Federal Air Surgeon's
Medical Bulletin

Aviation Safety Through Aerospace Medicine

Vol. 49, No. 2
2011-2

For FAA Aviation Medical Examiners, Office of Aerospace Medicine Personnel, Flight Standards Inspectors, and Other Aviation Professionals.

U.S. Department of Transportation
Federal Aviation Administration

Heads UP

New Altitude Trainer Validated

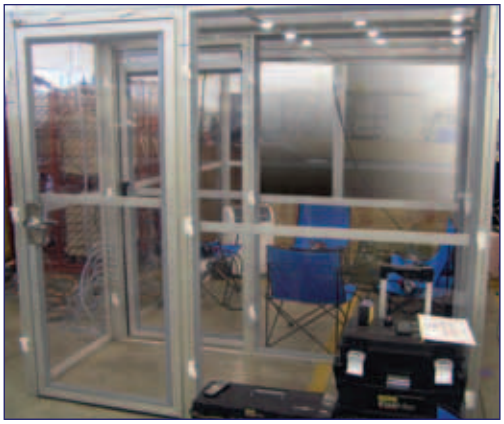
By Brian Pinkston, MD

The Civil Aerospace Medical Institute (CAMI) made history recently when its Airman Education team field-tested the Portable Reduced Oxygen Training Enclosure, or PROTE, at Kansas State University in Salina, Kan. The PROTE is a portable normobaric hypoxia enclosure that can be assembled in about two hours and can train 12-15 students per hour. CAMI's research† has shown that the new trainer provides an equivalent experience to an altitude chamber in terms of hypoxia symptoms, although it cannot provide the pressure changes experienced in the altitude chamber.

The trip to Salina was a proof of concept for the device as a means to take Airman Education's Aerospace Physiology training on the road. The PROTE will likely become a key element of our training since the USAF has been unable, for at least the short term, to provide the nationwide altitude chamber support that pilots had previously utilized.

The field test enabled 30 Kansas State student pilots and instructors to experience hypoxia to raise their awareness of how it can affect their ability to safely pilot an aircraft. The effects of hypoxia often occur without warning, so experiencing the symptoms helps pilots know how to react when encountering this situation in flight.

The trial was considered a success. The training was conducted in an afternoon, with no ill effects noted, and 30 pilots discovered their personal symptoms of oxygen deprivation.



PROTE setup prior to first demonstration run at Kansas State University.

Participating pilots test their reactions during simulated altitude exposure in the PROTE.

The next step will be to combine this capability with a formal physiology course, including spatial disorientation devices. CAMI is cooperating with universities, the Federal Aviation Administration's Safety Team, and other organizations to provide this service at aviation safety events like airshows and pilot safety programs.

✈

Dr. Pinkston manages the Civil Aerospace Medical Institute's Aerospace Medical Education Division.

†Documented in technical report DOT/FAA/AM-10/20, available online at: www.faa.gov/go/oamtechreports/2010s/

Two Hot Issues

By Fred Tilton, MD

Hello, everyone. I hope the winter months were good to you, and that spring is "springing" wherever you are located. There are two hot issues that I need to talk to you about.

Reporting Disqualifying Medical Conditions

There seems to be a misunderstanding regarding the requirement to report disqualifying medical conditions. Allegedly, an advocacy group has been telling pilots with current medical certificates that it is not necessary to report new disqualifying conditions (conditions that would require a special issuance) or the new use of potentially disqualifying medications until their next examination.

This information is correct if pilots refrain from flying. However, it would not be acceptable to continue to fly without notifying the FAA about the change(s) and getting a new restricted medical certificate.

While we cannot require pilots to surrender their certificate if they have held it for more than 60 days without taking some type of formal enforcement action, pilots are restricted from flying as pilot in command, or in any other capacity as a required pilot in such situations by 14 CFR 61.53 (a) (1) and (a) (2).

The 61.53 paragraphs pertain to all medically disqualifying situations. For example, if a pilot were to suffer a fractured arm, he or she could not fly while recovering. However, it would be perfectly acceptable for the pilot to return to flying when completely recovered and not suffering any residual functional problems.

In such a case, the individual could wait until the next examination to notify the FAA. If you have any questions on this issue, please call your Regional Flight Surgeon, who will be happy to discuss it with you.

Airman Medical and Student Pilot Certificates

The second item is related to a change in reporting requirements for the issuance of the combination Airman Medical and Student Pilot Certificate. You may be aware that a rule change has been proposed that will require a photo on all pilot certificates. If (or when) this rule change goes into effect, the combination certificate will be eliminated, and student pilots will have to visit a Flight Standards District Office to obtain their student pilot certificate.

> 'Throughout their career, pilots see you more often than any FAA employee'

In the meantime, the Transportation Security Administration has asked us to reduce the reporting time for such certificates. You are now required to transmit these examinations within seven days of issuance. This requirement only pertains to combination certificates, and you still have 14 days for all other examinations. Again, if you have any questions, please contact your Regional Flight Surgeon for clarification.

In closing, I want to repeat how much I appreciate what you do for the FAA and the airmen you examine. Throughout their career, pilots see you more often than any FAA employee. Make sure you take a few minutes to talk with them about flying, aviation safety, airplanes, and preventive health measures. You play a crucial role in the safety of the National Air Space System.

—*Fred*

Federal Air Surgeon's Medical Bulletin

Library of Congress ISSN 1545-1518

Secretary of Transportation
Ray LaHood

FAA Administrator
J. Randolph Babbitt

Federal Air Surgeon
Fred Tilton, MD

Editor
Michael E. Wayda

The Federal Air Surgeon's Medical Bulletin *is published quarterly for aviation medical examiners and others interested in aviation safety and aviation medicine. The* Bulletin *is prepared by the FAA's Civil Aerospace Medical Institute, with policy guidance and support from the Office of Aerospace Medicine. An Internet on-line version of the* Bulletin *is available at: www.faa.gov/library/reports/medical/fasmb/*

Authors may submit articles and photos for publication in the Bulletin *directly to:*

Editor, FASMB
FAA Civil Aerospace Medical Institute
AAM-400
P.O. Box 25082
Oklahoma City, OK 73125
E-mail: Mike.Wayda@faa.gov

Certification Update

Information About Current Issues

By Warren S. Silberman, DO, MPH

I thought I would revisit an article that I wrote about ten years ago for the Bulletin ["Aeromedical Certification Update: 10 Questions and 10 Answers," Federal Air Surgeon's Medical Bulletin, 2001-2, p. 3]. I have updated the questions and responses to make it current. Here are some case vignettes and responses in the form of questions and answers. There are likely many aviation medical examiners who may not have been active at that time. See if you know the proper medical certification policies.

