

Aeromedical Decision Making While Evaluating Aviators With Unilateral Hearing Loss

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Abstract

Hearing loss in adults is very common. Unilateral Hearing Loss affects binaural hearing which in the case of an aviator may directly affect his performance while flying. Thus when an aviator presents with unilateral hearing loss and a decision needs to be taken for his employability. Aeromedical decision making (ADM) entails more than a blind adherence to the rule book. Adequate weightage must be given to the role of experience, training and actual job performance prior to taking any decision for an aircrew with any disability. The issues faced while evaluating two cases of unilateral Sensorineural hearing loss is described with a view to shedding light on the logical thinking required to reach a decision on the all important question – 'Allow to Fly or to Ground?'

Key Words ; Sensorineural Hearing Loss, Aviators, Aeromedical Decision Making

Introduction

There are few people in the world whose lives are not touched by the ubiquitous aviation industry. The man behind the machine remains the keystone and thus it is of paramount importance that aero medical decisions are of the highest quality that can be reasonably achieved. In this era of evidence based medicine, developing appropriate management algorithms is the essential aspect of daily decision making. At AFCME & IAM, the premier institutes of IAF, we face a number of difficult aero medical decisions. Though the concepts and ideas discussed herein are neither original nor novel, but the practices of evidence based medicine has the potential to make a positive contribution throughout a structured aero medical risk management paradigm.

Hearing loss in adults is very common. Only a slight proportion of those cases seen in audiological and otological clinics are amenable to medical or surgical treatment that will restore normal hearing. Unilateral Hearing Loss affects binaural hearing. It may be congenital or acquired. It can be triggered due to bacterial or viral infections (such as measles or mumps), injuries to head and/or ears, strokes, tumors, head surgeries, Ménière's disease etc. Symptoms of a unilateral hearing loss vary from person to person. Most frequent is a severe restriction to directional hearing – a source of sound either cannot or just barely can be localized. Further, unilateral hearing loss often disrupts hearing and discrimination, especially in loud environments. Unilateral hearing loss challenges those affected, in multiple ways in their everyday life.

The biggest problem is that the onset of most hearing loss is insidious, slowly progressive and missed at the peripheral level. Consequently patients present at a later stage with moderately severe hearing loss. Occasionally, a patient may present early if the loss has progressed rapidly, but even then the hearing loss is of severe magnitude by the time the ENT specialist is

consulted. Our patients rarely come to a clinic complaining of a specific hearing loss (impairment) unless they have failed a screening test at work. What makes them consult a doctor is the handicap-the effect of their hearing loss on their life.

The challenge for the ENT surgeon is to try to determine the cause of the hearing loss in each patient. A small cohort of patients will have hearing loss which is potentially amenable to treatment. Another cohort will have a sinister, life threatening cause behind the innocuous hearing loss. The identification of the cause of the hearing loss is thus of paramount importance. Even if the best that can be achieved is only the balance of probability of a cause, the patient can be given a better idea of the likely prognosis.

With this concept in mind, we shall discuss two cases which force the clinician to-

- a) Lookup the books/journals again
- b) THINK OUT OF BOX before venturing an opinion.

The basic tenets of medicine viz. detailed history taking, a thorough clinical examination and understanding of disease process with support of routine and special investigations help in removing old cobwebs and develop an appropriate management algorithm.

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Case No 1

A 35 yrs old helicopter pilot who had flown 2500 hrs reported with insidious onset hearing loss on left side since last twelve years. The hearing loss was gradually progressive and had now reached a stage where he was unable to hear anything from the left ear. He gave no history of vertigo, tinnitus or loss of discrimination. He did not complain of facial weakness, diplopia or alteration of consciousness.

His general condition was good.

On ENT examination, both tympanic membranes were found to be intact and mobile. Weber's test was lateralized to the right ear, with Rinne's test being false negative on the left side. Absolute Bone conduction was normal on the right, but markedly reduced on the left side.

Conversational voice/ Forced Whisper test revealed 600/600cm hearing that is normal hearing on the right side, but only 60/60 cm hearing in the left ear. The otoneurological examination was normal.

Pure tone audiometry was done and revealed normal thresholds in the right ear with profound sensorineural hearing loss left ear. Short increment sensitivity index at 1 KHz was at 78% on the right side and 76% on the left side. Tone decay test revealed less than 5dB decay on either side. Speech intelligibility test was 92% on the right side and 54% on the left side.

A Gd enhanced MRI of both Temporal bones was done the study revealed no abnormality.

Case No 2

A 34 yrs old transport pilot who had suffered a closed head injury in 1997 was subsequently detected to be having Sensorineural hearing loss of the left ear. He was re-streamed to transport aircraft (AN32) in Mar 2001 and was flying till about one year ago. He had flown for 1600 hrs in total. He had been grounded after being found to be having profound hearing loss in the left ear. He gave no history of vertigo, tinnitus, and loss of discrimination, facial weakness or altered sensorium.

His general condition was good.

On ENT examination, both tympanic membranes were found to be intact and mobile. Weber's test lateralized to the right ear, with Rinne's test being false negative on the left side. Absolute Bone conduction was normal on the right, but reduced on the left side.

Conversational voice/ Forced Whisper test revealed 600/600 cm hearing that is normal hearing on the right side, but only 100/60 cm hearing in the left ear. The otoneurological examination was normal.

