Symposium Paper

AEROMEDICAL ASSESSMENT OF FLYING PERSONNEL

Surgical Problems

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Introduction

FLYING personnel must possess the highest degree of physical and mental efficiency to meet all the hazards of flying, specially under operational conditions and be capable of withstanding the severe stress encountered in flying. To achieve this, our selection of flying personnel has to be critical, and subsequent maintenance of their health is of paramount importance. Most of the surgical problems amongst candidates for military flying are avoided through proper screening before entering into services. But those surgical problems which arise during active service require careful treatment and critical evaluation before allowing the flying personnel to takeover the responsibility of an aircraft in the interest of the life and machine. Surgical problems are too many and it is not possible to discuss all of them in detail. Only those problems which we face commonly in our day to day practice have been discussed here.

Common Surgical Problems Amongst Entrants

These may be congenital or acquired. Careful and thorough clinical examination assisted by certain investigations helps to exclude most of the surgical disabilities.

(a) *Sequele of Fractures :* A candidate can be considered fit if fracture has united without any residual functional disability.

(b) *Amputations :* All cases with amputation are rejected except terminal phalanx of little finger or whole of little toe.

(c) *Effects of Old Injury :* When functional ability is affected it can be a cause for rejection, e.g. big scar on face if it prevents proper mask fitting.

(d) *Hernia, Varicose Veins, Undescended Testis :* These defects are cause of temporary rejection and to be assessed afresh after operative correction.

(e) *Cervical ribs :* Well developed cervical ribs with or without signs or symptoms are cause for rejection as they are likely to produce neuro vascular complications in the upper limbs. Rudimentary ones are considered fit.

(f) *Locomotor system :*

(i) Flat feet, genu valgus, gross varus, genu recurvatum, moderate or severe hallux valgus, hallux rigidus and hammer toes are causes for rejection.

(ii) Examination of spinal column plays an important part. Mild exaggeration of spinal curves need not be a cause for rejection if movements are absolutely free and full. Present methods of X-ray of spine in candidates excludes many congenital and acquired defects. Scoliosis above 7° COBB's is a cause for rejection. In a recent study at IAM amongst 240 candidates between March 1976 and April 1977, 12 candidates were found to have following spinal defects and made unfit for aircrew duties :

Type of defects	*No. of cases*
Scoliosis	8
Kyphosis	1
Reduced inter-vertebral disc space	2
Loss of cervical lordosis	1

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Surgical Problems arising while in service

Flying personnel in service are equally prone to any disease or accident like any one else. Road or traffic accidents are one of the commonest surgical causes of downgrading the category of aircrew. *Certain injuries are peculiar to flying personnel e.g. injuries to spinal column due to effects of acceleration, vibrations, ejections and forced landing.* High magnitude short duration 'g' forces make the spine a focus for concern. In a recent analysis in RAF, incidence of structural damage to vertebral column in flying personnel has been shown to be 40%. Association of certain spinal defects will make the spine fail during ejection. Fitzgerald[3] demonstrated structural abnormality in the spine during postmortem examination in 25% cases. Ejection injury rate in IAF is around 40% which compares with RAF. Delahaye et al[1] studied the spine of 6687 persons and found congenital abnormalities in the spine in 10% cases. In a study at IAM of 328 cases, about 50% showed some sort of congenital spinal defects. The yardstick applied earlier by Verma and Sharda[6] were that, no degree of scoliosis, postural or structural will be acceptable at the time of entrance. In the serving aircrew an uncomplicated scoliosis more than 10° was not acceptable for flying in an aircraft fitted with ejection seat. With more than one congenital abnormality existing, the case would not be considered fit for ejection seat aircraft flying. According to Delahaye et al[2], the scoliosis limit angle compatible with safe ejection seat flying is 15°. However in IAF a candidate with scoliosis above 7° is rejected and a pilot with scoliosis above 10° is considered unfit for flying aircrafts fitted with ejection seat.