1 A student pilot airman comes in to your AME office for a FAA medical examination. She is not one of your patients, so you are unaware of her medical history. On the front medical history side of the FAA 8500-8 exam form she placed a check mark in the "yes" block of #18G (heart or vascular problem). In the blank space below 18 she indicated that she has had a coronary artery bypass procedure in 1990. Seeing is has now been 20 years since her surgery, you issue the airman an unrestricted medical certificate that same day. Was this the best course of action?

Answer. No, the AME was very wrong to do this. Coronary artery disease that has required treatment or is symptomatic is a specifically disqualifying medical condition and requires the AME to defer because the FAA must determine that the airman is safe to fly for the duration of the medical certificate issued based on testing the airman provides. (Title 14 Code of Federal Regulations, CFR, part 67.401) Even if the airman were to provide the documentation and test results because she researched the requirements, as an AME you may not issue a medical certificate without permission from either your Regional Flight Surgeon or one of the physicians at the Aerospace Medical Certification Division (AMCD).

2 Airman Frederick T. Freeloader comes into your office for his biannual first-class FAA medical examination. He checks "yes" to block #18v. for his history of an arrest for driving while intoxicated four months previous. He was a very astute airman and has accessed the FAA Web site to review the requirements for such an event and brings you a copy of his court records that he received at the time of his court appearance. The remainder of his medical history and examination was unremarkable. Should you issue the medical certificate?

Answer. You should first question Mr. Freeloader about any other arrests, convictions, or administrative actions for alcohol or drugs. Make sure you ask if he reported this arrest to the FAA Security Division at the Mike Monroney Aeronautical Center in Oklahoma City. This is a requirement under 14 CFR part 61.15 (e) where the airman with one of the above circumstances is to report this to FAA Security Division within 60 days of the action. Neglecting to do this will place the airman at risk of suspension of the medical and airman certificates. You cannot issue until you obtain the police report. The airman will need to obtain this. Based on current policy, if the airman refuses to take a breathalyzer test or blew ≥ 0.15, you are to defer medical certification, and the AMCD will be requesting a substance abuse evaluation.

3 Airman Mary Kay writes in Block 19 of the Form 8500-8 that she saw a dermatologist in the last six months for the removal of a skin cancer. The AME, being astute, asks for a pathology report and a typed statement from the treating physician. When the AME reviews this, he notes that the skin lesion was a melanoma with a Breslow depth of 0.5mm. There were no other nodes discovered. She did not receive any additional treatment. What should you do?

Answer. Malignant melanoma over 0.75 mm Breslow depth requires the AME to obtain a current status report and a brain MRI to evaluate for brain metastases and to defer to the AMCD. If the lesion is less that 0.75 mm depth, the AME may issue, and the condition will not require an authorization for special issuance. www.faa.gov/go/ameguide/app_process/exam_tech/item40/amd/malignantmelanoma/ (Online reference: Guide for Aviation Medical Examiners).

4 A pilot who requires a first-class medical examination comes into your office for his flight exam. He informs you that he had a central retinal vein occlusion three months ago, and his vision can only be corrected to 20/200 in the right eye. Being a well-prepared aviator, he brings in a completed FAA Eye Exam Form 8500-7, which describes an episode of retinal vein occlusion. The condition has fully resolved, but the Snellen chart confirms the corrected visual acuity mentioned above. Assuming the central retinal vein occlusion will be allowed, what will you do about the very poor corrected vision in that eye?

Answer. The URL for the FAA medical policy on monocular vision is: www.faa.gov/go/ameguide/app_process/exam_tech/et/31-34/mv/. According to the online AME Guide, this corrected visual acuity makes the

Continued on page 4

Q & A from page 3

airman a monocular pilot. You will need to defer the examination to the AMCD and send them the completed Form 8500-7 that the airman has provided you. The AMCD will require that the airman wait three more months and grant the airman permission to take a medical flight test at that time (six months total since the event). The airman will then receive a Statement of Demonstrated Ability for monocular vision. The six-month period allows the airman to become adjusted to the monocular clues and practice his flight maneuvers with his instructor.

5 A 40 year-old pilot requesting first-class medical certification comes in for his examination. You perform the electrocardiogram as he is now due to have them yearly for first-class privileges. Your technician comes in and shows you a printed copy of what was transmitted into Oklahoma City, and you note that the airman had three premature ventricular contractions. You issue the airman a medical certificate. Was this proper procedure?

ANSWER. Absolutely not! I have been trying to tell you now for the past several years that you are REQUIRED to review the first-class ECGs, and if there are abnormalities, send the airman for a workup. If at that point the workup is negative, you may call with the information—but you may issue only if it is entirely negative. You really only need to call if you are unsure as to the workup or it comes back positive. In the case of premature ventricular contractions, the workup is, at a minimum, a maximal nuclear stress test. You would want to see the PVCs be reduced with exercise and there be no evidence of ischemia on the nuclear scan with stress.

This is it for now, but I shall present you some more challenges in the next *Bulletin*.

✈

Dr. Silberman manages the Aerospace Medical Certification Division.

Dr. Dunn, Cardiology Consultant, Passes Away

Dr. **Marvin Dunn**, a long-time consultant to the Federal Air Surgeon's Cardiology Panel, passed away recently at the age of 83.

Dr. Dunn was a true gentleman, great teacher, and wonderful mentor for the cardiology panels. He had a gift for explaining things and providing unique insights, always with a wry, gentle humor. He made everyone feel valued, but argued forcefully for his positions. He was humble to the point of almost being self-effacing (he never mentioned his remarkable professional accomplishments).

Marvin suffered a disability several years ago, which left him dependent on using two canes to walk. However, he had an indomitable spirit, never complaining or giving in to defeat. Over the last year or so, Dr. **Les Eber** and I convinced Marvin to use a wheelchair at the cardiology panels, which he grudgingly but graciously allowed (he hated it!). But at the panel in November, he mentioned to me that he thought it might be his last. Whether there were other health issues, or the physical burden of attending the panels was becoming too difficult, Marvin would never say. But he always maintained a smile, and perhaps the most buoyant attitude that anyone could ever have.

