

Utility of the Inferior Axis and Left Bundle Branch Block Pattern for Categorization of Patients With Premature Ventricular Complexes Before Catheter Ablation



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Much research on premature ventricular complexes (PVCs) have used inferior axis and left bundle block pattern (I-LBBB) as a unique category of PVCs, with the assumption that PVCs with this pattern originate in the outflow tract (OT) region and are idiopathic.^{1,2} However, it is well established that these assumptions are not true for all I-LBBB PVCs.³ The distinction between OT and non-OT PVCs is important because catheter ablation (CA) of non-OT PVCs have lower success rates and higher complication rates.⁴ Therefore, more precise algorithms to identify the site of origin (SOO) from the surface electrocardiogram (ECG) are recommended.⁵ Nevertheless, referring general cardiologists still often categorize patients as having I-LBBB or non-I-LBBB. Clarification of the clinical utility of this categorization is therefore needed to interpret existing data and advise referring cardiologists. We performed a pragmatic retrospective study from the perspective of the referring cardiologist outside of expert electrophysiology centers to test the association between the I-LBBB pattern in the regular surface ECG and probability of success from CA.

A total of 453 CAs for PVCs were performed at Oslo University Hospital Rikshospitalet from 2011 to 2020, including 333 first-time procedures. Patients who underwent their first CA for PVCs had a median age of 49 ± 14 years, and 209 (63%) were women. Co-morbidities were present in 117 patients (35%), with hypertension being most frequent. Symptoms were noted in 311 patients (93%), most frequently palpitations (247 patients, 74%). The median number of PVCs recorded in the last 24 hour Holter recording before referral was 14,576 (interquartile range 5,597 to 25,801), and the median PVC burden was 16% (interquartile range 8 to 26). CA was attempted in 245 patients (74%), and acute success was achieved in 198 (81%).

Of the 333 patients referred for a first-time procedure, 290 patients (87%) had I-LBBB PVCs. These patients

were younger than patients with non-I-LBBB PVCs (48 ± 14 vs 56 ± 13 years, $p < 0.001$) and fewer had coronary artery disease (5% vs 21%, $p < 0.001$) or ejection fraction $< 50\%$ by echocardiography (7% vs 29%, $p < 0.001$). More patients in the I-LBBB group reported palpitations (76% vs 61%, $p = 0.03$), whereas fewer reported dyspnea (12% vs 26%, $p = 0.02$). The PVC burden before CA was similar (16% vs 19%, $p = 0.5$) between the I-LBBB and non-I-LBBB groups, and the acute success rates (82% vs 74%, $p = 0.3$) and complication rates (2% vs 2%, $p = 1.0$) were comparable.

The SOO was established during the invasive electrophysiologic procedure in 273 patients (82%). The patients with SOO from the OTs were younger than patients with PVCs with other SOOs (48 ± 14 vs 54 ± 14 , $p = 0.013$), and fewer had ejection fraction $< 50\%$ (7% vs 26%, $p < 0.001$). As might be expected, patients who had PVCs with confirmed SOO in the OTs underwent CA more often than patients with PVCs from other SOOs (90% vs 65%, $p < 0.001$). In addition, the success rate of CA for PVCs with confirmed SOO in the OTs was higher than for non-OT PVCs (85% vs 62%, $p = 0.003$).

Importantly, among patients for whom the SOO was determined, 224 of 290 patients (77%) with I-LBBB PVCs were treated for PVCs originating from the OT, whereas 13 (4%) were treated for PVCs with SOOs outside of the OTs, and for 53 patients (18%), the SOO was not established. In comparison, 8 of 43 patients with non-I-LBBB PVCs (19%) were treated for PVCs with SOO in the OT ($p < 0.001$ compared with I-LBBB).

In summary, the I-LBBB pattern in the surface ECG taken was not a useful criterion to separate patients regarding the acute clinical outcome of CA. In contrast, per-procedure invasively confirmed SOO in the OT was associated with a higher rate of acute success. Hence, the I-LBBB pattern of PVCs alone is not clinically useful to categorize patients before CA. Our real-world data are an important reminder to referring cardiologists about the incomplete overlap between the I-LBBB pattern in the surface ECG and the SOO in the OT, and the importance of this fact, which is well known to electrophysiologists. In addition, our data are a caution for the interpretation of studies that have used this pattern as the sole ECG inclusion criterion. Referring cardiologists and future studies on the noninvasive evaluation of PVCs should use more advanced algorithms for the assessments of the SOO from the ECG.

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See page 149 for Declaration of Conflict of Interest.

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Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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