Transient Left Bundle Branch Block Induced by Left-Sided Cardiac Catheterization in Patients Without Pre-Existing Conduction Abnormalities

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A traumatic left bundle branch block (LBBB) is uncommon in a patient with intact atrioventricular conduction. Three of our patients developed LBBB during a left-sided catheterization. Two patients suffered from angina pectoris and the other had an abdominal aneurysm. Two of them had a history of hypertension. None of the patients had ever shown any conduction abnormalities before the catheterization. The electrocardiogram just before the examination was normal in all 3 patients. LBBB was observed when a catheter was introduced into the left ventricle, and lasted 2-4 min without significant change in heart rates. Examination revealed no significant stenosis proximal to the first septal perforator and normal left ventricular contraction in all patients. One patient developed permanent LBBB 14 months later. Catheter-induced LBBB may occur easily with certain anatomical characteristics of the left bundle branch or the distal His bundle, with or without some concealed damage to the conduction system. It is important to keep this complication in mind and to pay adequate attention to patients’ electrocardiograms as well as their angiographical findings, especially in those with pre-existing right bundle branch block. (Jpn Circ J 1998; 62: 146-149)

Key Words: Left-sided cardiac catheterization; Left bundle branch block; Complication

Transient left bundle branch block (LBBB) is caused by changes in heart rate, autonomic nervous tone, or mechanical damage. Generally, traumatic LBBB is believed to be rare because the left bundle branch in humans has a fan-like structure. Recently, we had 3 patients with transient LBBB during left-sided catheterization. None of them had a pre-existing conduction abnormality or was taking any medicine that causes deterioration in intraventricular conduction.

Case Presentations

Case 1
A 49-year-old woman was referred to our hospital because of recurring chest pain. She had suffered from hyperthyroidism, which had been successfully treated. An electrocardiogram on admission showed normal QRS complexes with a QRS duration of 0.10 sec, a normal QRS axis, and a PQ interval of 0.12 sec. Master’s 2-step exercise test showed no abnormalities. She underwent a cardiac catheterization. When a 7-Fr Sones catheter was passed through the aortic valve, LBBB occurred with no change in heart rate. The catheter was withdrawn immediately. LBBB was observed alternatively for 60 sec and resolved spontaneously (Fig 1). The catheter examination revealed 90% stenosis in the second diagonal branch and normal contraction of the left ventricle. She was prescribed nitrates and diltiazem. Although her clinical course had been uneventful and there was no significant change in heart rates, she developed permanent LBBB 14 months after the initial catheterization. A second cardiac catheter examination confirmed that the coronary lesion had not changed and there was no evidence of myocardial infarction.

Case 2
A 57-year-old man was referred to our hospital with a 4-month history of angina. He had had hypertension for more than 10 years. An electrocardiogram on admission showed sinus rhythm with narrow QRS complexes (with a duration of 0.1 sec) and normal QRS axis; the PQ interval was also normal (0.14 sec). Master’s 2-step exercise test showed ST depressions in the left precordial leads but no evidence of LBBB. The patient underwent a cardiac catheterization. When an 8-Fr Sones catheter was snared into the left ventricle, he developed LBBB with no change in heart rate. In addition, the electrocardiogram and pressure curve showed that the left ventricular systolic pressure dropped about 10 mmHg at the same time (Fig 2). LBBB ceased immediately the catheter was withdrawn from the ventricle. It was observed repeatedly when the tip of the catheter struck the interventricular septum a few centimeters below the aortic valve (Fig 3). Examination revealed 90% stenosis in the proximal segment of the left anterior descending artery distal to the first septal perforator, 75% stenosis in the first diagonal branch, and normal contraction of the left ventricle.
Later, the patient was given 3 other cardiac catheterizations, including a successful angioplasty in the left anterior descending artery lesion. However, there has been no recurrence of LBBB for 54 months since then.

**Case 3**

A 73-year-old woman was referred to our hospital for evaluation of an abdominal aortic aneurysm. She had had a history of hypertension for 3 years. An electrocardiogram on admission showed narrow QRS complexes of 0.10 sec in duration, and normal QRS axis and PQ interval (0.12 sec). During a catheter examination, LBBB was observed when an 8-Fr Sones catheter was introduced into the left ventricle, with no change in heart rate. The QRS complex showed LBBB which was gradually resolved within 15 min (Fig 4). Examination revealed no significant lesions in the coronary arteries, normal contraction of the left ventricle, and an aneurysm of the abdominal aorta that was 6 cm in diameter. The patient underwent surgical treatment with no complications. There has been no recurrence of conduction disturbances for 45 months.
CASE 3 73 y.o. female

before catheter in LV 4 min later 15 min later

II

Vs

mm/Hg pressure

150 Ao

100

50

0

Fig. 4. The electrocardiogram and pressure curve during catheterization in case 3. LBBB was observed following the introduction of an 8 Fr Sones catheter into the left ventricle. The QRS complex was gradually recovered within 15 min.

Discussion

LBBB is an uncommon complication of left-sided cardiac catheterization. As the trunk of the left bundle branch is short and divides immediately into different fascicles (ie, shows a fan-like formation), it is believed to be resistant to a single trauma, whereas the right bundle branch, running as a narrow unbranched stem, is sometimes injured during right-sided catheterization.1—4 However, some patients may have anatomical features that make them vulnerable to LBBB. Massing and James5 reported that the width of the left bundle branch origin varies with the individual, ranging from less than 1 mm to 14 mm, and the unidiabetic left bundle branch stem sometimes extends for 20 mm or more. Patients with these narrower origins are prone to a catheter thrust, causing LBBB. In addition, the distal His bundle runs just under the left ventricular endocardium. For example, it is known that a His bundle deflection is recorded in the aorta from the non-coronary cusp and from just inside the ventricle under the aortic valve.6 In addition, the left bundle fascicles are occasionally already divided from the right at the distal His bundle. Thus, in these anatomically vulnerable subjects, a single touch of the catheter may readily induce LBBB.

One patient (case 1) developed permanent LBBB 14 months after the initial catheterization. There are 2 possible explanations for this. One is that this patient already had concealed damage of the left bundle branch or distal His bundle, and that this is why transient LBBB was readily provoked. The other explanation is that the left bundle branch injury was irreversible, although LBBB disappeared immediately. Taking this into consideration, Feit et al8 implanted a cardiac pacemaker in all patients who developed conduction failure during left-sided catheterization. Although we did not implant a pacemaker because our patient had been asymptomatic and no heart block was indicated, it is necessary to follow these patients carefully because of the possibility of latent conduction abnormalities.

It has been shown that left ventricular performance is influenced by asynchronous wall motion as a result of LBBB in a functionally normal heart.9—12 We confirmed this: the left ventricular pressure dropped about 10 mmHg when the patient developed LBBB (case 2).

We believe that catheter-induced LBBB is more prevalent than has been generally supposed, as we experienced 3 cases within 3 months. For example, angiologists occasionally notice temporary series of wide QRS complexes that are often too short to be recorded or to be taken seriously. It is possible that some of these electrocardiographic abnormalities are catheter-induced LBBB. Recognizing the risk of this complication is especially important for patients with right bundle branch block, because induced LBBB would mean consequent complete atrioventricular block.13—19

LBBB is rare, but a possible complication of left-sided cardiac catheterization. It may occur relatively easily in subjects with certain anatomical characteristics of the left bundle branch or the distal His bundle with or without some concealed damage of the conduction system. It is important to keep this risk in mind and to pay adequate attention to the patient's electrocardiogram as well as the angiographical findings, especially in patients with pre-existing right bundle branch block.

References