Dr. Dunn was the head of the Cardiology Department at the University of Kansas Medical Center for more than 30 years and the former Dean of the University of Kansas Medical School. A prolific author, he had co-authored seven medical textbooks and was frequently published in peer-reviewed medical journals.

Marvin Dunn's passing is a great loss, and those of us who had the honor and privilege of working with him will always personally miss him.

—James R. De Voll, MD, MPH
Manager, Medical Appeals Branch

Alaska Team Scores Safety Success

By Kevin Williams, PhD

In an effort to reduce the number of fatal and serious injury (FSI) accidents in Alaska, the Alaskan Region Flight Standards Division in 2009 chartered a team to study the last six years of such accidents and make recommendations. The study period chosen was calendar years 2004 through 2009. During that period, there were 649 accidents, of which 97 were FSI accidents.

The team's review determined that only 33 accidents, or 5 percent of the total accidents, were not survivable as equipped. Based on autopsy results, 40 percent of those deaths might have been prevented by enhanced aircraft crashworthiness. This equates to 45 lives being saved, even without improvements in accident prevention awareness.

The leading cause of FSI accidents was stall/spin, with 29 accidents, followed by controlled flight into terrain, with 23 occurrences. Next was visual flight rule flight into instrument meteorological conditions, with 19 FSI accidents. Eighteen of the FSI accidents involved an off-field takeoff or landing, and 23 involved a willful violation of regulations.

The team developed 30 specific intervention/mitigation recommendations that were judged to be both practical and cost effective. The recommendations ranged from the creation and sponsoring of training seminars to the development and fielding of new technology.

The working group, all Federal Aviation Administration employees, was honored with an award for Federal Employee of the Year as a result of the work on this analysis and the development of mitigation and intervention strategies. The award was presented to the working group's team leader, **Dave Swartz** (Alaska Regional Flight Standards Division) at a recent award ceremony in Anchorage.

✈

Dr. Williams is an Engineering Research Psychologist at the Civil Aerospace Medical Institute. He was a member of the team that received the recognition by the Alaska Federal Executive Association.

Is Methotrexate Use Approved?

Dear Editor:

My husband is interested in taking flying lessons and obtaining his pilot license….He takes an RX called methotrexate. Does just taking this medication disqualify him from being able to get his license even if he passes the physical medical exam? I went ahead and got this information from the doctor:

"The methotrexate is dosed at 25mg, taken once per week. It is used as a baseline precaution, as prescribed by the rheumatologist in the treatment of an autoimmune inner ear disorder, which was first diagnosed in March 2007.

"During the course of therapy over the past four years, the immune system malfunction has ceased, and the patient has not suffered any additional effects. Clinically, if the immune-system disorder does not re-appear within two years of the first cessation, or re-appear in the form of another immune system malady (such as rheumatoid arthritis, lupus, etc.), the patient is considered free of the disorder. The long-term delivery of methotrexate at low doses is common in the treatment of many immune system disorders, and the medication has a 30-year plus history of no harmful side effects, needing only routine blood tests to monitor liver enzymes.

"The patient never experienced any positional vertigo or dizziness with the disorder. He experienced a mild to moderate hearing loss in his left ear, while hearing in the right ear remains borderline normal. Dozens of audiograms over the past four years have established no additional hearing loss since mid-2007."

Any guidance you are able to give is much appreciated.

Janice Spooner
Weatherford, Texas

Dear Mrs. Spooner,

The current FAA policy on medications is that if we already accept the medication and there are no "safety of flight" issues with the condition that it is being used for, we will accept its use. In the case of "methotrexate," we already accept its use in several conditions, one of which is rheumatoid arthritis. The situation you describe sounds like the FAA would permit with a waiver or authorization for special issuance, which is what we call a waiver. The one issue I possibly see here is the hearing capability of the person you describe. We would need to see what the FAA's approved hearing tests demonstrate. Thanks for your interest.

Warren S. Silberman, DO
Manager, Aerospace Medical Certification Division

'It's Your Neck'

Dear Editor:

I think it's time for Dr. Rathbun [Letter to Editor, FASMB Vol. 49, No. 1, p. 11] to either "Get on Board" with the FAA program or retire! Yes, at this point in time you do not need to have an office EKG with transmitting capability, as I found out after contacting the AMCD.

This particular function or testing may still be outsourced to another physician's office or a hospital department for completion, if you're willing to take the risk and liability. Having the FAA share responsibility with the ordering AME for an abnormal EKG, as eluded to, is not only ridiculous but downright stupid on the doctor's part. You perform the medical exam and all its requirements and assume responsibility for certification of that airman. It's your neck and license on the line not the technician (?EKG), the hospital, or the FAA.

We (AMEs) are agents for the federal government and [are] not employees! I was told the FAA has no responsibility for emergency ICU referrals, etc., nor should they.

So Dr. Rathbun, the solution is quite simple, get your own EKG machine with interpretation and transmitting capabilities, or stop doing first-class medicals. Sounds like a plan to me, maybe it's time!!

Michael A. Zittle, DO
Senior AME and HIMS Examiner
East Berlin, Pa.

Sleep Apnea Follow-Up

Dear Editor:

I work in a sleep clinic at Ft. Campbell, Kentucky and … I have a 60-y/o male private pilot diagnosed with obstructive sleep apnea in 2006. He uses CPAP nightly and reports doing very well with this. He came in yesterday—apparently has not had any significant follow-up since 2006 and needs info to continue flying.

I am unsure what to do: Does he need another sleep study/MSLT [Multiple Sleep Latency Test]? [I'm] not sure how to proceed. Thanks for any information.

Marty R. Litchfield, P.A.
Blanchfield Army Community Hospital, Ft. Campbell, Ky.

Dear Mr. Litchfield:

He should have been continuously followed with yearly requirements! If he has a CPAP machine with a compliance card, we will need to see a recent download of his use of the device. If he does not (and I strongly suggest that he invest in one if he plans on continuing to fly), he will need to provide us with a Maintenance of Wakefulness test. This test evaluates the ability for a patient to remain awake during four 40-minute periods spread out through the day versus a mean sleep latency test, which evaluates someone's ability to fall asleep. We ask that the airman not consume any caffeine prior to the test and, as a matter of fact, we require a drug test prior to screening that tests for at least caffeine and amphetamines.

