CASE REPORT

Is It Complete Left Bundle Branch Block? Just Ablate the Right Bundle

Hussam Ali, M.D., F.E.S.C.,* Pierpaolo Lupo, M.D.,* Sara Foresti, M.D.,* Guido De Ambroggi, M.D.,* Gianluca Epicoco, M.D.,* Angelica Fundaliotis, M.D.,* and Riccardo Cappato, M.D., F.E.S.C., F.H.R.S.†

From the *Arrhythmia and Electrophysiology Unit II, Humanitas Gavazzeni Clinics, Bergamo, Italy; and †Arrhythmia and Electrophysiology Research Center, Humanitas Clinical & Research Center, Rozzano, Italy

Complete left bundle branch block (LBBB) is established according to standard electrocardiographic criteria. However, functional LBBB may be rate-dependent or can perpetuate during tachycardia due to repetitive concealed retrograde penetration of impulses through the contralateral bundle “linking phenomenon.” In this brief article, we present two patients with basal complete LBBB in whom ablating the right bundle unmasked the actual antegrade conduction capabilities of the left bundle. These cases highlight intriguing overlap between electrophysiological concepts of complete block, linking, extremely slow, and concealed conduction.

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left bundle branch block; right bundle ablation; bundle branch reentry; concealed conduction

Complete left bundle branch block (LBBB) is established according to standard electrocardiographic criteria.¹ The term complete conduction block at the level of a cardiac tissue/structure usually refers to the inability of impulses to propagate and traverse that tissue/structure. However, functional LBBB may be rate-dependent or can perpetuate during tachycardia due to repetitive concealed retrograde penetration of impulse through the contralateral bundle “linking phenomenon.”² In this brief article, we present two patients with basal complete LBBB in whom ablating the right bundle unmasked the actual antegrade conduction capabilities of the left bundle.

CASE 1

A 67-year-old man with ischemic dilated cardiomyopathy and a biventricular defibrillator underwent an electrophysiology study because of recurrent episodes of ventricular tachycardia requiring multiple device therapies. Basal

recordings showed sinus rhythm with a complete LBBB pattern (QRS = 180 ms) and a prolonged HV interval of 90 ms (Fig. 1A). Programmed and overdrive atrial pacing reproducibly induced counterclockwise bundle branch reentry ventricular tachycardia (Fig. 1B), that was successfully ablated by targeting the proximal right bundle branch (RBB).

Due to the preexisting complete LBBB pattern, complete AV block was expected to occur after RBB ablation. However, sinus rhythm was restored with spontaneous 1:1 AV conduction showing complete RBBB, a 1st degree AV block and marked infra-Hisian delay with an HV interval of 210 ms (Fig. 1C).

CASE 2

An 83-year-old man with sick sinus syndrome and a dual-chamber pacemaker was referred to our center for AV junction ablation because of recurrent episodes of atrial tachyarrhythmia with rapid ventricular rates despite optimized

Address for correspondence: Hussam Ali, MD, FESC, Arrhythmia and Electrophysiology Unit II, Humanitas Gavazzeni Clinics, Via M. Gavazzeni 21 – 24125 Bergamo, BG, Italy. Fax: +39 0282246453; E-mail: hussamali.ep@gmail.com

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Figure 1. Top: 12-lead ECG and intracardiac recordings at basal sinus rhythm (A), during bundle branch reentry (B) and sinus rhythm after successful ablation (C); the gray arrows in Panel B indicate His potentials during tachycardia. Bottom: schematic design of the proposed corresponding patterns of impulse propagation. AVN = AV node; CS = coronary sinus; HB = His bundle; LBB = left bundle branch; RA = right atrium; RBB = right bundle branch; RV = right ventricle.

pharmacological therapy. Basal recordings (Fig. 2A) showed sinus rhythm with complete LBBB (QRS 150 ms) and normal AH and HV intervals (90 and 50 ms, respectively). Catheter ablation was initially performed at the His bundle level but did not obtain any effect probably due to poor catheter stability via a femoral approach. Considering the basal complete LBBB pattern, the ablation catheter was slightly moved more distally to target the RBB. Despite the preexistent complete LBBB, RBB ablation did not cause complete AV block but induced RBBB and 2:1 AV block at infra-Hisian level (Fig. 2B). This result was considered appropriate and confirmed through the follow-up by providing adequate rate control during

atrial tachyarrhythmias and, at the same time, saved the patient from being completely pacing-dependent.

COMMENTARY

In the first case, the apparent complete LBBB before ablation was due to extremely slow antegrade conduction over the LBB and collision with concealed retrograde conduction « linking » over the RBB (Fig. 1A/bottom). Despite the basal complete LBBB pattern, the LBB was capable of conduction both retrogradely during tachycardia (Fig. 1B/bottom) and antegradely during sinus rhythm as confirmed after RBB ablation (Fig. 1C/

Figure 2. (A) Basal 12-lead ECG and intracardiac recordings showing sinus rhythm and complete LBBB. (B) 12-lead ECG and intracardiac recordings after RBB ablation showing sinus rhythm, RBBB and 2:1 AV block at infra-Hisian level. The gray arrows indicate His potentials; d = distal; p = proximal.

bottom). Bundle branch reentry, an uncommon mechanism of postinfarction ventricular tachycardia frequently inducible by atrial stimulation,³ should be excluded before performing unnecessary and complex substrate ablation in the left ventricle.

Similarly, in the second case, RBB ablation did not cause complete heart block but 2nd degree 2:1 AV block reflecting that the LBB was capable of 2:1 antegrade conduction despite the apparent complete LBBB before ablation and LBB conduction capability was probably masked by retrograde conduction over the RBB. Ablating the RBB in this case provided adequate rate control during atrial arrhythmias while did not render the patient pacing-dependent.

These two cases highlight intriguing overlap between electrophysiological concepts of complete block, linking, extremely slow, and

concealed conduction. Despite a complete LBBB pattern at the basal ECG, ablating the right bundle unmasked some degree of antegrade conduction capabilities over the left bundle.

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