Physiological Variations of Spine

Hollinsheed[4] considers that frequent and slight dorsal inflexion with scoliosis to the right is a physiological variation. Cuniform vertebra, found at the centre of physiological curvatures are considered fit for ejection seat aircraft flying. Absence of union of the vertebral corner is another developmental disorder. Though some authors feel such vertebrae are more fragile, eminent radiologists disagree with them.

Sacralisation and Lumberisation

Unilateral or bilateral sacralisation of L5 or lumberisation of S1 are common radiological findings. Since the lumbosacral hinge is not the area of traumatisation during ejection, they are not considered as cause for rejection in IAF and French Air Force. Of late, unilateral sacralisation is considered as cause for rejection in candidates for flying branch as such [redacted] cases are likely to develope backache with stresses of flying.

Spina Bifida

This is a common radiological finding affecting L5 or S1. Though Verma and Sharda[6] considered this defect unacceptable for high G-load, Delahaye et al[2] do not feel so. In IAF we reject candidates with Spina Bifida of L5 but not S1.

Blocked Vertebra

Commonest site of such involvement is the cervical spine. As injury to the cervical spine is very rare amongst flying personnel, isolated blocked vertebrae are not considered as cause for rejection but if it affects more vertebrae the case should be rejected.

Fracture and Fracture Dislocation of Spine

Commonest site of fracture amongst aircrew are seen at dorsilumbar region. Simple fractures occur with minimum anterior compression and without affection of I.V. disc. Such fractures heal with rest and physiotherapy. They are usually given full flying category, three months after hospitalisation.

If the compression is more than 1/3rd the total height of the vertebra, the spinal curvature usually gets affected with possibility of undetectable damage to other components. Similarly, multiple fractures indicate damage to vertical endplates and in the presence of change in the thoracic curve, the individual is unsuitable for fighter aircraft flying.

In cases of comminuted fractures of spine there is invariable disruption of disc annulus, interspinal ligaments and inter-articular joints. Such fliers rarely become fit to fly aircraft fitted with ejection seats.

Fracture of cervical spine is rare in aviation accidents. However if such injuries occur, after healing the pilot should be recommended to fly transport aircraft only. In cases of fracture of transverse processes, the spine always *becomes painful* sooner or later.

Trauma without Fractures

Absence of any radiological lesion does not signify absence of anatomical injuries of the discs or spinal ligaments. Occurrence of pain and discal deterioration during the years following is always possible.

Arthrosis

Isolated arthrosis is not a cause for unfitness. But if it involves many intervertebral spaces and the spine becomes painful, the pilot is taken off from flying.

Tuberculosis of Spine

Even when fully treated the pilot is taken off from high performance aircraft flying.

Spondylitis Ankylopotica

This chronic disease is most often compatible during a certain period with fairly normal aeronautical activity. But as it progresses with stiffness of different joints and respiratory involvement, the flier is grounded.

Laminectomy

When this is done, whatever be the cause, it leaves behind spinal instability and is a cause for unfitness for flying.

Cure of Discal Hernia

Such surgical intervention does not necessarily modify the strength of spinal column. If at operation discal hernia is confirmed and the I-V. discs are curetted well, clinical results are expected to be satisfactory. If the patient becomes asymptomatic and does not develop any residual paresthesia or persistent algias, full flying can be restored.

Backaches

Backache is specially a problem of helicopter and transport pilots flying for a long time with repeated landing and take off, vibration and often uncomfortable sitting arrangements. According to Sliosberg[5] a helicopter pilot with a normal spine starts getting backache after about 300 hours of flying. The pain is often located in the lumbar region (75%). In a study of 128 cases in French Air Force, 16 pilots never complained of backache, 44 pilots experienced disagreeable inconvenience, 53 experienced uncomfortable pain and 15 experienced very severe backache. Most of the time there was no positive clinical or radiological findings. Some rest and analgesics usually help them. If backache persists in helicopter pilots, they may be advised to shift from helicopter to fixed-wing aircraft.

Conclusions

Surgical problems in aeromedical assessment are many. The decision cannot be stereotype. Each has to be considered on its own merit.

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