Wavvrren Silberman, DO, MPH
Manager, Aerospace Medical Certification Division

Aortic Valve Replacement

Case Report, by David M. Rogers, MD

Despite the challenges implantable heart valves present, it is possible for the airman to obtain aviation medical certification. Each valve type has certain advantages and disadvantages that can be applied to each patient situation. The valve replacement decision is very complex, and it is apparent how important it is to include the aerospace medicine specialist, along with the cardiology specialist and surgical team, to optimize care for the aviator.

History

The airman was a 19-year-old male applying for third-class/student pilot certificate with aspirations of a career in aviation as a commercial pilot. Upon presenting to his aviation medical examiner (AME) for initial evaluation, he stated he had received a mechanical aortic valve one year prior. He had previously developed aortic insufficiency caused by valve leaflet vegetations resulting from streptococcal endocarditis on a bicuspid aortic valve. His initial presentation was fever, followed by vascular embolic phenomena, including splenic infarct and lower-extremity arterial infarct (both of which eventually resolved without any long-term effect). He later developed increasing postural lightheadedness with associated widened pulse pressure. Echocardiogram prior to surgery revealed aortic insufficiency (3+, severe), which was progressively worsening from prior studies, and left ventricular enlargement. Stress echocardiogram (bicycle) demonstrated EF 50% at rest, increasing to 60% with exercise. Pre-operative Holter monitor showed no ventricular or supraventricular ectopy. Although he was not in overt heart failure, he was offered aortic valve replacement as part of the treatment of the sequelae of endocarditis. The airman underwent successful aortic valve replacement in late 2008 and received a mechanical On-X ™ aortic valve. The patient's cardiologist described an excellent recovery and the airman was maintained on warfarin anticoagulation. Ten months after surgery, the patient had a complete cardiovascular evaluation, which was negative for transient ischemic attack, loss of consciousness, dyspnea, chest discomfort, palpitations, or any other cardiovascular problems that could be attributed to aortic valve replacement. Stress echocardiogram was normal and demonstrated a competent valve; 24-hour Holter monitor was negative for rhythm abnormality, and his INR results were therapeutic (INR 2.5 to 3.5) on warfarin.

Aeromedical Issues

In the past, aortic valve replacement was considered disqualifying for aviation duties. To this day, a prosthetic valve does not return the patient to a truly normal state, and replacement surgery is often described as trading one problem for another (1). Prosthetic valves fall into two broad categories: mechanical and bioprosthetic. Bioprosthetic valves are partially or completely made up of human or animal tissue. Mechanical valves are constructed from various metal compounds. Mechanical valves offer longer durability, though increased thromboembolic risk, compared to bioprosthetic valves.

Assuming an aortic valve replacement appropriately resolves the underlying problem, the most important aeromedical issues with valve replacement involve both acute and chronic complications. Acute complications include all attendant problems with cardiac surgery and perioperative recovery such as valve failure and arrhythmia. Arrhythmias are a challenge owing to the nature of the cardiac surgery and the proximity of the aortic root to conduction pathways, and they are rare three months after surgery (2). The FAA requires a six-month waiting period to assure appropriate stabilization of the valve and myocardium. Chronic complications vary depending on valve type. Valve failure can occur suddenly or over time, though modern mechanical valves are far more durable and less prone to structural failure than earlier models. Thrombosis and thromboembolism are probably the biggest threats for mechanical valves, occurring at a rate of 1-2%/year in anticoagulated patients (3), though newer mechanical valves appear to be less thrombogenic and therefore require a lower level of anticoagulation. Bleeding complications as a result of anticoagulation occur at a rate of 0.5-2% per year (4). Infective endocarditis remains a lifelong threat that necessitates SBE prophylaxis prior to high-risk procedures.

Despite the challenges implantable heart valves present, it is possible for the airman to obtain aviation medical certification. Each valve type has certain advantages and disadvantages that can be applied to each patient situation. The valve replacement decision is very complex, and it is apparent how important it is to include the aerospace medicine specialist, along with the cardiology specialist and surgical team, to optimize care for the aviator.

Outcome

In this case, the airman was granted a Special Issuance for a third-class medical because his valve replacement went without complication, demonstrated appropriate function, and the airman showed no evidence of arrhythmia or functional deficit. The Guide to Aviation Medical Examiners (5) contains the specific protocol for heart valve replacement: a six-month post-procedure

Continued ⟶

recovery period, complete details of surgical procedure, technique, and valve type, full cardiac evaluation by attending physician, 24-hour Holter monitor, echocardiogram with Doppler, coronary angiogram (required only if coronary vessels were re-implanted with the heart valve procedure), and documentation of warfarin anticoagulation stability (if applicable). The AME Guide also contains an Aviation Medical Examiner Assisted Special Issuance (AASI) procedure for single valve replacement, which allows the AME to re-issue the certificate after initial authorization by the FAA Flight Surgeon if the airman provides the appropriate follow-up information.

References

1. Rayman RB, Hastings JD, Kruyer WB, et al. Clinical aviation medicine, fourth edition; 2006; Castle Connolly Graduate Medical Publishing LLC, pages 205-8.
2. Strader JR, Gray GW, Kruyer WB. Clinical aspects of cardiovascular medicine. In Davis JR, Johnson R, Stepanek J, Fogarty JA, eds. Fundamentals of aerospace medicine, 4th ed., Philadelphia: Lippincott; 2008, 337-8.
3. ACC/AHA 2006 Guidelines for the management of patients with valvular heart disease: Executive Summary. Circulation 2006 Aug; sup:15-21.
4. Otto CM, Bonow RO. Aortic insufficiency. In: Valvular heart disease (3rd ed.) Philadelphia: Saunders, 2009: 155-7.
5. Guide for aviation medical examiners. Federal Aviation Administration, www.faa.gov/go/ame/guide. Accessed 10 Nov 2009.

✈

About the Author

David M. Rogers, MD, MPH, is currently a USAF Flight Surgeon in the Residency in Aerospace Medicine at Brooks City-Base, San Antonio, Texas. He wrote this case report while rotating at the Civil Aerospace Medical Institute.

