

Pressure (Alternobaric) Vertigo : A Case Report

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A 22 years old Flight Cadet reported with recurrent attacks of Pressure Vertigo both on ground and during ascent to an altitude of 10,000 feet when the pressurization system in the cockpit cuts in. The Cadet had been flying with minor upper respiratory infection. During evaluation he was found to have chronic tonsillitis which was treated surgically. Aeromedical aspects of the case is reported.

Keywords : Flight Cadet, spatial disorientation, chronic tonsillitis.

Vertiginous reactions in connection with atmospheric pressure changes were recognised and described amongst divers and caisson workers as early as 1894 by Curnow¹ and by Alt et al². Amongst aircrew, this phenomenon was recognised as early as 1927 by Denker³. In aircrew the difficulties caused by this type of vertigo will be disorientation, which may be hazardous to flight safety and also individual safety. The duration and intensity of pressure vertigo appear to be sufficient to cause accidents particularly during critical phases of flight. Earlier surveys conducted elsewhere have shown that some 10-17% of pilots have experienced pressure vertigo sometime or other during their flying career^{4,5}. The magnitude of this problem in Indian Air Force is not known. However, recently we had a typical case of pressure vertigo in a Flight Cadet who had been referred to Institute of Aerospace Medicine for evaluation.

Case History

A 22 years old Flight Cadet commenced his flying training at Air Force Academy (AFA) in Kiran MK-I aircraft in August 88. On 06 August 88, on his 4th instructional dual sortie, he developed otitic barotrauma right ear with a small perforation for which he was admitted and treated symptomatically and cured. On 23rd August 88, he was medically cleared for continuation of flying training. During first phase of flying at AFA, the cadet had 3 episodes of pressure vertigo which were neither reported to his instructor nor to medical officer. The first episode was on ground after completion of the dual sortie, when he was

clearing his ears by valsalva manoeuvre. The second episode was during 3rd solo after 25 hours of flying experience and the third episode took place around 50 hours of flying experience stage. The second and third episodes of pressure vertigo occurred at an altitude of 10,000 feet during ascent when the pressurization system of the cockpit starts functioning. All these three episodes occurred while the cadet was flying with minor upper respiratory infection. All the episodes had common features like subjective feeling of rotation, blurring of vision and unsteady feeling which lasted for about 15-20 seconds. There were no history of nausea or vomiting. Immediately after the episodes, he felt absolutely normal. The cadet successfully completed the first phase of 87 hours of flying training in December 1988. Later he reported for second phase of training in Kiran MK-II aircraft in January 1989. During this stage he had 4-5 episodes of vertiginous attacks, twice on ground and the remaining times while flying, during ascent at the altitude of 10,000 feet. The subjective feeling and the duration of vertigo was similar in nature during all the episodes as reported earlier and he did not report to his Medical Officer or Instructor. The last episode occurred on 9th March 1989 during long cross country flight and during ascent at an altitude of around 10,000 feet, and the same was noticed by the Instructor. On further enquiry, the cadet revealed the previous episodes. He was referred to Institute of Aerospace Medicine (IAM), Bangalore for further evaluation.

Ear, Nose and Throat (ENT) evaluation revealed chronic Tonsillitis and mild deviation of nasal septum with adequate airways. No other abnormality was detected. Investigations like routine urine examination, haemogram, X-ray PNS, X-ray skull, audiogram, tympanogram were normal. Neuropsychiatric evaluation revealed no abnormality. A good motivation for flying was also revealed. He was admitted to Command Hospital, Air Force for Tonsillectomy, Proof Antral Puncture and Nasopharyngoscopic examination which was

done under general anaesthesia on 25th March 1989. The antral puncture and nasopharyngoscopic examinations were normal. The post operative recovery was uneventful and he was discharged from hospital on 5th April 1989. The cadet was re-examined at IAM on subsequent days including ear clearance run in the Decompression Chamber with the rate of ascent 3000 feet per minute to an altitude of 15,000 feet and with variable rates of descents of 1000, 2000, 3000 feet per minute. The first author was the observer inside the chamber and the response of the cadet was found normal.

