

Real-time assessment of bidirectional block during pulmonary vein cryoablation

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Bidirectional block at the left atrium–pulmonary vein junction is an established endpoint of atrial fibrillation ablation. Its real-time assessment has not yet been performed during pulmonary vein balloon cryoablation. In this case report, we illustrate the possibility of demonstrating its occurrence using the Achieve[®] catheter with specific manoeuvres, suggesting the application of this technique in specific contexts.

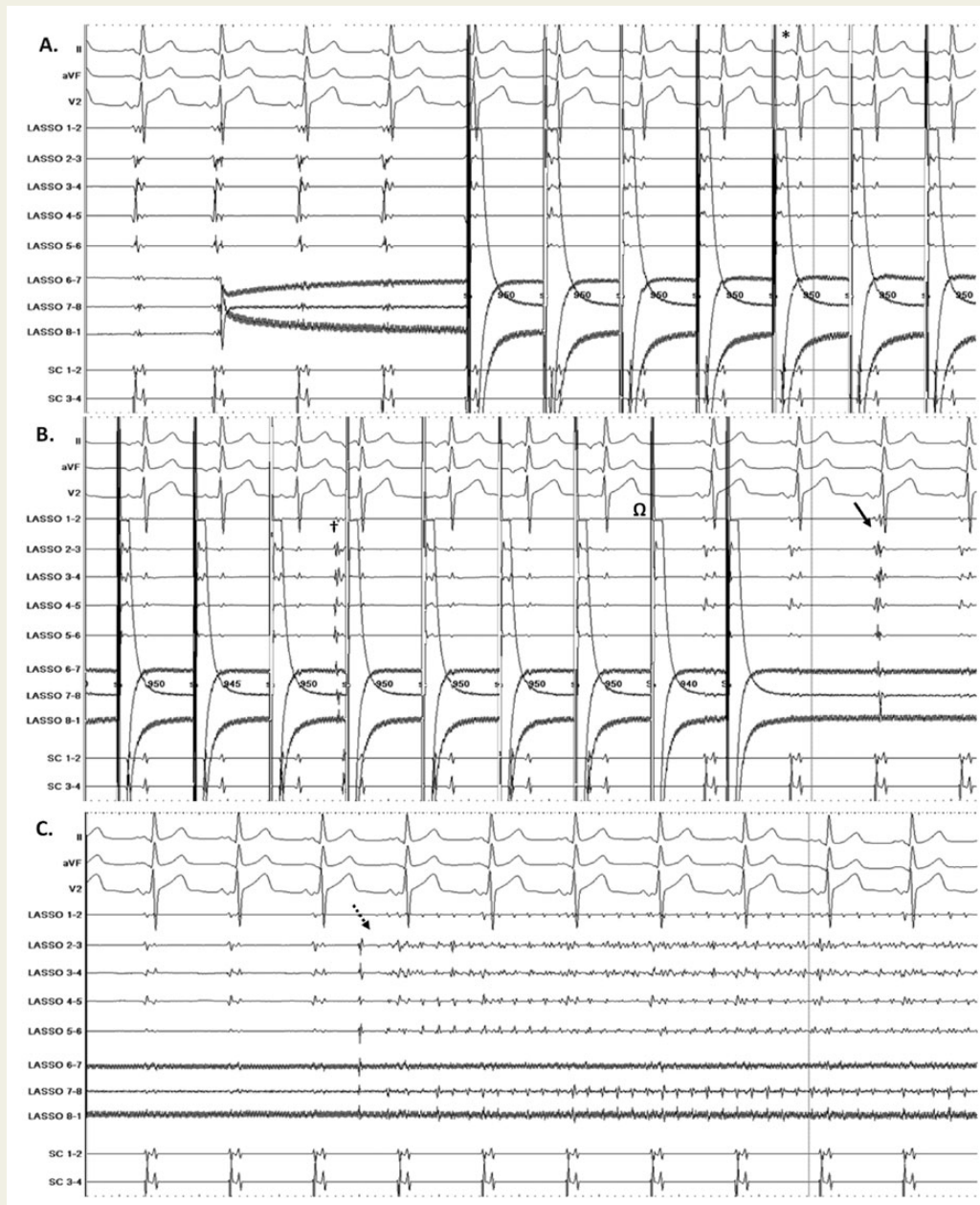


Figure 1 Real time assessment of bidirectional block of a left superior pulmonary during cryoballoon ablation.

Bidirectional block at the left atrium (LA)–pulmonary vein (PV) junction, defined as the absence of conduction into the PV from the LA (entrance block) and in the opposite direction (exit block), is an established endpoint of catheter ablation of atrial fibrillation (AF).

Controversial results have been presented during radiofrequency catheter ablation of AF regarding the prevalence of uni- and bidirectional block at the LA–PV junction: unidirectional block ranged from <0.6¹ to 40% of cases.² In these images we try to illustrate the chronology between these two phenomena during PV isolation. A deeper understanding of this knowledge gap may provide important evidence to elucidate the ongoing debate and may also suggest whether entrance and exit pathways depend on the same fibres or not, which may have clinical implications. During balloon cryoablation of AF, real-time entrance block assessment can be documented in 47% of patients through the use of an eight poles inner lasso-like catheter specially designed for placement inside the Artic Front[®] cryoballoon and PV potentials registration during cryoenergy delivery (Achieve[®] catheter, Medtronic[®]).³ To the best of our knowledge, real-time assessment of exit block during balloon cryoablation has not yet been described and might be a way of increasing the number of patients where an efficacy primary endpoint can be demonstrated during lesion formation.

We evaluated the possibility of demonstrating the occurrence of entrance and exit block, in real-time during PV balloon cryoablation, elucidating their chronology. We intended to first demonstrate the exit block by continuously pacing inside the vein at high amplitude (12 mA/1.0 ms) with the Achieve catheter during cryoablation. These tracings illustrate a left superior PV (LSPV) before and during the beginning of balloon cryoablation. The LA was constantly captured by pacing inside the LSPV (lasso 7–8) (change in P-wave morphology—*) at a rate slightly faster than the spontaneous sinus rhythm showing a preserved exit conduction (the absence of exit block). Observe that the first intracardiac electrograms clearly shows a sharp PV potential (e.g. lasso 2–3 and 7–8) in spontaneous sinus rhythm confirming a preserved entrance conduction (the absence of entrance block). Then, while pacing, we can observe an ectopic beat (†) (also demonstrating preserved exit conduction because originated within the PV), followed by loss of LA capture (Ω—occurrence of exit block). Immediate stopping of LSPV pacing after loss of LA capture allowed the demonstration of the entrance block because of complete disappearance of PV potential. The bidirectional block was confirmed by the presence of a dissociated PV potential in spontaneous sinus rhythm (black arrow) and an AF spontaneously induced inside this very active vein after an ectopic beat (dotted arrow) not conducted to the LA (exit block) (Figure 1).

We have administered adenosine to assess the possible reconnection, but the PV remained dissociated.

The simultaneous occurrence of these phenomena nicely illustrates that entrance and exit block are deeply interconnected and possess a close temporal relationship, supporting the theory that a unidirectional block is extremely rare and may be only explained by rare anatomic variants related to unusual fibre orientation. This feature has been recently demonstrated in this *Journal* by Andrade *et al.*⁴ Our case suggests the use of real-time assessment of exit block as an alternative to entrance block evaluation, when the PV potentials are not very clear or when the presence of far-field from the LA appendage impairs the analysis of the potentials.

Conflict of interest: S.B. is a consultant for Boston Scientific and Medtronic. J.P.A. is a consultant for SJM and Biosense Webster.

References

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