Transverse Myelitis in an Aviator

Case Report by Blaine M. Powell, DO, MPH

Transverse myelitis (TM) is a rare syndrome affecting between 1 and 8 new cases per million people annually. The condition is characterized by focal inflammation within the spinal cord, which is responsible for neural dysfunction of motor, sensory, and autonomic pathways located within the area of inflammation (1). TM may exist as a component of a multifocal disease process (e.g., multiple sclerosis), multi-systemic disease, or as an isolated idiopathic process. This article presents a case report of an airline transport pilot who experienced an episode of idiopathic transverse myelitis.

History

A 52-year-old first-class airman was hospitalized in October 2008 for progressive ascending bilateral numbness, loss of vibration and position sense—beginning in the feet, climbing to his chest, hands, and mid-forearm—over the course of 10 days. Bowel and bladder symptoms were absent. A cervical spine MRI revealed a 6-mm lesion in the posterior part of the spinal cord at the C5-C6 level with surrounding edema producing expansion and swelling of the cord. MRI scans of the brain and thoracic spine were normal. Spinal fluid examination revealed no inflammation. Cerebrospinal fluid (CSF) WBC count and protein were within normal limits. Oligoclonal bands were absent on CSF examination. Immunologic studies were negative. CSF and Lyme disease antibodies were negative. Serum folic acid and B-12 levels were normal. Erythrocyte sedimentation rate was within normal limits. The airman was treated with high-dose intravenous methylprednisolone, 1 gram daily followed by a six-day taper.

After discharge, the airman's symptoms slowly resolved in the same topographical manner in which it presented. Subsequent cervical spine MRI scans showed decreasing enhancement associated with the spinal cord lesion. Approximately eight months after the onset of illness, the airman achieved near-complete resolution of neurologic symptoms, except for mild, abnormal two-point sensory discrimination in the right ring and little fingers, as well as the left little finger. All motor strength testing was normal.

Aeromedical Concerns

The primary concern in acute TM is skeletal muscle weakness, which can evolve over a matter of several hours to a few days. Flying and aircrew abilities may be affected, creating safety of flight concerns.

Dysautonomia may also be present, posing an additional concern regarding tolerance of gravitational force changes, blood pressure, and cardiac rhythm disturbances that may be especially life-threatening in the aviation environment. Fortunately, the autonomic findings in transverse myelitis are typically limited to bowel and bladder dysfunction.

The medical standards for medical certificates, described in Title 14 of the Code of Federal Regulations (CFR) parts 67.109 (b)(1)(2), 67.209(b)(1)(2), and 67.309(b)(1)(2), state no neurologic condition can exist that the Federal Air Surgeon finds the person unable to safely perform the duties or exercise the privileges of the airman certificate applied for or held (6). The aviation medical examiner must deny or defer issuance of a medical certificate of those airmen who do not meet the standards set forth in the above mentioned regulations.

Continued on page 8

Transverse from page 7

At the discretion of the Federal Air Surgeon, an Authorization for Special Issuance of a Medical Certificate (Authorization), valid for a specified period, may be granted to a person who does not meet the provisions of part 67 subparts B, C, or D. The person must show 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 (7).

Outcome

Upon review of the airman's history of illness and current status report, as required by the FAA, he was granted a time-limited certification for six months by the Aerospace Medical Certification Division. He was advised that his certification was contingent on the stability of his current disease status. At the end of six months, the airman was required to submit a current status of disease report and a current cervical MRI scan report for further consideration of recertification.

Transverse Myelitis

Transverse myelitis affects individuals of all ages, with bimodal peaks between the ages of 10-19 years and 30-39 years (2-3). An antecedent illness has been reported in 30% of pediatric cases(1). No specific agent, however, is strongly associated with transverse myelitis; 75 to 90% of TM patients experience monophasic disease and have no evidence of multisystemic or multiphasic disease (1).

Acute transverse myelitis is a devastating syndrome, mimicking complete transection of the cord. Muscle weakness and bladder dysfunction are universal complaints, in comparison to constipation and fecal incontinence, which are less common. Sensory symptoms, including paresthesia and numbness, are present in the majority of patients. Muscular weakness is severe in roughly two-thirds of patients (4).

Deep tendon reflexes are decreased or absent during the acute stages of illness. Loss of sensation of pain and temperature below a well-demarcated level is universal. Similar losses of perception of touch and proprioception are very common (4). Sparing of proprioception and vibration sense suggests other etiologies such as anterior spinal artery disease.

Symmetric loss of sensory and motor functions and a prominence of autonomic (bladder) dysfunction are essential to the diagnosis. Slight asymmetric distribution of symptoms may occur; however, dramatic asymmetry suggests an alternate diagnosis.

Intravenous steroid treatment is often instituted for patients with acute TM, despite the lack of randomized, double-blinded, placebo-controlled studies to support the treatment regimen.

Recovery typically begins within 6 months, with most patients exhibiting improved neurologic function within 8 weeks from onset of illness. Rate of improvement may be rapid in the first 6 months, with continued recovery of function at a slower rate thereafter, possibly for up to 2 years (5).

References

1. Kaplan A, Krishnan H, Deshpande D, et al. Diagnosis and management of acute myelopathies. *Neurologist* January 2005; Vol. 11, No. 1.
2. Berman M, Feldman S, Alter M, et al. Acute transverse myelitis: Incidence and etiologic considerations. *Neurol* 1981;31:966 –71.
3. Christensen PB, Wermuth L, Hinge HH, et al. Clinical course and long-term prognosis of acute transverse myelopathy. *Acta Neurol Scand* 1990;81:431– 35.
4. de Seze J, Lanctin C, Lebrun C, et al. Idiopathic acute transverse myelitis: Application of the recent diagnostic criteria. *Neurol* December 2005 Vol. 65, Issue 12.
5. Knebusch M, Strassburg HM, Reiners K. Acute transverse myelitis in childhood: Nine cases and review of the literature. *Dev Med Child Neurol* 1998;40:631– 9.
6. Code of Federal Regulations (CFR). Title 14 Part 67 medical standards and certification. Subpart B, 67.109. www.faa.gov. Accessed 15 November 2009.
7. Code of Federal Regulations (CFR). Title 14 Part 67 medical standards and certification. subpart E, 67.401. www.faa.gov. Accessed 15 November 2009.

