOUS PNEUMOTHORAX IN US ARMY AIRCREWMEMBERS: REVIEW, MANAGEMENT, AND DISPOSITION

INTRODUCTION

A spontaneous pneumothorax is a pneumothorax that occurs as a result of some disease process (secondary spontaneous pneumothorax) or from unknown causes (primary or idiopathic spontaneous pneumothorax). It is generally described as a "relatively" benign condition occurring in otherwise healthy individuals without demonstrable pulmonary disease. However, it represents a far more serious problem in aircrewmembers where its occurrence could have catastrophic results, particularly during high altitude flight, night, and night nap-of-the-earth flights. Similarly, one cannot exclude from consideration the life-threatening aspects of tension pneumothorax, hemothorax, and respiratory failure which may develop following spontaneous pneumothorax.

The purpose of this paper is to review both the literature and the US Army Aeromedical Activity Data Repository's files on spontaneous pneumothorax in order to develop a rationale for the management and disposition of US Army aircrewmembers with spontaneous pneumothorax.

REVIEW

Etiology of Pneumothorax

It was not until 1932 that spontaneous pneumothorax was recognized as a benign entity with an incidence no greater among patients with tuberculosis than in the general population (39). This has been emphasized by subsequent studies (47,49,56). Presently, the vast majority of cases are due to ruptured subpleural blebs or bullae (1,12,27) without demonstrable disease. In one study, 79% of the patients with spontaneous pneumothorax were free of associated pulmonary disease (63). Age may be an important determining factor in disease associated with spontaneous pneumothorax. This is emphasized by the reported observation that 67% of the patients under age 20 with spontaneous pneumothorax were free of associated disease while only 20% of the patients over 60 were similarly free of pulmonary disease (47).

The apices of the lung are the usual sites for rupture of subpleural blebs (11,47). This is believed to be due in part to the greater expanding stresses acting on the apices, as a result of distortion by gravity, than on the rest of the lung (74). This distortion of the lung by its own weight results in more negative intrapleural pressures and larger alveoli in the apical region (6,32,48,74). These expanding

stresses make the apices more vulnerable to mechanical failure in the event of randomly occurring weakness in the pulmonary tissues or with generalized pulmonary parenchymal disease (74). The relative ischemia of the apices (27) due to the general underperfusion of the apical regions of the lungs as compared to the basal regions (4,38) also may contribute to the preponderance of apical lesions. The lower incidence of spontaneous pneumothorax in the elderly is consistent with the former hypothesis since the lung becomes more compliant (71) with age and, thus, less susceptible to the distortion stresses (74). Both hypotheses are consistent with the near equal distribution 0.92:1 (47), 1.06:1 (37), 1.44:1 (63) of spontaneous pneumothorax in the right and left lung, respectively.

Tuberculosis was long considered the major cause of spontaneous pneumothorax (24,39); however, it is now recognized that tuberculosis is an uncommon contributing factor to most cases of spontaneous pneumothorax (17,24). Certain pulmonary parenchymal disease (histiocytosis X, scleroderma, Marfan's syndrome, and diffuse interstitial pneumonitis) do predispose to spontaneous pneumothorax (16,17). The literature abounds with diseases and other entities associated with spontaneous pneumothorax (30,47,60,62,73). In patients over 40 years of age, spontaneous pneumothorax is most often due to chronic bronchitis and emphysema (31). Table 1 provides a summary of diseases/entities associated with the occurrence of spontaneous pneumothorax.

Incidence, Age, and Sex in Pneumothorax

Spontaneous pneumothorax is a common clinical entity with a usual reported incidence of from 0.005 to 0.05% in the general population (47,49). The incidence among US Army personnel appears very similar (0.017 to 0.03%) (11,70) to that occurring in the civilian population. The slightly higher incidence (0.05 to 0.08%) reported (28,29) in US Air Force personnel is probably attributable to both differences in reporting practices and in age distribution for the two populations. It occurs most often in healthy young males (39,42,60) between the ages of 20 and 40 (1,37,47,60), but may occur in newborns or the elderly (1). Typically, half the cases are in the age category of 20 to 29 (47,49) and 80% of the patients are under age 40 (37). The male:female sex distribution has been variously reported as 5:1 (27), 10:1 (1), and 13:1 (17). Characteristically, the males are tall and thin (27,42).