Pure tone audiometry was done and revealed normal thresholds in the right ear with severe Sensorineural hearing loss left ear. SISI at 1 KHz was at 84% on the right side and 80% on the left side. TDT

revealed less than 5dB decay on either side. SIT was 92% on the right side and 50% on the left side.

Gd enhanced MRI of both Temporal bones revealed a Normal study.

DISCUSSION

The world is chaotic, disorganized and vexing and medicine is not immune from this reality. When confronted with a case of hearing loss, the prime questions which need to be answered include:

- (a) What is the cause of the loss?
- (b) How will it affect the aviator's performance?

In the cases under discussion, it has been established that they have a cochlear lesion and the differential diagnosis can be:

- (a) Viral infection
- (b) Endolymphatic Hydrops
- (c) Labyrinthine concussion
- (d) Perilymph fistula
- (e) Labyrinthine infarction
- (f) Auto-immune labyrinthitis

Since the actual cochlear insult occurred many years ago, it will not be possible to ascertain the specific cause. However, what will be the progress of their disability? Are they likely to develop later complications such as

- a) Vertigo
- b) Tinnitus
- c) Loss of hearing in other ear
- d) Loss of discrimination

None of these aviators had complained of any vertiginous episodes at any stage. They had been under observation for many years and at no stage had the otoneurological evaluation revealed any vestibular abnormality. The other ear remained unaffected by the disease process. CNS pathology such as vestibular schwannoma, CP Angle tumor etc were ruled out on MRI. These aviators are highly experienced and strongly motivated with good track record confirmed by the executive reports given by their respective commanding officers. Should they then be allowed to fly?

What about the rule book? Blind adherence to Manual of Medical Examinations and Medical Boards (IAP 4303) para 6.11.5 would result in a final category of A4G3 (P). The individuals would lose their flying career, and the organization would lose two highly trained, experienced and motivated personnel. Is there no alternative?

Can the thinking and rational medical practitioner

find a better way to deal with such cases, within the existing framework of rules and without compromising on safe flying standards?

Available Evidence.

A survey of hearing loss in Army aircrew¹ examined the accident rates for 70 Army aviators who had impaired hearing below the normally acceptable limit but were still flying following a medical examination and subsequent issue of a waiver. No relationship was found between accident rates and impaired hearing in this group.

Studies of RT intelligibility in pilots with hearing loss [2] have revealed that even for ears with maximal discrimination of 65-70%, the RT discrimination appeared to be excellent. Another study [3] observed that even pilots with normal hearing had mean RT discrimination of only 72% if they were young and inexperienced. Thus, hearing loss in itself need not be a predictor of occupational performance. Cockpit noise too can lead to poor auditory performance [4,5] while at the same time exposing the pilot to further risk of noise induced loss [6].

The American Academy of Audiology guidelines for the Audiologic management of adult hearing impairment [7] specify the following postulates for the all round assessment of hearing loss and resultant disability:

Postulate 1

Objective of the initial audiologic assessment should be –:

- i) to understand the difficulties the individual is having.
- ii) to gain an objective feel for hearing status and speech understanding under cockpit conditions.
- iii) to understand the aviator's stage of readiness to embrace some form of intervention.
- iv) to determine candidacy for the most appropriate solution.

Postulate 2

Routine procedures are limited in their ability to make audiologists understand the complex speech understanding difficulties. The real world impact of hearing impairment cannot be predicted from sensitivity loss alone. The correlation between pure-tone data, speech recognition scores and self-assessed handicap is imperfect. Presenting mono-syllabic words in quiet is not going to make us quantify and understand our client's difficulties. Objective tests should be designed to uncover the hearing loss the individual is facing and to determine individual's dependence on capability to use lip reading etc.

Postulate 3

We should rethink our conceptualization of hearing technologies. We must make the connection between hearing impairment, specific activity limitations, and participation restrictions.

In the light of the above research, it becomes evident that there were these two experienced pilots, both of whom had flown extensively with gradually progressive unilateral hearing loss with normal hearing in one ear, with complimentary executive reports. The clinical condition had reached finality without any complications. Last but not the least, though they did not meet the hearing standards as per para 6.11.5 of Manual of Medical Examinations and Medical Boards (IAP 4303)[8], their acquired flying skills could compensate for unilateral hearing loss. It would also be prudent to recapitulate that as per para 11.1 of IAP 4303 4th ed , either individual remains fit for flying with his present status.

It will also be farsighted that the aviator undergoes a regular & rigorous medical examination at unit & AFCME / IAM as per the schedule given below, so that any possible deterioration in condition can be diagnosed early:-

1. Ground runs trials / Simulator training and trials.
2. To use a “speech-audiometric“ test (RT-test) which is completely based on the aviation jargon used in radiotelephony (RT) communications.
3. Monthly review by Aviation Medicine Specialist with a detailed otoneurological examination and any h/o adverse/risk factors in particular is to be elicited.
4. Review yearly at AFCME / IAM with detailed notes of Aviation Medicine Specialist examination.

Both the aviators were thereafter cleared for flying.

The above case studies illustrate that with a rational approach to the evaluation of unilateral hearing loss, it may be possible to salvage those aircrew whose disability is static and who are highly motivated. It takes much toil and sweat, not to mention money to produce an experienced aviator. Our effort as doctors should be to “Keep them flying”!

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