About the Author

Commander (Dr.) Blaine Powell is the Senior Medical Officer of the aircraft carrier, USS John C. Stennis (CVN-74). The article was written during a rotation at the Civil Aerospace Medical Institute while a resident in Aerospace Medicine at the Naval Aerospace Medical Institute in Pensacola, Florida.

Web Site Shortcuts (Reminder)

If you missed the article in the last *Bulletin,* several abbreviated URLs (Uniform Resource Locators) were implemented in January because of aviation medical examiner comments regarding the excessive length of URLs required when navigating to frequently accessed content. Here is a list of the shortcuts you can use (and bookmark):

AMCS Support Page ..... www.faa.gov/go/amcssupport
AME Guide..... www.faa.gov/go/ameguide
Aerospace Medicine Technical Reports ..... www.faa.gov/go/oamtechreports
AME Seminar Schedule ..... www.faa.gov/go/ameseminars
AME Training Information ..... www.faa.gov/go/ametraining
Content specific to AMEs ..... www.faa.gov/go/ame

The shortened URLs will help you more quickly navigate to these commonly accessed services.

Medical Certification of an Airman With Internal Carotid Artery Dissection

Case Report, by Bret Heerema, MD, MS, MPH

This article presents a case report of an airman who had experienced an internal carotid artery dissection during a triathlon.

History

A 52-year-old male commercial pilot in excellent physical condition and medical history significant only for hyperlipidemia (well-controlled on atorvastatin calcium) experienced blurred vision in his right eye during the last mile of a sprint triathlon (½-mile swim, 12-mile bike ride, 3-mile run). His vision recovered shortly after the race, and he attributed the event to a "bug in his eye." Later that morning, some right-sided neck and temporal pain developed, which he attributed to muscular pain secondary to his exertion during the race. The following day, the neck and temporal pain had spread to the mastoid region and he acquired photophobia. Two days after the triathlon, he was suffering from a severe headache, and his wife noticed that his right eye was drooping. She convinced him to see his family physician, who diagnosed him with Horner's syndrome and referred him to the local emergency room. Eventually, a 4-cm distal right internal carotid artery dissection was discovered.

The airman was hospitalized for 17 nights, during which he was treated with IV heparin and warfarin sodium (Coumadin) until he was stable enough to be released to his own care. Endovascular therapy with stent placement and surgical repair was considered but declined, as these interventions are typically reserved for patients who have recurrent ischemia despite antithrombotic therapy.[1] In the airman's case, he had good collateral circulation through the Circle of Willis, and no infarct resulted from the episode. After six months of warfarin therapy, his dissection was determined to be fully healed and patency had returned back to baseline state of circulation. Vision was fully restored, neurological evaluation was normal except for 1 mm residual ptosis of the right eye. Warfarin was discontinued, he was placed on ASA, and he applied for aeromedical recertification.

Aeromedical Concerns

The primary acute aeromedical concern relating to carotid artery dissection is the potential for sudden incapacitation due to perforation or hemorrhage. Visual changes, headaches, and neck pains due to dissection may be distracting and interfere with performance during critical phases of flight.

In addition to addressing any functional impairment from a carotid artery dissection, an aviation medical examiner (AME) should also consider any underlying diseases. Predisposing conditions such as Marfan, Ehlers-Danlos, autosomal dominant polycystic kidney disease, pseudoxanthoma elasticum, fibromuscular dysplasia, and osteogenesis imperfecta should be addressed.[2] Absent these predisposing factors, the long-term recurrence rate is approximately 1% per annum.[3] Also, all medications used to treat this condition should be free of side effects that may impair the airman's ability to safely operate an aircraft.[4]

If no underlying disease is found, the recurrence rate of carotid dissection is low. However, a full evaluation should be completed for evidence of a stroke, which increases the risk of seizures. Studies suggest that carotid dissections have a benign long-term prognosis with low rates of ipsilateral carotid territory recurrence and any stroke. Furthermore, the stroke rates in carotid dissections are not related to the persistence of severe carotid stenosis or occlusion.[5] However, even if recurrence rates are lower than for other causes of stroke, the risk of seizures is the same, and FAA stroke protocols should be followed in determining aeromedical disposition in those cases.

Continued ⟶

Carotid Artery Dissection

Carotid artery dissection is the most common cause of stroke in young adults.[8] About 70% occur in young adults between the ages of 20 and 40. The signs and symptoms include headache, neck pain, Horner's syndrome, transient vision loss, and ischemic stroke. Horner's syndrome is a classic neurologic syndrome whose signs include myosis, ptosis, and anhidrosis. Carotid artery dissection is thought to be caused by severe hyperextension and rotation to the head or neck. An acute Horner's syndrome with neck or facial pain should be presumed to be caused by carotid dissection until proven otherwise.[9] Between 40-60% of patients with internal carotid artery dissections will present with an isolated, painful Horner's syndrome.[10] Patients often have a history of neck trauma, but this can be subtle, and a number of carotid dissections are spontaneous events. Patients with acute carotid dissection are at a high risk for cerebral infarction, which usually occurs within the first few weeks, often within days, after onset of the Horner's syndrome.[11] For this reason, emergent diagnostic tests should be obtained.

Role of the AME

The general medical standards for medical certificates (annotated in Title 14 of the Code of Federal Regulations parts 67.113, 67.213, and 67.313) include no functional or structural disease, defect, or limitation that makes the person unable to safely perform the duties or exercise the privileges of an airman.[6] AMEs are authorized to examine airmen to determine whether they meet these standards.

The *Guide for Aviation Medical Examiners* outlines the standard examination procedures that should be used to evaluate the applicant's neurological status.[7] A neurologic evaluation should consist of a thorough review of the applicant's history. Certain laboratory studies, such as scans and imaging procedures of the head or spine, electroencephalograms, or spinal paracentesis, may suggest significant medical history. The examiner should note conditions identified in Item 60 on the application with facts, such as dates, frequency, and severity of occurrence. The basic neurological examination consists of an examination of the 12 cranial nerves, motor strength, superficial reflexes, deep tendon reflexes, sensation, coordination, mental status, and includes the Babinski reflex and Romberg sign. The examiner should be aware of any asymmetry in responses because this may be evidence of mild or early abnormalities. The examiner should evaluate the visual field by direct confrontation or, preferably, by one of the perimetry procedures, especially if there is a suggestion of neurological deficiency.