Signs and Symptoms of Pneumothorax

Classically, the individual with spontaneous pneumothorax presents with chest pain (78-98%), dyspnea (78-82%), and cough (25%) (37,47). The chest pain is usually of varying severity and is most frequently localized

Table 1. Diseases/entities associated with the development of spontaneous pneumothorax.

Condition	Reference
Acute Lymphoblastic Leukemia	Geltner, et. al., 1978 (30)
Asthma	Ruckley & McCormack, 1966 (60)
Chronic Bronchitis	Dines, et. al., 1970 (17)
Emphysema	Mattila & Kastiainen, 1977 (47)
Endotracheal Tube Suctioning	Vaughn, et. al., 1978 (73)
Histiocytosis X	Roland, et. al., 1964 (58)
Labor	Najafi & Guzman, 1978 (50)
Marfan's Syndrome	Dwyer & Troncale, 1965 (23)
Menses	Shearin, et. al., 1974 (62)
Pneumonia	Hussain, 1977 (36)
Pulmonary Neoplasms	Dines, et. al., 1973 (18)
Radiation Therapy	Twiford, et. al., 1973 (72)
Sarcoidosis	Carr, et. al., 1963 (8)
Tuberculosis	Myerson, 1948 (49)
Upper Respiratory Tract Infection	Mattila & Kastiainen, 1977 (47)

over the site of the pneumothorax (11,37); however, the pain may radiate to the shoulder, neck, lower back, or abdomen (11.24). The pain is of sudden onset (56) and is usually followed by shortness of breath (11,56). Interestingly, although breathlessness is complained about subjectively, it is objectively seen in few (11). The onset of symptoms may be gradual in about 20% of the cases (64). The severity of the dyspnea usually increases with the degree of lung collapse (37) but may also be out of proportion to the amount of pneumothorax (31). The degree of dyspnea will obviously be influenced by the level of exertion (70). Older patients generally have more severe dyspnea and anxiety in comparison to the degree of pneumothorax (31). The elicitation of the classic signs of pneumothorax-hyperresonnance, diminished or absent breath sounds and a positive coin test - is related not only to the size and location of the pneumothorax, but also the diagnostic acumen of the examiner (70). Generally, these latter signs can be elicited with a pneumothorax of 40% or more (49). Some individuals develop no signs or symptoms with a pneumothorax (8) and the diagnosis is made when a roentgenogram is made for other reasons. The mortality from pneumothorax is low (0.08 to 1.0%) (37,47) and is often related to associated pulmonary disease (31). Table 2 summarizes the principal signs and symptoms of pneumothorax.

Site, Extent, and Recurrence of Pneumothorax

The site of predelection for a pneumothorax is about equal for the two sides of the chest (56); however, it has been variously reported as 0.92:1 (47), 1.06:1 (37), 1.44:1 (63), and 1.94:1 (39) for the right/left lung ratio. It occurs bilaterally (simultaneously) in 1.5 to 2.5% of the cases (47,60). Approximately 20% develop a concurrent serothorax (47). The extent of the pneumothorax is mild (<15%) in 10 to 15% of the cases (47,63), moderate (15 to 30%) in 28 to 50% of the cases and marked (>30%) in 35 to 61% of the cases (17,47,63). Total collapse of the lung has been reported to occur in 31% of the cases (47) and tension pneumothorax in 2 to 33% of the cases (17,22,31,47,52,59). The incidence of tension pneumothorax appears to be less in young individuals as compared to older individuals (31). Mediastinal emphysema develops in 1.5% of the cases (47) and is associated on auscultation with a crunching, crackling, or churning sound that is synchronous with the cardiac cycle (70). Spontaneous pneumothorax is reported to recur ipsilaterally in 27 to 50% of the cases (1,37,60,63,70) and contralaterally in up to 10% of the cases (1).