In view of the above findings, the cadet was temporarily recommended for restricted flying with an instructor and was advised to report with a detailed Executive Report on flying to decide his future flying career. The flight cadet reported to IAM for review on 26th April 1989 with a detailed Executive Report on flying and also the medical report. The Executive Report on flying was satisfactory and there was no recurrence of pressure vertigo during 19 different types of sorties during the period of observation. The medical report was also normal. Detailed ENT evaluation including ENT clearance run in Decompression Chamber was also normal. In view of the normal medical and ENT evaluation report as well as satisfactory Executive Report on flying, the cadet was considered as fully cured of his disability of pressure vertigo on account of elimination of the predisposing cause. Hence, he was recommended fit for full flying duties. The cadet successfully completed his flying training on time.

Discussion

Pressure (Alternobaric) vertigo is a well known entity which can affect the divers as well as aircrew who are subjected to rapid atmospheric pressure changes. It is an occupational hazard which can endanger the life as well as safety of the mission. Though the receptors of the semicircular canals are normally stimulated only by angular movements of the head, in certain susceptible individuals, these can also be stimulated by a rapid change of pressure within the middle ear. According to Melvill Jones⁴, approximately 10% of a group of pilots

interviewed by him had experienced vertigo immediately after equilibration of middle ear pressure. According to Lundgren et al⁵, a study on interview of 180 Swedish Royal Air Force Pilots revealed 17% of the population experiencing alternobaric vertigo and 72% of these cases stated that they had been troubled by vertigo in connection with colds when they were flying. According to Lundgren⁶, the incidence seems to be higher in sports divers. In some of the pilots this occurred only during ascent and in others only during descent and in a small minority the illusory sensation was apparent both during ascent and descent⁷. It is generally assumed that the vertigo is caused by a relative over pressure in the middle ear either in lower ambient pressure (ascent) or by valsalva Manoeuvre (descent)⁸. Characteristically the vertigo is of sudden onset, being preceded by a click, as air leaves or enters the middle ear cavity, but decays rapidly and rarely lasts longer than 10 or 15 seconds. There might be a concomitant blurring of vision and apparent movements of objects within the visual fields caused presumably by nystagmic eye movements similar to vertigo produced by sudden changes in angular velocity.

The symptoms of pressure vertigo are more likely to occur when there is some difficulty in equilibrating middle ear pressure because of stickiness of eustachian tube usually due to mild congestion and inflammation brought about by a common cold or other infection of the upper respiratory tract. There are, however, a few individuals who suffer from pressure vertigo even in the absence of infection. Studies by Ingelstedt et al⁸ have shown that these individuals require a higher middle ear pressure than the normals to open the eustachian tube and vent gas to ambient. In certain individuals, asymmetry in the opening pressure of eustachian tubes, such as one ear equilibrating at a low differential pressure and other at a high tubal pressure may precipitate the symptom of vertigo.

The mechanism by which the sensory receptors of the vestibular apparatus are stimulated by changes in the middle ear pressure is still conjectural. The dominant symptom of vertigo strongly suggests that the ampullary

receptors of semicircular canal rather than the maculae are stimulated. Furthermore, the transient nature of the disturbance accords with the theory proposed by Melvill Jones⁴, that the cupula is deflected when the over-pressure in the middle ear is suddenly relieved on passive venting or when the middle ear pressure is raised transiently above ambient by valsalva manoeuvre.

Despite uncertainties about the mechanism of pressure vertigo and the nature of individual difference in susceptibility, it can be a cause of severe and potentially dangerous spatial disorientation. Apart from the dangers of otitic barotrauma, the increased probability of pressure vertigo is another reason why aircrew should not fly when suffering from upper respiratory infection or other conditions that impair ventilation of middle ear.

The reported case of pressure vertigo in a Flight Cadet was diagnosed early and given an adequate definitive therapy that cured the condition fully. It has helped the Flight Cadet to complete his flying training successfully as per the schedule.

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