This information should be submitted to the FAA Aerospace Medical Certification Division (AMCD). Under favorable circumstances, they will issue a special issuance with follow-up requirements. An applicant with a history of carotid dissection may be favorably considered if free of sequela.

Outcome

Sixty days after the airman's medication was changed from warfarin to ASA, the airman provided the results of a full neurological evaluation, which showed minimal right eyelid ptosis with normal balance, motor, vision, cognition, and coordination. A full eye evaluation showed no residual visual effects and no visual field obstruction due to his ptosis. A six-month Special Issuance was granted, requiring a current status report and any testing deemed necessary for recertification. The fact the airman had a known cause of the dissection and no ischemic changes strengthened his case for certification at that time.

References

1. Cohen JE, Ben-Hur T, Rajz G, et al. Endovascular stent-assistant angioplasty in the management of traumatic internal carotid artery dissections. *Stroke* 2005; 36:e45.

2. de Bray JM, Baumgartner RW. History of spontaneous dissection of the cervical carotid artery. *Archives of Neurology* 2005; 62:1168.

3. Baumgartner RW, Bogouosslavsky J, Caso V, Paciaroni M. Handbook on cerebral artery dissection. *Frontiers of Neurology and Neuroscience* 2005; 20:12.

4. Federal Aviation Administration. *Guide for aviation medical examiners*. www.faa.gov/go/ameguide. Accessed 12 Nov 2009.

5. Kremer C, Mosso M, Gerogiadis D, et al. Carotid dissection with permanent and transient occlusion or severe stenosis: long-term outcome. *Neurology* 2003; 60:271.

6. Code of Federal Regulations. 14 CFR, chapter 1, subchapter D, part 67 Medical standards and certification. www.faa.gov/go/ameguide. Accessed 12 Nov 2009.

7. Federal Aviation Administration. Guide for *Aviation Medical examiners* examination techniques. www.faa.gov/go/ameguide. Accessed 15 Nov 2009.

8. Mattu A, Goyal D, Barrett JW, et al. Emergency medicine: Avoiding the pitfalls and improving the outcomes. Blackwell Pub. BMJ Books. pp. 46. 2007.

9. Ettinger ER, Wyatt HJ, London R. Anisocoria. Variation and clinical observation with different conditions of illumination and accommodation. *Investigative Ophthalmology & Visual Science* 1991; 32:501.

10. Selim M, Caplan LR. Carotid artery dissection: current treatment options. *Cardiovascular Medicine* 2004; 6:249.

11. de Bray JM, Baumgartner R, Guillon B, et al. Isolated Horner's syndrome may herald stroke. *Cerebrovascular Disease* 2005; 19:274.

About the Author

LtCol Bret Heerema, MD, MS, MPH, was a resident in Aerospace Medicine at the USAF School of Aerospace Medicine at Brooks City-Base, Texas. He based this article on a review of cases evaluated while on rotation at the FAA Civil Aerospace Medical Institute.

Autism Spectrum Disorders

Case Report, by Helen Wright, MD

The autism spectrum disorders typically present in early childhood with abnormalities in social interaction, communication, and restricted and repetitive behaviors. These deficits persist in adulthood and are often associated with other psychiatric co-morbidities and low intelligence (8). It is of note that these illnesses are complex, and there is a broad spectrum of behaviorally defined severity. Some individuals cannot function in society at all, while others have above-normal IQ and function at very near normal. This article examines a second-class airman in whom autism spectrum disorders only recently came to the attention of the FAA.

History

A 63-YEAR-OLD male second-class airman and flight instructor with about 4,500 hrs of flight time reported autism for the first time on his most recent application for recertification. He had been medically certified since 1971.

It appears that the airman was diagnosed with high-functioning autism at the age of five. He found the public school system to be challenging and was institutionalized at age 11 and was subsequently integrated into high school. The airman believed he was "cured" and joined the military as a navigator. He had trouble holding a job out of the military but eventually achieved a PhD degree in physics.

He was denied his medical certificate in 1974 for a psychophysiological gastrointestinal disorder, which had ended his military career as a navigator. He was issued his certificate on appeal, but the full spectrum of his illness was not discovered. Although the FAA did not know it at the time, in 1995, he was found to have a severe enough deficit to receive Social Security Disability for psychiatric reasons (medical records pertaining to this could not be produced by the Social Security Administration).

The airman's records were requested and reviewed when the autism diagnosis was revealed at his recent medical. A neuropsychological evaluation in 2001 confirmed autism. He displayed some typical features of autism spectrum disorder, ASD, including poor social skills and unequal cognitive skills (e.g., superior vocabulary but low skill in psychomotor processing speed). A psychiatric evaluation suggested that he is "aggressive in his disregard for norms and social expectations" and could be very hazardous if he disregarded aviation standards and rules. The airman described numerous socially provocative acts such as painting his house with glow-in-the-dark paint, specifically to irritate the neighbors, and testing indecency laws with sexually graphic artwork submitted for public display. He exhibited poor insight. Describing his reasons for dressing in a fuchsia gorilla suit to ride his bicycle and sometimes while flying, he declared this to be a non-issue since "There is no FAR against fuchsia gorilla suits." A psychiatric consultation requested by the FAA in 2009 suggested that he has an autism spectrum disorder, narcissistic personality disorder, and anxiety with somatic manifestations.

Autism Spectrum Disorders

Autism spectrum disorders are a heterogeneous group of neurodevelopmental disorders characterized by impairments in socialization, communication, and behavior that persist in adulthood (1). The Diagnostic and Statistical Manual of Mental Disorders categorizes these as "Pervasive Developmental Disorders" (2). Prevalence of ASD has increased markedly since the 1990s and is approximately 1 in 1000 (3) or perhaps even higher. It has been reported in the range of 1 in 150-500 (4, 5, 6). It is unclear whether the increase is due to better ascertainment, broadening diagnostic criteria, or increased incidence.

Autism spectrum disorders encompasses a number of disorders of diverse etiology, including autistic disorder (classic autism), Rett disorder, childhood disintegrative disorder, Asperger syndrome, and pervasive developmental disorder, not otherwise specified, including atypical autism (2). The pathogenesis is not fully understood, but it is generally agreed to be multifactorial and to have genetic origins in the majority of cases (7). Diagnosis is typically made in early childhood when the patient fails to meet developmental milestones.

