Medical Certification of a Pilot With Glomus Jugulare Treated With Fractionated Stereotactic Radiosurgery

Case Report, by James C. McEachen, MD, MPH

This article presents a case report of a first-class pilot who was diagnosed with a right-sided glomus jugulare tumor and subsequently treated with fractionated stereotactic radiosurgery. The article includes a brief review of the airman’s medical history and outcome data, as well a discussion of the pertinent aeromedical issues.

History

A 46-year-old male first-class pilot with over 12,000 hours of flight time applied for first-class medical re-certification following fractionated stereotactic radiosurgical treatment of a right-sided glomus jugulare tumor using a CyberKnife® System.

The airman had a history of hereditary paraganglioma syndrome. He was initially diagnosed following work-up of uncontrolled hypertension, despite three antihypertensive medications. Following a positive 24-hour urine metanephrine test, the airman was referred to an endocrinologist and underwent multiple imaging studies, to include an abdominal CT scan and an MIBG (metaiodobenzylguanidine) nuclear study. The composite evaluation helped confirm a functioning paraganglioma in his mediastinum, which was subsequently removed surgically. A CT of the neck, combined with angiography, demonstrated both a left-sided carotid body tumor that was surgically excised and a right-sided glomus jugulare tumor. Neither tumor showed increased uptake on MIBG scanning, suggesting non-functioning lesions.

The characteristics of the glomus jugulare tumor favored a non-surgical approach to treatment. Following consultation with a radiation oncologist, the airman underwent fractionated stereotactic radiosurgery using the CyberKnife to treat the right-sided lesion. No post-procedural sequela was reported.

Aeromedical Issues

Depending on its location, growth pattern, and secretory nature, glomus jugulare tumors have the potential to significantly affect one’s hearing, vestibular response, vision, speech, and/or hemodynamic response. Symptoms from glomus jugulare tumors are typically caused by tumor mass effect, invasion of adjacent lower cranial nerves, high blood flow through the lesion (pulsatile tinnitus), or neuroendocrine effects.

The interval from the first symptom to diagnosis is approximately three to six years. A review of the recent literature has shown that glomus jugulare tumors have been associated with a variety of head and neck symptoms, to include: sensorineural hearing loss, positional vertigo, aural pulsations, tinnitus, dizziness, headaches, monocular vision loss, diplopia, periorbital pain, hoarseness of voice, vocal cord paralysis, absent gag reflex, dysphagia, and lower cranial nerve palsy.

Role of the AME

The general medical standards for medical certificates annotated in Title 14 of the Code of Federal Regulations (CFR) parts 67.113, 67.213, and 67.313 include no organic, functional or structural disease, defect, or limitation that may reasonably be expected, for the maximum duration of the airman medical certificate applied for or held, to make the person unable to perform those duties or exercise those privileges.

In an airman with an initial diagnosis of glomus jugulare tumor, the aviation medical examiner (AME) should obtain a detailed history and physical examination for submission with the case on deferral to the FAA Aerospace Medical Certification Division (AMCD). The Guide for Aviation Medical Examiners outlines the standard evaluation procedures that should be used to evaluate an airman’s hearing, vestibular response, vision, and speech.

For airmen with a glomus jugulare tumor treated with stereotactic radiosurgery, the AME should not perform a post-treatment medical examination until the airman’s oncologist reports that the tumor is controlled and stabilized. Once this is achieved, the AME should pay particular attention to the head and neck evaluation to include assessment of the cranial nerves to help better determine the airman’s functional capability for operating an aircraft. When questions arise, the AME can seek guidance from the Regional Flight Surgeon’s office or the AMCD.

Outcome

Approximately six months after completing fractionated stereotactic radiosurgery treatment, the pilot’s oncologist obtained an MRI of the neck that demonstrated no further growth in the right-sided lesion. A nuclear MIBG study showed no uptake within the mass, consistent with a non-functional tumor. A urine metanephrine test was negative. Upon presentation to his AME for medical re-certification evaluation, the pilot was found to have no aeromedically significant limitations with regard to his functional capacity to operate an aircraft.

In accordance with 14 CFR part 67.401, at the discretion of the Federal Air Surgeon, an Authorization for Special Issuance of a Medical Certificate, valid for a specified period, may be granted to an airman who shows to the satisfaction of the Federal Air Surgeon that the duties authorized by the class of medical certificate applied for can be performed without endangering public safety during the period in which the Authorization would be in force.

Based on the pilot’s history, physical examination and reassuring oncology documentation, approximately seven months after completion of CyberKnife treatment, the airman was authorized a Special Issuance by the AMCD. The Special Issuance was time-limited to six months, with subsequent re-issuance contingent upon continued satisfactory oncology consultation.

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reports and neck MRI results. Imaging follow-up at six-month intervals over the next two years revealed no further growth in the mass. After two years of close surveillance, the time limitation on the airman’s special issuance was amended to one-year intervals. He continues to fly as a first-class pilot.

**Etiology of Paraganglia**

Paraganglia represent extraadrenal neuroendocrine tissue with unique regulatory functions. They are located throughout the body near vessels and nerves that aid in their chemoreceptor function. Paragangliomas are tumors of the paraganglia that can arise where such extraadrenal tissue is located. Within the head and neck, the four most common sites are at the carotid artery bifurcation, the jugular foramen, along the vagus nerve, and within the middle ear.

Glomus jugulare tumors represent rare, slow-growing, highly vascular paragangliomas that arise within the jugular foramen of the temporal bone. The incidence is approximately 1 in 1.3 million people, with a female preponderance. The typical patient is middle-aged and presents late in the course of the disease with a painless, slow-growing mass. The average age of presentation is between 50-60 years (range of reported cases: six months to 88 years). Paragangliomas occur as sporadic or familial tumors. Patients with familial glomus jugulare tumors exhibit an autosomal dominant penetrance, a younger median age at diagnosis, and a higher incidence of multicentric tumors. While paragangliomas are known to display neuroendocrine activity through catecholamine secretion, functioning glomus jugulare tumors in the head and neck are exceedingly rare, accounting for 1-3% of cases.

Treatment options for these tumors include surgery, radiotherapy, and embolization. A growing body of research continues to support the effectiveness and safety of radiosurgery for treatment of glomus jugulare tumors while minimizing adverse side effects. Complications of radiosurgery have included internal carotid artery thrombosis, pituitary-hypothalamic insufficiency, cerebrospinal fluid leak, tumor growth, and radiation necrosis of bone, brain, or dura. Glomus jugulare tumors are generally benign but 1-3% metastasize. Common sites for metastases, in order of decreasing frequency, are lung, adjacent lymph nodes, liver, and spine. Twenty years after treatment, the survival rate is 94%, and 77% of patients remain symptom-free.

**References**

4. 14 CFR, Chapter 1, Subchapter D, Part 67 Medical Standards and Certification. Online at: www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=c1cd5f42d1b3b2a7555500e22e6d-6e7e&tpl=/ecfrbrowse/Title14/14cfr67_main_02.tpl; last accessed 8 Dec 2012.

**About the Author**

James C. McEachen, MD, ME, MPH, Lt Col, IA ANG, MC, FS, was a fellow in Aerospace Medicine at the Mayo Clinic (Rochester, MN); he wrote this case report at the Civil Aerospace Medical Institute. Currently, he is an Associate Professor in Aerospace Medicine at Wright State University (Dayton, OH), as well as an FAA Aviation Medical Examiner.