Post concussion Syndrome After Closed-Head Injury in an Airline Pilot
Case Report, by Michelle R. Brown, MD, MPH

Traumatic brain injury is a global health concern. Annually, 300-800/100,000 individuals suffer head injuries often resulting in disability and permanent neurologic impairment. Neurological sequelae include post concussion syndrome, posttraumatic epilepsy, and neuropsychological deficiencies. This article presents a case report of a first-class pilot who experienced a mild closed head injury and includes a brief review of the aeromedical issues surrounding such an event.

History
A 51-year-old male airline pilot with over 14,000 hours of flight time suffered a closed-head injury after losing control of the motorbike he was operating. The airman was not wearing a helmet for protection, and his head impacted a grassy surface at 30 mph. The impact resulted in a loss of consciousness of approximately 5 minutes. The airman was transported via private vehicle to a local emergency room for evaluation. Physical examination was negative for focal neurological deficits and positive for cervicalgia. The airman had a Glasgow Coma Scale score of 14 with posttraumatic amnesia less than one hour. Imaging included CT scans of the head and cervical spine, both of which were negative. The airman was discharged from the emergency department with a diagnosis of mild traumatic brain injury (TBI).

Seven days post-injury, the airman presented to his primary care physician complaining of headache, dizziness, unsteady gait, and blurred vision of the left eye. He was referred to both neurology and neuro-ophthalmology for further evaluation. Additional imaging was obtained by neurology, which included a brain MRI/MRA that was negative except for a T2 signal hyperintensity in the right pontine region. A neuro-ophthalmologic evaluation was normal to include visual field testing.

The airman was diagnosed with post concussion syndrome and placed on amitriptyline. In addition, he was enrolled in a multidisciplinary vestibular rehabilitation program for his balance and dizziness complaints.

Three months following the incident, he denied any symptoms of headache, dizziness, unsteady gait, blurry vision, irritability, depression, anxiety, insomnia, concentration or memory issues, or fatigability. He sought a repeat neurological evaluation for return to duty. Repeat neurological exam and follow-up neurocognitive testing was normal. The airman was cleared by his neurologist to return to all daily activities.

Aeromedical Issues
Aeromedical concerns are directed at the neurological disability that may persist for days or weeks following the acute event. Neurological sequelae such as post concussion syndrome, focal neurological deficit, neuropsychological deficiency, and posttraumatic epilepsy may lead to disability. Post concussion syndrome includes non-specific complaints such as headache, dizziness, irritability, insomnia, and impairment in memory or concentration. These symptoms usually last three to six months and are self-limiting. Focal neurological deficits cover a broad range of impairments, which may include cranial nerve palsies, aphasia, or hemiparesis. Most focal deficit recovery occurs within a six-month period, but full recovery may take up to three years. Structural brain injury may result in personality, behavioral, or executive function changes, leading to neuropsychological deficiencies. Often, neuropsychological testing is required to evaluate for deficiencies.

The most concerning neurological sequela from an aeromedical standpoint is posttraumatic epilepsy. Risk of epilepsy following a closed head injury is approximately 5%. The risk of posttraumatic epilepsy increases in individuals with depressed skull fractures, posttraumatic amnesia lasting more...
than 24 hours, cerebral hematoma, loss of consciousness, and cerebral contusion. For mild TBI, the excess risk of seizures remains elevated for 10 years after mild brain injury. While seizure risk is difficult to predict, it is also complicated by various conditions such as hypoxia and sleep deprivation, both common conditions in commercial aviation that can lower the threshold for occurrence.

Outcome

The general medical standards for medical certificates are annotated in Title 14 of the Code of Federal Regulations (CFR) Parts 67.113, 67.213, and 67.313. An airman may not possess any disease, defect, or limitation that makes the airman “unable to safely perform the duties or exercise the privileges of the airman certificate applied for or held.” Head trauma associated with epidural or subdural hematoma, focal neurologic deficit, depressed skull fracture, or any loss of consciousness or amnesia can be found under item 46 in the Guide for Aviation Medical Examiners, neurologic, presence of any neurologic condition or disease that potentially may incapacitate an individual.

TBI is classified as mild, moderate, or severe. Mild TBI includes loss of consciousness and/or posttraumatic amnesia of less than 1 hour. Moderate TBI includes either loss of consciousness and amnesia of more than 1 hour but less than 24 hours or non-depressed skull fracture. Severe TBI includes loss of consciousness greater than 24 hours, brain contusion or intracranial bleed, or depressed skull fracture. Mandatory waiting periods are based on the severity of the TBI and risk of posttraumatic epilepsy. The mandatory waiting period for mild TBI is six months if free from seizures (AMCD staff, personal communication, 12/16/2014). An airman may recover full neurocognitive function but remain disqualified due to a high risk of posttraumatic epilepsy. The disposition guidance indicates that for all classes of medical certificates, aviation medical examiners should submit all medical records, including pre-hospital, emergency department, specialty consultation, and operative reports. In addition, a current status report is required annotating all medications to include dosages and side effects.

In our case, the airman received a general denial letter after the incident for not meeting the medical standards prescribed in 14 CFR, Section 67. The FAA requested any previously issued unexpired medical certificate(s) be returned in accordance with 14 CFR Part 61.53, to which the airman complied.

The airman’s case underwent an independent medical review by The Federal Air Surgeon’s Neurology Panel, which convenes twice yearly. Given the history of mild TBI with loss of consciousness, the panel recommended a six-month waiting period from the time of the incident, and the airman had to remain free from symptoms during that period before he could be reinstated to flight duties. After the mandatory waiting period, the airman was issued a warning letter requiring him to report immediately to the FAA any adverse changes in his medical condition and to abide by 14 CFR Part 61.53.

Aerospace Medical Certification Division data analyses from 2011-2014 revealed that 203 active airmen with a history of head trauma were issued medical certificates. Most of the cases were third-class certificates (75%), followed by second-(13%), and first-class (12%) holders.

References

4. 14 CFR, Chapter 1, Subchapter D, part 67 medical standards and certification. Downloaded 16 Dec 2014 from: http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&sid=60fa367aa2e49a07c9bd19842706347&rgn=div8&view=text&node=14:2.0.1.1.5.2.1.7&dtdno=14

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