Aeromedical Concerns

While the impaired social interaction characteristics of ASD are perhaps best known, it may be potential difficulty with cognitive skills and problems with communication and behavior that offer the most challenge in an aviation environment. Marked and sustained

Continued ⟶

impairment of communication is a hallmark of ASD (2), which can clearly be a problem in aviation. Uneven cognitive skills means an individual may be strong on tasks that require rote or mechanical capacity (such as during the student phase of aviation) but much weaker with conceptual processes, including reasoning and interpretation (such as those that may be needed during an aviation emergency or when making judgments about safety of flight) (9). Those with ASDs often have restricted and repetitive patterns of behavior, including preoccupations and rituals that might be counterproductive in aviation.

Sensory processing abilities are abnormal in the majority of those with ASDs (9). This, too, encompasses a wide spectrum of severity and character among patients, but visual hypersensitivity or preoccupation with visual stimuli such as lights is common, and there may be hypersensitivity to certain frequencies or types of sound. Such individuals may have superior attention or other components of sensory skill, but there is generally marked difficulty in other aspects of perception (10). There is little research from which to extrapolate the influence that sensory processing difficulties associated with ASDs might have in aviation. One study looked at driving had found that those with ASDs were slower but had an equal rate of non-social hazard identification as the comparison group; however, performance on hazards with a social component was worse (11).

There is also a high correlation of ASDs with co-existing mental health problems from a broad spectrum of disorders and for unfavorable psychosocial life circumstances (1). These include anxiety, mood, and personality disorders, many of which may independently disqualify an airman.

The apparent dramatic increase in the prevalence, or at least diagnosis, of ASD may make this a more significant aeromedical issue in the future. Autism spectrum disorder can be a challenge for the aviation medical examiner to diagnose if the history is not volunteered, given the broad spectrum of behavioral problem severity. Given that an AME may not have previously examined the airman, or had with only infrequent and brief medical exams, diagnosis of a typical autism or mild Asperger syndrome would require a focus on history and follow-up of any suspected social or behavioral abnormality. If ASD is suspected, the case should be deferred to the Aerospace Medical Certification Division.

Outcome

Formal FAA guidelines do not exist for autism spectrum disorders. Its broad spectrum of severity and character suggests that each case must be considered individually. Decisions are based on review by FAA consultants, psychiatric and psychological evaluation, and other tests as needed. This individual's case was reviewed by two FAA consultants, and his disorder was deemed incompatible with aeromedical safety, and he was issued a final denial in accordance with Title 14 Code of Federal Regulations part 67.207(c) (12).

References

1. Hofvander B, Delorme R, Chaste P, et al. Psychiatric and psychosocial problems in adults with normal-intelligence autism spectrum disorders. *BMC Psych* 2009;9:35.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4th edition, text revision. Washington, DC: American Psychiatric Association; 2000.
3. Williams JG, Higgins JP, Brayne CE. Systematic review of prevalence studies of autism spectrum disorders. *Arch Dis Child* 2006;91:8-15.
4. Baird G, Simonoff E, Pickles A, et al. Prevalence of disorders of the autism spectrum in a population cohort of children in South Thames: The Special Needs and Autism Project (SNAP). *Lancet* 2006;368(9531):210-5.
5. Fombonne E. Epidemiological surveys of autism and other pervasive developmental disorders: An update. *J Autism Dev Disord* 2003;33:365-82.
6. Centers for Disease Control and Prevention (CDC). Prevalence of autism spectrum disorders--Autism and developmental disabilities monitoring network, six sites, United States, 2000. MMWR Surveill Summ. 2007 Feb 9;56(1):12-28. www.cdc.gov/mmwr/preview/mmwrhtml/ss5601a2.htm, accessed on November 14, 2009.
7. Johnson CP, Myers SM. Identification and evaluation of children with autism spectrum disorders. *Pediatrics* 2007;120:1183-215.
8. Mouridsen SE, Rich B, Isager T. Psychiatric disorders in adults diagnosed as children with atypical autism. A case control study. *J Neural Transm* 2008;115:135-8.
9. Filipek PA, Accardo PJ, Ashwal S, et al. Practice parameter: Screening and diagnosis of autism: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Child Neurology Society. *Neurology* 2000;55:468-79.
10. Plaisted GK, Davis G. Perception and apperception in autism: rejecting the inverse assumption. *Philos Trans R Soc Lond B Biol Sci* 2009;364(1522):1393-8.
11. Sheppard E, Ropar D, Underwood G, van Loon E. Brief report: Driving hazard perception in autism. *J Autism Dev Disord* 2009 Nov 5. [Epub ahead of print].
12. Code of Federal Regulations (CFR). 14 CFR, chapter 1, subchapter D, part 67 medical standards and certification. November 10, 2009, http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=3962b5b411db13eb5644678f7ba995dc&rgn=div5&view=text&node=14:2.0.1.1.5&idno=14, accessed on November 14, 2009.

About the Author

Major Helen Wright is a member of the Canadian Forces and recently completed the U.S. Navy Resident in Aerospace Medicine program at the Naval Aerospace Medical Institute in Pensacola, Fla. She wrote this case report while on rotation at the Civil Aerospace Medical Institute. Dr. Wright is currently working at the Canadian Forces Directorate of Flight Safety.

Aviation Medical Examiner Seminar Schedule

2011 Seminars		
June 13–17	Oklahoma City, Okla.	Basic (1)
August 26–28	Washington, D.C.	CAR (2)
October 6–8	Tucson, Ariz.	CAMA (3)
October 31–November 4	Oklahoma City, Okla.	Basic (1)
November 17–19	Portland, Ore.	NPN (2)

CODES

CAR Cardiology Theme

NPN Neurology/Neuro-Psychology/Psychiatry Theme

(1) A 4½-day basic AME seminar focused on preparing physicians to be designated as aviation medical examiners. Call your Regional Flight Surgeon.

(2) A 2½-day theme AME seminar consisting of 12 hours of aviation medical examiner-specific subjects plus 8 hours of subjects related to a designated theme. Registration must be made through the Oklahoma City AME Programs staff, (405) 954-3831 or -4830.

(3) This seminar is being sponsored by the Civil Aviation Medical Association (CAMA) and is sanctioned by the FAA as fulfilling the FAA recertification training requirement. Registration will be through the CAMA Web site: www.civilavmed.com.

The Civil Aerospace Medical Institute is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians.