Syncope Due to Positional Alternating Bundle Branch Block

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Abstract

We present the case of a 69-year-old female who described recurrent abrupt syncope associated only with recumbency or leaning forward. She had preexisting LBBB on her ECG, and a structurally normal heart. An implantable loop recorder captured episodes that were flagged as "asystole" and "pause detected," but analysis of the recordings provided the correct diagnosis, and possible insight into the association with recumbency.

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Key Words

Alternating bundle branch block • Recumbent syncope

Case Report

Alternating bundle branch block (BBB) is a class I indication for implantation of a permanent pacemaker [1], irrespective of symptoms. It is a harbinger of complete failure of conduction, and can present as unpredictable and sudden syncope. We describe a case where both syncope and alternating BBB were triggered by change in body position.

A 69-year-old female with a history of hypothyroidism and mild bronchospasm was referred for evaluation of recurrent syncope. She described five episodes of syncope over the last 9 months, each triggered by change in body position—either leaning back or lying down on her side. Three of these events occurred during yoga practice. The events were abrupt in onset without any premonitory symptoms; the resulting loss of consciousness was complete but brief, lasting

less than 10 seconds in duration; and each episode was self-limited. Three of the five episodes were witnessed by her yoga instructor, and there was no seizure activities, loss of bladder or bowel continence, post event confusion, disorientation, or weakness. She had other episodes of presyncope as well, without loss of consciousness but with greying of vision, also triggered by similar changes in body position.

Her physical examination was completely within normal limits. There was no abnormal orthostatic change in heart rate or blood pressure. Given the positional nature of her symptoms, we performed sequential bilateral carotid massage in both supine and seated positions; however, no bradyarrhythmias were provoked. Her resting ECG showed incomplete or complete left bundle branch block, which was known for the past four years, with QRS duration measurements ranging from 110 to 130 ms. An echocardiogram revealed a structurally normal heart.

She was offered the choice of a diagnostic EP study, an extended period of outpatient monitoring, an implantable loop recorder, or an empiric pacemaker. After obtaining a second opinion, she opted for the loop recorder, and a Medtronic Reveal Linq device was inserted subcutaneously at the fourth left intercostal space. The telemetered R waves measured 0.6 to 0.8 mV.

Upon interrogation of the device a week post implant there were multiple instances flagged by the device as "asystole." Review of the stored ECGs revealed abrupt changes in QRS vector and amplitude resulting in undersensing (Figure 1). Because of her

Figure 1. Two representative stored tracings of changing conduction patterns. (A) The ECG changes from a left BBB to right BBB back to left BBB. (B) There are varying degrees of incomplete right BBB, ending with a non-specific conduction delay pattern. Note the intermittent loss of sensing due to changing QRS signal amplitude, resulting in the incorrect detection of “asystole” or “pause” by the device.

history of positional symptoms, we elected to run real-time telemetry from her recorder while the wand was held firmly over the recorder location. Figure 2 shows the ECG changes that were recorded as the patient changed position from sitting to lying on her left side (A), from sitting to lying on her right side (B), and from sitting to leaning forward (C).

A permanent pacemaker was inserted within the next few days.

Discussion

Alternating BBB is a well-known cause of syncope, and reflects bilateral bundle branch disease. ECG manifestations may vary, often resulting in changing patterns of complete and incomplete BBB [2]. Syncope in the setting of alternating BBB is thought to occur when both bundles fail to conduct at the same time, resulting in abrupt asystole. The transition from conduction over one bundle to the other is often interspersed by one narrower QRS complex, which represents equally delayed conduction down

both bundle branches, as evidenced in each of the 3 tracings in Figure 2. Conduction over each bundle may be (but does not necessarily have to be) associated with noticeable changes in PR interval [3]; such PR interval changes were not seen on the majority of the ECGs, but one stored example was found that demonstrated a 40 ms increase in PR interval when conduction occurred over the diseased left bundle branch (Figure 3).

