Interesting Electrocardiogram

INTERMITTENT INTRAVENTRICULAR CONDUCTION DEFECTS

M. Irene Ferrer, MD

Instability of intraventricular conduction raises some very interesting questions. When the form of the QRS complex changes during supraventricular rhythm (sinus, atrial fibrillation, supraventricular tachycardias) a number of explanations exist. When one rules out intermittent pre-excitation of the WPW type (Figure 1) as the cause of a changing QRS, the possibilities remaining are various forms of bundle branch block.

A. Intermittent Right Bundle Branch Block (RBBB)

1. Although the commonest form of Incomplete RBBB (IRBBB) is a fixed one (non-changing) and is usually of congenital and benign origin, it may occur in acquired form with acute pulmonary emboli, right ventricular hypertrophy, myocarditis, and after intracardiac surgery. Even an intermittent form of IRBBB can, therefore, alert one to these events.

2. Alternating incomplete and complete RBBB (Figure 2) is usually seen when there is active organic disease in the conduction system and where sooner or later complete RBBB will remain.

3. Rate-related intermittent complete RBBB (CRBBB). The relationship of the heart rate to the appearance of CRBBB is often very precise, e.g., no RBBB at rates between 60 and 65/min. but the CRBBB is seen if rates rise over 65 (Figure 3). This finding carries no risk and can be ignored.

B. Intermittent Left Bundle Branch Block (LBBB)

1. Incomplete LBBB (ILBBB). In contrast to complete RBBB, this IV conduction defect almost always goes on to become complete LBBB and indicates organic disease which is in an active stage. It carries, therefore, the same risk as complete LBBB.

2. Occasionally one can find intermittent or alternating incomplete and complete LBBB on routine electrocardiograms or leads from Holter monitoring and these eventually end up as complete LBBB.

Intermittent Intraventricular Conduction Defects

3. Rate-related intermittent complete LBBB (CLBBB) (Figure 4). In contrast to rate-dependent RBBB, a common occurrence, rate-dependent complete LBBB has a very different risk. It generally appears at rates between 75 and 80/min. and not at very fast rates, indicating a pathologic condition of the left bundle and not a physiologic variant in this (left) bundle’s refractory period as occurs with rate-related RBBB. Secondly, all cases of intermittent LBBB, whether rate-related or periodic, eventually become constant LBBB with all the implications of this lesion.

Changing Forms of Intraventricular Conduction Defects

Occasionally various sites in the intraventricular conduction system are attacked by disease but show dysfunction only periodically. This tracing (Figure 5) illustrates variations in conduction in the right bundle branch while the left anterior fascicle remains blocked on all beats. The record shows atrial fibrillation, and all but one QRS complex (the first, on the extreme left) shows bifascicular block, i.e., RBBB and the marked left axis deviation (MLAD) characterizing left anterior fascicular block. The first beat, however, shows no RBBB and the QRS is narrower with a MLAD indicating left anterior fascicular block alone. The modest ventricular rate of 83-90/min. (no digitalis being taken) indicates AV blocking due either to AV node or His bundle disease. The unstable over-all AV conduction suggests the possible future onset of complete, or third degree, AV block.

Reference


Consultant in Cardiology, Metropolitan Life Insurance Company. Professor Emeritus of Clinical Medicine, College of Physicians and Surgeons, Columbia University. Consultant Electrocardiographer, Presbyterian Hospital, Columbia Presbyterian Medical Center, New York, New York.
Figure 1
Intermittent WPW

Every other beat shows pre-excitation of the WPW type.
Figure 2

Alternating Incomplete and Complete RBBB

The sinus beat at the start of every lead set has a QRS of 0.10 sec. duration and the following or second beat has a QRS of 0.13 sec. duration. This alternation between Incomplete and Complete RBBB is best seen in lead V1 where the rR' is seen on all beats, with the wider QRS present on the second and fourth beats. The wide QRS might be misinterpreted as a VPC but has the same PR as the narrow QRS.
In the first four beats the rate is between 60 and 65/min. and CRBBB is seen. When the rate shows below 60 (see lead I where rate is 58 in beats 5 to 8) the CRBBB is gone.
The first four beats have normal QRS-T waves at rates between 67 and 71/min. When the rate reaches 75/min. (marked with arrow) there is complete LBBB.
Figure 5
Changing Forms of IVCD