Exertion and Onset of Pneumothorax

Physical effort is not often considered a major precipitating factor in the development of spontaneous pneumothorax (47); however, its frequent association with spontaneous pneumothorax deserves review. In past years it was the opinion of most investigators that effort played

Table 2. Signs and symptoms of spontaneous pneumothorax.

Chest Pain
Dyspnea
Cough
Diminished Breath Sounds
Hyperresonance
Collapse
Cyanosis
Epigastric Pain
Hemoptysis
Mediastinal Shift
Subcutaneous Emphysema
Tachycardia
Tightness in Chest
Weakness

an important part in precipitating spontaneous pneumothorax (56). In one study 39% of the cases were clearly related to exertion (26% walking; 13% doing moderate work - shoveling, running of obstacle course; and 59% were without provoking cause) (11). Twenty percent of another series gave a history of unusual exertion prior to the acute episode - strenuous lifting, severe coughing, wrestling, running upstairs - while 80% occurred during rest or during usual daily activities (49). Recently, it was reported to occur in 50% of the cases at rest and in 39% (24% during strenuous effort and in 15% during light activity) during exertion (47). Interestingly, the chief precautionary measure for military patients from one study was the avoidance of exertion, coughing, or straining against a closed glottis, which was recognized to increase intrapulmonary pressure and perhaps precipitate spontaneous pneumothorax (11).

Pathophysiology of Pneumothorax

Normally, a continuous layer of gas between the lung and chest wall will not occur unless there is an extensive pneumothorax. Rather, part of the lung will continue usually to adhere to the chest wall (2). With regard to tension penumothorax, it is important to remember that air only enters the pleural cavity at a pressure greater than atmospheric during forced expiration (45); however, it will enter the pleural cavity during inspiration until the pressures are equalized on the two sides of the pleura (45). Further, one must be aware of the potential development of tension pneumothorax in patients receiving positive pressure ventilation (40). In this case, air would enter the pleural cavity during the inspiratory phase. Positive pressure ventilation itself may cause rupture of subpleural blebs or bullae leading to pneumothorax (17,51).

Characteristically, a pneumothorax causes an abrupt increase in respiratory rate (9,19) and decrease in depth (reduced tidal volume) of breathing (10). From a study of lung deflation in man (33) the mean ($\pm$S.D.) pre- and post-lung deflation respiratory rates (f/min) of four subjects were determined to be 17.7 $\pm$ 5.7 and 30.2 $\pm$ 13.3, respectively. This increase in respiratory rate is believed to be due to the Hering-Breuer reflex (9,33). The degree of lung collapse that occurs in pneumothorax is not equal necessarily to the volume of the pneumothorax. In man, for example, it was reported that 1/5 of the air injected was spent in collapsing the lung and 4/5 in distending the chest wall (9). There is also an expiratory increase in pulmonary resistance with a pneumothorax that may maintain or augment functional residual capacity and promote gas exchange (54).

The hypoxia that exists in pneumothorax is reflected in the mean ($\pm$S.D.) $P_a O_2$ (71.3 $\pm$ 11.1) observed in one series of twelve patients with pneumothorax (53); the more extensive the pneumothorax the lower

the arterial oxygen tension. In another study of three individuals the P_aO_2 was noted to decrease 6.3 mm Hg with lung deflation (33). However, in this same study (8 subjects) breath-holding time was reduced markedly from 57.6 ± 19 sec. to 28.7 ± 14 sec. with lung deflation. Although the physiologic shunt is approximately 2% in the normal individual (61) the mean (± S.D.) shunt in 12 patients with pneumothorax was 10.9 ± 8.8% (53). With a pneumothorax of less than 25% the more extensive the pneumothorax the greater the shunt (53). The cardiac output is reported to decrease (57) progressively with increasing extent of pneumothorax. Others, however, have reported variously a decrease, increase and no change in the cardiac output of patients with pneumothorax (66). The residual volume and functional residual capacity increased (14) and the vital capacity (25,76), oxygen uptake (25), and diffusing capacity (14,76) decreased in patients following recovery from pneumothorax.

