Case Report

Chronic Cervical Sprain due to +Gz Stress

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Injury to neck resulting in neck pain in both acute and chronic form has been reported in pilots flying high performance aircrafts. This paper deals with a case of chronic sprain-supraspinous ligament of cervical spine in the region of C6-C7 which occurred in a young pilot while flying Mig-29 aircraft. Severity and seriousness of disability resulted in permanent withdrawl of flying medical category followed by invaliding medical board (not solely on medical ground) resulting in loss of a trained pilot. An evaluation procedure which can be followed in such cases has been suggested.

Incidence of cervical pain in aviators flying modern generation aircraft with high sustained 'G' capability has shown an increasing trend. The incidence is fairly high even amongst our own aircrew flying these kind of aircraft [1]. Neck catches and neck pains not only impair head movements restricting vision but with their persistent discomfort and preoccupation, reduce a pilot's efficiency and capability. It can also result in a permanent disability resulting in a loss of highly trained pilot. A case of chronic sprain of supraspinous ligament (C6-C7) in a young pilot of Indian Air Force (IAF) is reported.

Case Report

A 31 years old flier developed neck pain, while flying Mig-29 aircraft in January 1988. Onset of pain was sudden, when he turned his neck laterally and upwards while undergoing +9Gz in a 2v2 mission. Pain was so severe that the pilot was dazed and confused for sometime and the sortie was aborted. Pain was not radiating to any other part but was localised to the neck region only. Discomfort and pain persisted inspite of rest for few days. He continued flying as it was not very severe. Stiffness of neck used to increase in the evening and get aggravated in cold weather and also with sudden jerks. He reported sick in April 88 and was investigated at a Service Hospital in Pune. The aircrew justified this delay in reporting sick inspite of considerable discomfort to him, to the common occurrence of neck pain in the Sqn pilots which subsides after sometime. Clinical examination revealed local tenderness in the region of C6 and C7. Neck movements were restricted and painful especially in extreme range. No neurological deficit was noticed. X-ray spine did not reveal any abnormality. A diagnosis of sprain-supraspinous ligament of cervical spine was made and he was placed in low medical category. He was reviewed at Institute of Aerospace Medicine (IAM), Bangalore in Sep 88. During review, he was found to be symptomatic inspite of conservative management and removal of stress. X-Ray spine at IAM revealed osteophytic lipping arising from posterior aspect of C3, C5, C6 and C7 with spondylotic changes. Human Engineering evaluation was not carried out as the individual was symptomatic. He was again observed in lower medical category. As there was no relief and he continued to have restriction in neck movements especially in lateral flexion and turning of neck to right, he was recommended to be placed in permanent low medical (non-flying) category in March 89. After a year of tenure as ground duty officer, he underwent an invaliding medical board (not solely on medical ground) in Mar 90. He was released from service in July 90.

Discussion

Aircrew have been exposed to +Gz stress for decades. The disabling effects of +Gz forces are primary challenge to those who fly modern generation, high performance aircrafts and to the scientists dealing with human factors in aviation industry. Besides well known phenomenon of grey out, black out and loss of consciousness (LOC) associated with decreased or nil cerebral perfusion, the incidence of neck injury/neck pain and backache has been increasing. Neck injury sustained in cockpit environment is not a new phenomenon. Pillips in 1959 had reported an acute flexion injury to neck in a student pilot

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during a +9Gz pull out in an AD-4[2]. Compression fracture of C6 with ligament injury to C5-C6 and sliding of C6 relative to C5 vertebra in a flight surgeon from Royal Norwegian Air Force has been reported by Anderson[3]. Schall has reported two cases of compression fracture, one case of interspinous ligament injury, two cases of herniated nucleus pulposus (HNP), one case of Myofacial pain syndrome and one case of fracture of spinous process of C7[4].

Vanderbeek[6], while carrying out a prevalence study of acute neck injury in USAF resulting from high G forces in pilots of high performance aircraft, found that 50.6% of the pilots had some type of neck pain in the preceding three months period. Higher aircraft performance was associated with increased injury prevalence. With increasing age, higher incidence of major neck injuries were reported. Knudson et al has reported that 74% of F/A 18 aviators surveyed reported neck pain with high +Gz[7]. Out of 37 pilots reporting neck injury, 11 required removal from flight duties averaging 3 days. None of the cases reported by these authors, have been removed from flying status permanently.

The pain resulting from neck injuries may appear both in acute and chronic forms. The probability of injury to neck increases when a pilot turns his head while performing a combat manoeuvre. When the head is upright, cervical spine can resist an acceleration of 8 to 9G. In case of position of head, other than upright, the movement of the head and the neck can only be braked by anatomical structures, which can result in injuries. Most of the pilots, reporting neck pain, have reported that the checking six was the most common position that causes pain[7]. Weight of the flying helmet is a major factor which leads to increase in the incidence of cervical injuries. Estimated weight of the head in the region of C6-C7 can be taken as 4 Kg and helmet along with associated equipment weighing in the region of 1.5 to 2 Kg. Thus, the load on C6 - C7 vertebra at 9G will be in the region of 49.5 Kg to 54 Kg. Similar actiology can cause sprain/pain in other regions of back which keep on aggravating with subsequent exposure to high +Gz forces.

Evaluation

A careful evaluation of neck pain sustained during flying high performance aircraft consist of proper history of the profile of the mission, any history of past injury and proper clinical and diagnostic evaluation. It is essential to differentiate between non-neurological lesions (Myofascial) from various types of cervical spine injuries. An occult injury should be considered with a history of recurrent neck pain, even if the patient may not recall any precipitating trauma. In diagnostic evlauation, repeated X-Rays of cervical spine, including functional projections with neck flexed and extended, should be taken before ruling out any bony injury. Occult traumatic fracture may not be seen on the first set of X-rays. CT scan of cervical spine and bone scintigraphy can be useful. A psychological evaluation and executive report from unit will help in ruling out cases of fear of flying.

Protective Measures

The ability to counteract the stress imposed by the HSG on neck muscles and other spinal muscles can be enhanced by strengthening these muscles through regular exercises. A regular physical conditioning programme can improve not only +Gz threshold but also the ability of human body to withstand the stress better without getting fatigued early. The weight and wearing comfort of the helmet require a serious and urgent attention. The emphasis should be on developing a helmet as light as possible and also helmet should be individual fit for comfort. Indoctrination of aircrew emphasising the demand of modern high performance aircraft, and the need to follow a regular exercise to develop strength and stamina should continue. Facilities for weight training and strengthening of muscles should be made available to all fighter aircrew.

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