Teaching series

ELECTROCARDIOGRAPHIC ABNORMALITIES IN AIRCREW-III

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Case Report

63 yrs old asymptomatic commercial aircrew with no co-morbidities reported for his renewal medical examination. The individual was normotensive and all the general and systemic examination was unremarkable. A routine ECG was done as a part of evaluation protocol and showed abnormalities.

Questions

1. What are the findings on the ECG?
2. What is the diagnosis?
3. What is the possible aetiology?
4. What is the aeromedical significance of this finding?
5. How will you evaluate such cases?

Answers to aviation medicine quiz–

1) b  2) c  3) b  4) d  5) a  6) b  7) d  8) a  9) d  10) a  11) b
12) d  13) d  14) a  15) b  16) d  17) b  18) b  19) a  20) c
Answers to teaching series

1. The electrocardiogram shows:

The QRS complexes is prolonged (> 0.12 seconds)

Tall and notched R waves in lateral leads seen most prominently in lead AVL (RsR complex). The s wave represent the notched plateau.

Small initial r wave followed by a deep, wide S wave in lead V1 and V2. The small initial r wave is more prominent in lead V2 compared to V1.

Secondary ST-T wave changes: The ST segment and T waves are opposite in direction to the terminal QRS deflection. The ST segment is thus depressed (minimally convex upwards) in the lateral leads with associated T wave inversion. The T wave in lead V1 and V2 is asymmetrical and upright with ST segment elevation.

2. Complete left bundle branch block (LBBB)

LBBB is the result of a delay or interruption of conduction with on the left bundle branch. It can occur at any of the several sites in the intraventricular conduction system including the main left bundle branch, in each of the two fascicles, or less commonly, with in the fibres of the bundle of His. A delay of conduction manifests as incomplete bundle branch block while a complete interruption, manifests as complete LBBB.

3. Bundle branch block may occur in a variety of conditions. In subjects without structural heart disease, right bundle branch block is seen more commonly than left bundle branch block. Left bundle branch block is often a marker of one of four underlying conditions associated with increased risk of cardiovascular morbidity and mortality: coronary heart disease (frequently with impaired left ventricular function), hypertensive heart disease, aortic valve disease, and cardiomyopathy. Bundle branch blocks may be chronic or intermittent. A bundle branch block may be rate-related, for example, it often occurs when the heart rate exceeds some critical value.

4. Complete LBBB indicates organic heart diseases and is commonly associated with ischaemic and hypertensive heart disease. In virtually all of the available studies that examined the clinical course of patient with new onset LBBB, the morbidity and mortality are significant, especially if coronary artery disease is present. In the Framingham Study, for instance, only 15% of patients with new LBBB were free of heart disease 10 years after initial diagnosis. Amongst patients with coronary artery disease, the presence of LBBB correlates with more extensive disease, more severe left ventricular dysfunction, and reduced survival rates. Patients with associated left axis deviation have more severe clinical manifestations.

In addition to the hemodynamic abnormalities produced by these underlying conditions, the abnormal ventricular activation pattern of LBBB itself induces hemodynamic perturbations, including abnormal systolic function with dysfunctional contractile patterns, reduced ejection fraction and lower stroke volumes, and abnormal diastolic function. There is increased risk of sudden incapacitation in the aircrew and thus needs to be evaluated extensively and periodically.

5. Evaluation of a case of LBBB in an aircrew includes

(a) Evaluation for modifiable coronary artery disease risk factors: smoking, obesity, hypertension, diabetes and dyslipidemia

(b) Echocardiography shows septal motion abnormality, but can also provide information about underlying coronary artery disease as
well as the left ventricular systolic and diastolic function.

(c) Stress Testing: Exercise induced ST segment depression is found in most patients with LBBB and cannot be used as a diagnostic or prognostic indicator regardless of the degree of ST segment abnormality. As the conduction abnormality precludes the use of conventional ECG criteria for the diagnosis of exercise induced ischemia myocardial perfusion imaging is the procedure of choice. In patients with LBBB without prior myocardial infarction, resting myocardial perfusion images are generally normal. However the septum is generally thin and in old patients the left ventricle is often dilated.

A number of investigators have reported exercise induced myocardial perfusion defect in anteroapical and anteroseptal areas in patients with complete LBBB and angiographically normal coronary arteries. In some patients, partial or complete reversibility of these defects has been observed.

(d) Coronary angiography