Altitude and Flying and Their Interaction With Pneumothorax

The potential deleterious impact of altitude on the cardiopulmonary system of patients with pneumothorax was emphasized at a medical forum on airline medical problems in 1940 (78). The increase in the volume of the pneumothorax with altitude (Boyle's Law) was recognized to cause a mediastinal shift (tension pneumothorax) with subsequent development of respiratory distress. This potential problem was subsequently emphasized at altitudes of 10,000 feet as was the potential for pleural tears in the presence of pneumothorax and pleural adhesions during ascent in altitude (44). Thoracic volume expansion was first demonstrated in patients roentgenographically in a hypobaric chamber in 1942 and found to approximate predictions based on Boyle's Law (43,69). The seriousness of patients flying with a pneumothorax was emphasized by the report of a patient dying as a result of flying at 16,000 feet with a pneumothorax (20). A US Air Force analysis of 1777 flights ($\leq$10,000 feet) of patients by the Military Air Transport Service during 1949 revealed no signs or symptoms associated with flying 19 patients with spontaneous pneumothorax (21). The conclusion was that there were no observed contraindications to the air transportation of cardiac or pulmonary patients in their series when flown below 10,000 feet (21). This was substantiated by a subsequent experimental study showing that patients with pneumothorax could tolerate altitudes of 10,000 feet (5). Although the great interest in the problems of the patient with pneumothorax waned with improved methods of treating tuberculosis, it continues to receive periodic emphasis (67,68).

Numerous studies have reported the occurrence of pneumothorax in-flight (3,13,26,29,35,46,75,79): however, the occurrence of spontaneous pneumothorax during flight, in the absence of pre-existing pulmonary diseases, is reported not to be greater than that of spontaneous pneumothorax occurring during other activities (29). In another series, three of 25 flying personnel with pneumothoraces, sustained them in-flight

and then had 8 subsequent recurrences either in-flight or in a hypobaric chamber (13). In this same series (13) and in another (3) progressive expansion of air containing bullae were demonstrable roentgenographically. Recently, the effects of acceleration have been stressed as contributing to spontaneous pneumothorax (41). Importantly, blebs or bullae that do not communicate freely (air exchange) with the respiratory tract (15) will sustain greater stresses during ascent and may thus predispose to the occurrence of spontaneous pneumothorax. This probably accounts for the relatively low (11%) roentgenographic demonstration of bleb/bullae expansion during rapid reduction of barometric pressure (55). The danger of loss of life and material and the abortion of important missions (7) as a result of an in-flight spontaneous pneumothorax cannot be overemphasized.

Treatment of Pneumothorax and Prevention of Recurrence

The choice of treatment and management of pneumothorax is dependent on the severity, extent, and complications of the pneumothorax. Treatment is directed at complete reexpansion of the lung, relief of the signs and symptoms, management of complications, and prevention of residual pulmonary dysfunction and recurrence. The general categories of treatment/management include nonoperative management, thoracentesis, tube thoracostomy, pleurodesis, parietal pleurectomy, resection, pleural abrasion, and decortication. The following guidelines in managing an initial episode of spontaneous pneumothorax have been recommended (1): with a pneumothorax of 15% or less and in the absence of a continuing air leak, rest is the only required therapy; if the pneumothorax is between 15 and 30% needle thoracentesis to remove as much air as possible is recommended; and, with a pneumothorax of 30% or more tube thoracostomy is employed. These guidelines are conservative forms of therapy (7). Intrapleural air is absorbed at the rate of approximately 1.5% of the pneumothorax volume per day (1).

The overall management of pneumothorax should not exclude considerations of the prevention of recurrence, especially among aircrewmembers. Indeed, it has been reported that conservative therapy is insufficient for aircrewmembers due to the high incidences of recurrence with its attendant dangers in high altitude missions (7). Conservative management of 94 patients presenting with an initial episode of spontaneous pneumothorax was followed by a 43.5% recurrence (8); however, surgical intervention of 6 initial cases resulted in no recurrences (8). Similarly, no recurrences were observed in another study of 49 patients following surgical intervention (60).

MATERIALS AND METHODS

The files of the US Army Aeromedical Activity Data Repository and the US Army Aeromedical Review and Evaluation Board were reviewed for

all available cases of spontaneous pneumothorax. Twelve cases were identified and reviewed for age at time of occurrence, sex, race, height, weight, precipitating factors, site and extent of pneumothorax, signs and symptoms, management, and disposition. Data for each category were not complete for all subjects.

RESULTS

A summary of the key findings is provided in Table 3. All cases in this series occurred in Caucasian males. Although detailed histories were not available in all cases, chest pain and dyspnea of sudden onset were characteristic presenting symptoms. Three episodes (25%) occurred during physical exertion. One incident (recurrent spontaneous pneumothorax) occurred while in-flight. Initial treatment was conservative in all cases; 83% received chest tube thoracostomy and 17% observation only. In general, aggressive treatment was employed with recurrent pneumothoraces. All recurrent pneumothoraces were ipsilateral. Apical resection and pleural abrasion were utilized in 67% of the recurrent cases, pleural abrasion alone in 16.5%, and chest tube thoracostomy alone in 16.5%. Further recurrences have not occurred to date in those individuals treated by apical resection and pleurodesis.

DISCUSSION

The findings reported in this review are in consonance with the literature. The relatively young age (28.0 ± 1.7), 58% in age category of 20-29, of occurrence in males observed in this review approximates values previously reported (1,47,49). The clinical impression that pneumothorax tends to occur in tall, thin individuals (27,37) is supported by our observations. The mean height (70.6 inches) of the subjects in this study population exceeded both the mean height (67.5 inches) of normal healthy young men (27) and the mean height (70.0 inches) of patients with spontaneous pneumothorax. The relatively greater expanding stresses in the apices of the lungs (74) of tall individuals coupled with greater apical ischemia from underperfusion in tall individuals may be key predisposing factors in the development of spontaneous pneumothorax. Indeed, it has been reported that in tall, thin individuals there is a rapid growth rate relative to pulmonary vasculature that may account for apical ischemia and resultant bleb formation during growth (42,77). The recent observation that a spontaneous pneumothorax is most likely to occur in individuals with a sharp rib margin (sharp rib syndrome) is of interest (65) and warrants further investigation.

The high percentage of recurrence (50%) of spontaneous pneumothorax observed in this population following initial conservative management is of major concern. The percent recurrence (50%) observed is not

Table 3. Summary of findings in 12 cases of idiopathic spontaneous pneumothorax involving US Army Aircrewmembers

Parameters	Results
Age (years)	28.0 ± 1.7*
Height (inches)	70.6 ± 0.7
Weight (pounds)	151.7 ± 3.5
Right/left lung localization (total)	1.0:1.0
(initial incident)	1.25:1.0
(recurrent incident)	0.67:1.0
Extent of pneumothorax (%) (total)	35.4 ± 5.1
(initial incident)	42.1 ± 5.1
(recurrent incident)	23.7 ± 8.9
Recurrence (%)	50.0
Time to Recurrence (months)	15.8 ± 9.2 (7.0 ± 3.1)**

*Mean + S. E.
**Exclusion of individual with a recurrence after 60 months.

different from that (27 to 50%) reported by others (1,37,60,63,70); however, it is of such magnitude as to raise serious concern when considering aircrewmembers. In addressing the management, one cannot exclude consideration of the potential dangers posed by the occurrence of a spontaneous pneumothorax in combat operational flight such as during high altitude flights, night, and night nap-of-the-earth flights. Similarly, one cannot exclude from consideration the life-threatening aspects of tension pneumothorax, hemothorax, and respiratory failure which may develop following spontaneous pneumothorax (60).