Our initial concern was that the changes in QRS complex morphology were due to actual movement of the recorder in the subcutaneous tissues at the base of the left breast, resulting in a change in the perceived QRS vector. However, we excluded that possibility by: (a) ensuring that the Medtronic programmer head (wand) was firmly held against the chest wall, so that there was no displacement of the recorder with body motion; (b) the observation of the narrower QRS complex at the point of transition; (c) the observation that there was no discernible change in the P wave vector, which should have also changed if it was the recorder that was shifting; and (d) the associated PR interval change as shown in Figure 3.

Figure 2. Real-time telemetered signals with the wand held firmly over the implanted loop recorder as the patient was instructed to change body positions. (A) The patient changed position from sitting to lying on her left side, and the QRS complex changes from right BBB to left BBB morphology. (B) The patient changed from sitting to lying on her right side, and the QRS complex changed from left BBB to right BBB morphology. (C) The patient was instructed to lean forward, and then sat back up; the ECG changes from left BBB to right BBB and back to left BBB. Note the narrower QRS complexes (marked *) and altered T waves at the point of transition in conduction from one bundle to the other in each instance. There is minimal change in sinus rates, making rate-related BBB unlikely.

Upon reviewing the English language literature, we encountered very few examples of positional changes in the ECG. The earliest such report was prior to the development of precordial or augmented leads, dating back to 1933 [4]; in fact, the authors recommended that no attempt be made to designate the bundle branch involved, and that instead all such cases be called “intraventricular block of the bundle-branch type”. This assertion was then challenged in 1935 based on studies in dogs and monkeys [5]. In the setting of severe acute asthma, new right BBB and other ECG changes have been attributed to changes in right sided filling pressures and hyperinflation of the lungs [6]. We were unable to find any prior report on alternating BBB related to change in body position.

We also considered causes of syncope associated with changes in body position. The commonest etiology would be orthostatic syncope, with gravitational stress associated with arising from recumbency or

from the seated position; however, our patient had the opposite situation, with syncope occurring with recumbency or leaning sideways. Carotid hypersensitivity causes syncope with head turning, and this was also excluded. Dizziness with recumbency associated with rotatory symptoms may be a manifestation of vertigo due to inner ear disease, but this too was not applicable to our patient. We came across a report of experimentally induced severe hypoxia causing recumbent syncope in 2% of healthy participants [7]. Seizures may occur during any position; syncopal seizures have been described during recumbency [8].

Finally, we reviewed the data on changes in ventricular filling pressures with changes in body position. In healthy male volunteers, recumbency increased the average right ventricular systolic pressure from 18.6 to 22.8 mmHg and end diastolic pressure from 0.2 to 5.1 mmHg [9]. Although not directly studied with simple recumbency in health, there are data in patients with

Figure 3. Analysis of one stored ECG shows a 40 ms increase in PR interval with the development of RBBB, consistent with slower conduction in the diseased left bundle branch.

sepsis and circulatory failure that describe right ventricular stretching by an average of 20% (range 14 to 29%) with leg elevation [10]. Positional changes, especially during yoga, are likely to be associated with some degree of Valsalva maneuver due to tensing of core abdominal muscles; it has been well described that right heart pressures increase with the release phase of the Valsalva maneuver [11]. It is conceivable that such elevations in pressure and right ventricular stretch may affect conduction in a diseased right bundle branch, resulting in RBBB and switch conduction to the opposite (left) bundle branch.

It should be noted that paroxysmal AV block was the most likely etiology of syncope, but the patient did not experience syncope in the short period of time while the ILR was in situ, and she was asymptomatic during the recordings showing alternating BBB. Therefore, no definite proof exists that paroxysmal AV block was the actual cause of her syncope, al-

though she has not had any recurrence of symptoms in the past 8 months since pacemaker implantation.

In summary, we report an unusual case of changing BBB and syncope related to changes in body position. The exact explanation is unknown, but one may conjecture that it may be related to changes in right and left ventricular filling pressures/stretch, changes in sympathovagal balance, or mechanical effects of cardiac displacement within the chest secondary to changes in body position.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

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