Acquired Right Bundle-Branch Block and Left Anterior Hemiblock in Ostium Primum Atrial Septal Defect

By Dwain L. Eckberg, M.D., John Ross, Jr., M.D., and Jacob R. Morgan, Capt., MC, USN

SUMMARY

Over a 3-year period of observation, the electrocardiogram in an adult patient with an ostium primum atrial septal defect changed from first-degree atrioventricular block alone to right bundle-branch block and left-axis deviation (left anterior hemiblock) with variable atrioventricular block. Coronary atherosclerosis was excluded by selective coronary arteriography. Although right bundle-branch block and left anterior hemiblock are commonly present at birth in patients with endocardial cushion defect, this is believed to represent the first reported instance in which these electrocardiographic abnormalities have developed under observation in later life. It is postulated that chronic hemodynamic stress contributed to the progression of disease in the conduction system.

Additional Indexing Words:

First-degree atrioventricular block
Complete atrioventricular block
Endocardial cushion defect
Second-degree atrioventricular block
Coronary arteriography
Left-axis deviation

Left-axis deviation with right bundle-branch block is of value in distinguishing patients with ostium primum atrial septal defect (incomplete endocardial cushion defect) from those with ostium secundum atrial septal defect.1-3 Blount and co-workers2 ascribed the left-axis deviation to left ventricular hypertrophy resulting from associated mitral regurgitation. Toscano-Barbosa and colleagues,4 on the other hand, held that the conduction disturbances in this condition were due to a congenital abnormality of the conduction system, unrelated to mitral regurgitation or other pathophysiologic disturbances.

The present report describes a 44-year-old woman with an ostium primum atrial septal defect in whom the electrocardiogram changed from first-degree atrioventricular block to variable atrioventricular block associated with complete right bundle-branch block and left anterior hemiblock, over a 3-year period of observation. This is believed to be the first reported case of this congenital defect in which the typical conduction disturbances developed in later life.

Case Report

A 44-year-old female was first noted to have a heart murmur at 12 years of age. She bore four children without difficulty, but at 35 years of age she developed easy fatigability and dyspnea on exertion, which was slowly progressive over the 3 years prior to admission. She also noted chest discomfort, not

From the Department of Cardiology, U. S. Naval Hospital, San Diego, California, and Department of Medicine, School of Medicine, University of California at San Diego, La Jolla, California.

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Address for reprints: Capt. J. R. Morgan, USN Box 161, U. S. Naval Hospital, San Diego, California 92134.

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of the mean frontal QRS axis superiorly and to the left.

Discussion

Between the ages of 38 and 41 years, this patient’s scalar electrocardiograms changed from mild first-degree atrioventricular block, to variable, more-advanced atrioventricular block associated with complete right bundle-branch block and left-axis deviation. The patient’s most recent electrocardiogram (fig. 1) satisfied the criteria for the diagnosis of bifascicular disease involving the right bundle branch and the anterior superior division of the left bundle branch. These features included: (1) typical, complete right bundle-branch block; (2) left-axis deviation, and a mean vector for the first half of the QRS interval at about $-60^\circ$ with a small rS in lead II; and (3) small, normal Q waves in leads I and aV L. Although the presence of first-degree atrioventricular block is compatible with concomitant disease in the posterior division of the left bundle branch (trifascicular block), this diagnosis cannot be made with confidence from scalar electrocardiograms. It is of interest, however, that complete atrioventricular block occurred transiently in this patient.

There are several possible explanations for progression of disease of the conduction tissue in patients with ostium primum atrial septal defect, as documented in the present report. The right bundle branch and the anterior superior division of the left bundle are thinner than the posterior division of the left bundle and therefore vulnerable to injury by passive stretch resulting from atrial or ventricular enlargement. Several studies have demonstrated that the right bundle branch and the anterior division of the left bundle lie near the rim of the endocardial cushion defect. Progressive, chronic endocardial fibrosis, caused by turbulence in the region of the defect could directly damage these contiguous conduction fascicles. Of course, bifascicular disease also could develop as a coincidental feature in an older patient. However, in the present patient coronary atherosclerosis was excluded by selective coronary arteriography. Other
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causes of disease in the conduction fascicles, such as sclerosis of the cardiac skeleton\textsuperscript{10} and scleral degenerative changes\textsuperscript{11} of the cardiac conduction tissue, would be unusual in a young patient.

Lev\textsuperscript{7}, Visioli\textsuperscript{8}, and Feldt\textsuperscript{6} and their associates have shown that anatomical displacement of the normal conduction tissue is a relatively constant finding in endocardial cushion defect. Rossi\textsuperscript{12} demonstrated disruption, interruption, and absence of fascicles in endocardial cushion defect, and Visioli and co-workers\textsuperscript{8} described interruption of conduction fascicles with anomalous insertion of chordae tendineae directly into the free wall of the left ventricle.

The fact that left-axis deviation is present at birth in many infants with incomplete endocardial cushion defect was used by Burchell and associates\textsuperscript{13} as circumstantial evidence that left-axis deviation results from a congenital abnormality of conduction tissue. An explanation for left-axis deviation was also presented by Durrer and associates\textsuperscript{14} who found abnormally early activation of the posterior-inferior surface of the left ventricle, which they ascribed to early takeoff and foreshortening of the posterior division of the left bundle branch from the bundle of His. Burchell and co-workers\textsuperscript{19} using similar techniques, were unable to corroborate these findings, however. This mechanism seems unlikely in our patient since the earliest electrocardiographic tracings showed normal left ventricular activation.

The findings in the present patient indicate that in rare instances right bundle-branch block and left anterior hemiblock will not be present at birth in patients with ostium primum atrial sepal defect but will develop later, presumably as a result of chronic abnormal hemodynamic stresses. Although this is believed to be the first reported case in which these conduction disturbances have developed after birth, partial regression of conduction abnormalities has been reported following surgical repair. Thus, Levy and associates\textsuperscript{15} reported that in 28 of 32 patients left-axis deviation was less marked following surgical repair of the lesion, and three patients with left-axis deviation preoperatively had normal mean frontal QRS axes postoperatively. These observations support the view that the conduction disturbances in some patients are at least in part dependent upon longstanding physiologic stresses. Finally, the present findings indicate that acquired trifascicular block may occur, and should be watched for, during the natural course of patients with ostium primum atrial sepal defect.

References


Figure 1

Serial electrocardiograms demonstrating progression of conduction disturbances in a patient with ostium primum atrial sepal defect. See text for details.


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