Numerous electrocardiographic, clinical and pathologic studies support the concept of a trifascicular bundle branch system in man. Vectorcardiographic criteria have been formulated for the diagnosis of left anterior hemiblock, left posterior hemiblock and the combination of left anterior hemiblock and right bundle branch block. The development of techniques for recording timed vectorcardiograms has recently afforded an opportunity to record the vectorcardiographic manifestations of transient fascicular blocks in both single and biplane modes. We describe here the graphic recordings from two patients with intermittent bundle branch block which exemplify the use of the timed Frank vectorcardiogram (running loop) for the graphic display of such conduction disturbances.

CASE REPORTS

Figure 1 shows the frontal and horizontal plane timed vectorcardiograms (not simultaneous) recorded from a 77-year-old man with coronary artery disease, atrial fibrillation, left anterior hemiblock, right bundle branch block and recurrent Stokes-Adams syncope. A right ventricular endocardial demand pacemaker was inserted for treatment of the syncopal episodes. In the frontal plane, timed vectorcardiogram, paced beats 1, 2 and 3 manifest left axis deviation and left bundle branch block configurations with delay of the middle and terminal 70 msec QRS vectors. Conducted beats 4 through 8 result in superior and leftward directed QRS loops with terminal delay which are diagnostic of left anterior hemiblock. In the horizontal plane, beats 1, 2, 7 and 8 are conducted with a right bundle branch block pattern. The QRS loops are oriented in an anterior direction with terminal delay in the right anterior quadrant. Paced beats 3 through 6 (rate 88/minute) conduct with an atypical left bundle branch block pattern.

Figure 2 shows the simultaneously recorded frontal and horizontal plane timed vectorcardiograms obtained from a 73-year-old man with coronary artery disease, atrial fibrillation, left bundle branch block and intermittent left anterior hemiblock with right bundle branch block. The first two beats (1 and 2) are conducted with frontal plane left axis deviation.

Figure 1. Frontal (FP) and horizontal plane (HP) timed Frank vectorcardiograms recorded from a 77-year-old man with coronary artery disease, atrial fibrillation, left anterior hemiblock, right bundle branch block and Stokes-Adams syncope. (PA = pacemaker artifact). The QRS loops are interrupted at 2 msec intervals. (See discussion)
and left bundle branch block at a heart rate of 85/minute. The next three beats (3 through 5) are conducted with a left anterior hemiblock and right bundle branch block pattern and their R-R intervals differ by 40 milliseconds. The last five beats conduct with a left axis deviation and left bundle branch block pattern (6 through 10). Of interest was the frontal plane QRS loop of the first beat in this latter group, (beat 6). The frontal plane QRS axis of this beat was identical with that seen during left anterior hemiblock (-60°) at a time when it conducted with a left bundle branch block configuration.

**Discussion**

The records described here illustrate the usefulness of the timed Frank vectorcardiogram for the recognition of intermittent bundle branch block. Transient left anterior hemiblock and right bundle branch block during conducted supraventricular impulses in case 1 suggest that this patient's Stokes-Adams syncope was based on intermittent trifascicular block.\(^1\) The marked leftward displacement of the frontal plane QRS loops in this case confirm Rosenbaum's contention that in the presence of left anterior hemiblock, right bundle branch block effects a more superior and rightward shift of the frontal plane QRS axis in a counterclockwise fashion.\(^1\) Appearance of left anterior hemiblock and right bundle branch block in conducted beats after right ventricular pacemaker insertion has been recorded with standard scalar electrocardiographic techniques, and has been ascribed to resumption of antegrade A-V conduction through the left posterior fascicle.\(^10\)

Biplane running loops obtained in the second case were especially noteworthy. Persistent left axis deviation during right bundle branch block and left bundle branch block suggests a block of the left anterior fascicle throughout the recording. Alternating periods of right bundle branch and left posterior fascicular conduction then ensued, with complete left bundle branch block usually evident during more rapid ventricular rates.\(^11\) An identical superiorly displaced frontal plane maximal QRS vector during right and left bundle branch block suggests that either simultaneous mainstem left bundle branch block and left anterior hemiblock or partial left posterior hemiblock and left anterior hemiblock were operative in this patient.\(^12\)

In conclusion, the timed Frank vectorcardiogram is a practical and valuable technique for graphically displaying transient bundle branch blocks.

**References**