Right Bundle Branch Block

Case Report, by Kevin D. Hettinger, MD

The prevalence of right bundle branch block in the general population is estimated at between 0.2% and 0.8%. Right bundle branch block in asymptomatic men without evidence of intrinsic cardiac pathology is a manifestation of a primary abnormality of the cardiac conduction system but has no demonstrable adverse effect on long-term cardiac morbidity or mortality. This article presents a case report of a first-class pilot who presented with new onset right bundle branch block, as well as associated aeromedical issues.

History

Your last patient on a Friday afternoon is a 61-yr-old male first-class pilot with over 8,500 hours of flight time applying for first-class medical recertification. The airman has been asymptomatic. He does walk for exercise without limitation. He denies exertional chest pain, shortness of breath, light-headedness, syncope, orthopnea, paroxysmal nocturnal dyspnea, edema, or palpitations. He has never been diagnosed with hypertension, although he does have dyslipidemia. He has never had a heart attack, heart failure, arrhythmia, stroke, transient ischemic attack, or thyroid disease. He does snore, but he has not been witnessed to stop breathing. He does feel well rested in the mornings. His sister has a history of supraventricular tachycardia, and his mother has a cardiac pacemaker. He has occasional caffeine intake and alcohol use and denies history of smoking or drug use. However, a routine electrocardiogram (ECG) reveals an incomplete right bundle branch block, which is new compared with the ECG from the year prior.

Aeromedical Issues

The primary aeromedical concern with new ECG changes are whether these changes are indicative of existing significant cardiac pathology or warning signs of a future cardiac event that could affect the airman’s ability to safely operate an aircraft.

The term bundle branch block (BBB) refers to impaired transmission of electrical impulses through specialized conduction pathways within the ventricles of the heart known as bundle of His and right and left bundle branches. Impaired conduction through each is termed left bundle branch block (LBBB) and right bundle branch block (RBBB). LBBB and right bundle branch block, separately, produce no symptoms and are recognizable only by duration of the QRS on ECG. Typically, complete right bundle branch block (CRBBB) is defined as a QRS complex of 0.12 sec in duration; incomplete right bundle branch block (IRBBB) is defined as a duration of greater than 0.1 but less than 0.12 sec.

When compared with control groups matched for the age at which RBBB appeared, men with RBBB showed no difference in the prevalence of antecedent coronary risk factors or obstructive lung disease. RBBB in asymptomatic men manifesting as a primary abnormality of the cardiac conduction system has no demonstrable adverse effect on long-term cardiac morbidity or mortality.

IRBBB among athletes is thought to result from enlarged right ventricular cavity size and increased cardiac muscle mass from exercising. It occurs in 35–50% of athletes, compared with 10% in young, healthy controls. Studies in this population support current consensus guidelines that suggest this ECG change does not require further investigation if the family/personal history and physical examination are normal and the athlete is asymptomatic.

IRBBB has a good long-term prognosis, usually does not progress toward high-degree A-V block, and its maximum prevalence is at ages 20–29 years with a sharp decrease at older ages. Therefore, certification of an IRBBB depends upon its etiology. The cardiac pathologies producing the pattern, which by themselves may be disqualifying, can be detected by noninvasive methods. If the pattern merely arises from a conduction disturbance or delay in the right bundle branch, it does not imply a risk; as an isolated modification of the ECG, it does not merit any limitation of flying activities. A number of USAF subjects with RBBB or LBBB have been maintained on flying status in the absence of objective evidence of cardiovascular disease.

Decision Considerations/Outcome

According to the Guide for Medical Examiners, for all classes, left and right bundle branch blocks require a cardiovascular examination (CVE) and a graded exercise stress test (EST). If there is no evidence of structural, functional, or coronary heart disease, the aviation medical examiner can issue; otherwise, the certification is deferred. A current cardiovascular evaluation must include:

- personal and family medical history assessment
- clinical cardiac and general physical examination
- assessment and statement regarding the applicant’s medications, functional capacity, and modifiable cardiovascular risk factors
- prognosis for incapacitation
- blood chemistries (fasting blood sugar, current blood lipid profile to include total cholesterol, HDL, LDL, and triglycerides) performed within the last 90 days

The Guide for Aviation Medical Examiners Disease Protocols further clarify that if the BBB has been previously documented and evaluated, no further evaluation is required. A medical
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The right bundle branch is a long, thin, and discrete structure composed of high-velocity conduction Purkinje fibres. It is located in the right side of the interventricular septum and occupies a subendocardial position in its superior and inferior thirds and deeper position in the middle third. The appearance of a right bundle branch block alters the ventricular activation sequence, produces a QRS prolongation, and changes the orientation for R- and S-wave vectors, thus generating a typical electrocardiogram pattern.

The prevalence of RBBB in the general population is estimated at between 0.2% and 0.8%, and it clearly increases with age. It may be associated with different cardiac structural diseases such as ischemic heart disease, myocarditis, hypertension, congenital heart disease, cor pulmonale, and pulmonary embolism. Its prognosis depends on the type and severity of the associated heart condition; for example, in patients with ischemic heart disease the presence of RBBB is a well-established mortality predictor. Data suggest an excellent prognosis in patients otherwise free of heart disease.\(^5\)

Certificate should not be issued to any class if the applicant has a new onset of a BBB. A RBBB in an otherwise healthy person 30 years of age or younger should not require a CVE. All others who do have a RBBB require a CVE, but a radionuclide study should not be required unless the standard exercise stress test cannot be interpreted. A stress echocardiogram may be sufficient in most cases. A LBBB in a person of any age should have a CVE and should include a pharmaceutical radionuclide perfusion study. Those individuals who have a negative work-up may be issued the appropriate class of medical certificate. No follow-up is required. If any future changes occur, a new current CVE will be required.\(^4\)

For those cases of new RBBB in young aviators (less than 30), the AME should consider consultation with the Regional Flight Surgeon or the Aeromedical Certification Division. An airman who has an incomplete RBBB pattern on previous ECGs, and then demonstrates a complete RBBB, does not require an evaluation.\(^11\)

Outcome

You referred the airman for cardiology specialty examination and a standard EST. The results of the EST were 1) negative, 2) rate-related BBB, and 3) good exercise capacity. The remaining cardiology examination and lab work revealed no other cardiac pathology or significant risk factors.

The airman was granted a first-class medical certificate with an eligibility letter stating, “…operation of aircraft is prohibited at any time new symptoms or adverse changes occur or any time medication and/or treatment is required.”

References


About the Author

Kevin D. Hettinger, MD, MOH, Lt Col, USAF, MC, SFS, was a resident in aerospace medicine when he wrote this case report at the FAA Civil Aerospace Medical Institute.