Initial management should provide for adequate reexpansion of the lung and stabilization of the patient. Clinical guidelines (1) of observation only for a pneumothorax of 15% or less (absorbed at rate of 1.5% per day), needle aspiration for a 15 to 30% pneumothorax, and chest tube thoracostomy for a pneumothorax of greater than 30% are useful rules of thumb. In our experience, the majority (83%) of cases required only chest tube thoracostomy at initial presentation.

It can be argued from the findings of Fuchs (29) that low ambient pressure does not increase the risk of spontaneous pneumothorax and, thus, conservative management is adequate for aircrewmembers. However, the high incidence of recurrence (50%) with the added hazard of operational aviation warrants a more aggressive attitude when managing an aircrewmember with spontaneous pneumothorax.

The current recommendation and policy of the US Army Evaluation and Review Board is that aircrewmembers will be restricted from flying for six months following an initial incident of spontaneous pneumothorax, in the absence of demonstrable pulmonary disease. The data from this review would indicate that 6 months restriction would place the aircrewmember at the mean time (7.0 $\pm$ 3.1 months) for recurrent pneumothorax. Hence, it is evident from this review that conservative treatment and 6 months restriction from flying duty is within the anticipated recurrence period. The 6 month restriction is insufficient to provide reasonable assurance in regard to the potentially catastrophic event of recurrence.

CONCLUSION AND RECOMMENDATION

Review of the literature and the data from our study indicate that apical resection and/or surgical pleurodesis essentially eliminate the high probability of recurrence of spontaneous pneumothorax. Although possibly considered aggressive therapy, the lower risk to surgery in this young age and otherwise healthy group, coupled with the potential safety hazard to aviation warrant serious consideration of surgical procedure. The finding of a 50% recurrence following conservative management and the absence of subsequent recurrences following more aggressive treatment dictate stricter guidelines for aviators.

Following the initial conservative management and in view of data presented in this study, it is recommended that pleural abrasion and resection be considered the primary treatment in aircrewmembers. Pulmonary function evaluation three months post-surgery would be required prior to submission of request for waiver and returning to flying status. A more conservative approach following initial treatment would require a one-year restriction from flying followed by complete pulmonary function evaluation.

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US Army Aeromedical Center, Fort Rucker, Alabama,
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by Joseph C. Denniston, MAJ, VC; Frank S. Pettyjohn, COL, MC; John C. Kelliher, CPT, VC; Daniel T. Sanders, COL, MC; James O. Colley III, MAJ, MC; Edward F. Cole, COL, MC

UNCLASSIFIED

1. Spontaneous Pneumothorax
2. Aircrewmembers
3. Management
4. Disposition

Spontaneous pneumothorax is a common clinical entity with a reported incidence of 0.005 to 0.05% that occurs most often in healthy young adult (50% between 20 to 29 years of age) males (85%) as a result of ruptured subpleural blebs. A single episode of spontaneous pneumothorax is not usually considered a grave therapeutic problem (mortality < 1%) in nonflying personnel. It raises immediate concern in aircrewmembers, however, where its occurrence can affect an individual's ability to control an aircraft, particularly during high altitude and night nap-of-the-earth flight. This takes on added significance in light of the reported high incidence (50%) of recurrence.

The US Army Aeromedical Activity Data Repository files were reviewed for the age, precipitating factors, recurrence rate, signs and symptoms, management and disposition of the 12 identified cases of spontaneous pneumothorax on file in the data repository. The cases characteristically involved young (28.0 ± 1.7 years) tall (70.6 inches) males presenting with acute chest pain and dyspnea. The etiology, pathophysiology, signs and symptoms, incidence, recurrence, and management are reviewed. Recommendations for the management and disposition of US Army aviators with spontaneous pneumothorax are provided.

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