

SPONTANEOUS PNEUMOTHORAX OCCURRING IN FLIGHT

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SYNOPSIS

This paper reports a rare case of spontaneous pneumothorax occurring in flight. The subject was a trainee pilot in a Republic of Singapore Air Force T-33A jet trainer. The subsequent management and the aeromedical considerations relating to safe return to flying duties are discussed.

INTRODUCTION

Spontaneous pneumothorax occurring in a pilot at the controls of an aircraft in flight is an emergency with potentially disastrous consequences. Fortunately, such an occurrence is rare.

CASE REPORT

LTW, a 21-year old male Chinese, was undergoing flight training on 4 Aug 82. He took off from Paya Lebar Airport at about 1100 hrs in a two-seater T-33A jet trainer, accompanied by his flight instructor. The rate of climb was 1500 feet per minute. At 5000 feet, while carrying out routine checks, he suddenly experienced difficulty in breathing and coughed once or twice. The aircraft continued to climb to 7000 feet, by which time his breathing became worse. He experienced a "cold feeling" in the upper zone of the left chest. He informed the instructor, who took over controls at about 8000 feet and landed safely at Tengah Air Base at about 1125 hrs.

The subject was met by an ambulance on arrival. On examination, the Base doctor suspected pneumothorax and referred him to Alexandra Hospital where a chest X-ray showed pneumothorax on the left side. He was admitted and treated by underwater seal drainage. Two week later, the chest tube was removed. Repeat X-ray, however, showed a small residual apical pneumothorax and infective changes in the right middle zone. He was treated with antibiotics and discharged the next day, with a follow-up appointment one month later. Subsequent X-ray showed a fully re-expanded left lung.

The opinion of RSAF Aeromedical Specialists was that LTW should remain grounded since the risk of recurrence in mid-air could not be ruled out. It was felt, however, that a medical waiver could be granted if he underwent successful pleurodesis.

As LTW was very keen to pursue his flying career, he readily agreed and was admitted to Singapore General Hospital on 24 Sep 82. But while waiting for surgery, he sustained another left spontaneous pneumothorax on 27 Sept 82, necessitating underwater seal drainage. Surgical pleurodesis of the left lung was performed on 29 Sep 82, where numerous subpleural blebs were oversewn and the pleural surfaces abraded. Post-operative recovery was uneventful. He was discharged from hospital on the 10th post-operative day. A follow-up chest X-ray on 8 Nov 82 showed his left lung to be fully expanded.

In April 83, LTW underwent lung function tests and a simulated flight in an altitude chamber. The latter included experience of hypoxia at 25000 feet, and rapid decompression from 8000 feet to 22000 feet in 2 seconds. LTW was assessed as fit to resume flying training, without restriction.

DISCUSSION

Spontaneous pneumothorax is seen mainly in young adult males who have previously been in good health. In a study by Myers (1) 92% of 115 cases were below the age of 40 and 75% were between 20 and 25 years of age. Since aircrew are mainly young, healthy, adult males, its occurrence in this occupational group would not be unusual. The development of this entity in the air, however, is extremely rare.

In Leach's (2) series of 41 cases of aircrew with spontaneous pneumothorax, not one episode occurred during flight. Dermksian et al (3) reviewed 25 cases of aircrew with spontaneous pneumothorax and found 3 cases occurring in the air. Heath (4) recorded only one episode of pneumothorax in 89, 916 man flights in the altitude chamber.

When it occurs on the ground, the condition is generally regarded as relatively innocuous. But in flying personnel, the problem is always serious because of the risks involved in going to altitude. The development of sudden, severe chest pain and shortness of breath would be potentially incapacitating; loss of consciousness due to cardiopulmonary embarrassment is a possibility; and rupture of blebs and bullae could be occasioned by the stresses of flight such as rapid decompression, pressure breathing or high G-forces (5).

Aggravation of pneumothorax upon aerial ascent, as illustrated by the present case, is easily explained by the fact that with decreasing absolute pressure of atmosphere, air within the pleural cavity will expand according to Boyle's law, resulting in progressively increasing degrees of lung collapse. This has been well demonstrated by clinical and radiographic observations during altitude chamber flights (6, 7). Its importance in aerial transportation of patients with chest injuries has also been pointed out (8). Todd (7), on the basis of fluoroscopic and X-ray studies at various altitudes, recommended that no person with pneumothorax should ascend beyond 4000 feet above sea level.

The risk of recurrence is high, up to 30% after the first pneumothorax and up to 80% after the third pneumothorax (9, 10, 11, 12). In approximately 10% of cases, pneumothorax will develop spontaneously on the contralateral side (12, 13). Because of the potentially disastrous consequences of a recurrence occur-

ing in mid-air, the development of a single episode of spontaneous pneumothorax in aircrew poses a problem with regard to continued fitness for flying duties.

In the Royal Air Force, the policy is to insist on definitive treatment (usually silver nitrate pleurodesis) before returning aircrew to flight duty. Even then, Hopkirk et al (4), in a review of 32 RAF aircrew who have had pleurodesis, noted that 3 persons (9%) subsequently had recurrence on the same side while 4 others (12%) had recurrence on the opposite side. The fact that a substantial number of recurrences were on the opposite side has raised the question of whether bilateral pleurodesis should be offered after the first incident of spontaneous pneumothorax.

In the US the approach is by comparison, less conservative. Citing Fuch's (15) review of the literature which concluded that the occurrence of spontaneous pneumothorax in a decreased ambient pressure environment is extremely rare, Rayman (16) recommended that medical waivers be granted for spontaneous pneumothorax cases if certain criteria are met:

- a. there has been a single episode
- b. there has been complete recovery with full expansion of the lung
- c. pulmonary function tests are normal
- d. there is no demonstrable underlying lung pathology
- e. one year has elapsed (since most recurrences occur within 12 months)

In Rayman's view, surgical treatment should be insisted upon only if there has been a recurrence. If in spite of this measure a third episode occurred, then the individual should be permanently removed from flying duty.

In the present case, the subject was required to undergo surgical pleurodesis before he was allowed to fly again. He also had satisfactory lung function tests and an uneventful flight in an altitude chamber. The altitude chamber test was considered necessary, in order to show that the subject is able to withstand the stresses of low ambient pressures as well as any sudden loss of cabin pressurization.

At the time of writing the subject LTW is still on flying status, although he has since been channelled to helicopters for non-medical reasons.

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