Non-Invasive Myocardial Wokload Analysis in Patients with Bundle Branch Block (BBB) And Mechanical Dyssychrony

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BACKGROUND

In patients with bundle branch block (BBB), the intra-left ventricular conduction delay results in inhomogeneous activation of different myocardial segments, in particular in septal and lateral walls where the septum is activated first followed by the lateral wall, resulting in different workloads in those segments. Recent data showed that Apical rocking- as a surrogate of mechanical dyssynchrony- might be better representative of true left bundle branch block (LBBB) as compared to ECG.

OBJECTIVE

Quantification of workload of different myocardial segments, non-invasively, using pressure-strain loops in patients with wide QRS complex and ventricular conduction delay and/or mechanical dyssynchrony.

MATERIALS AND METHODS

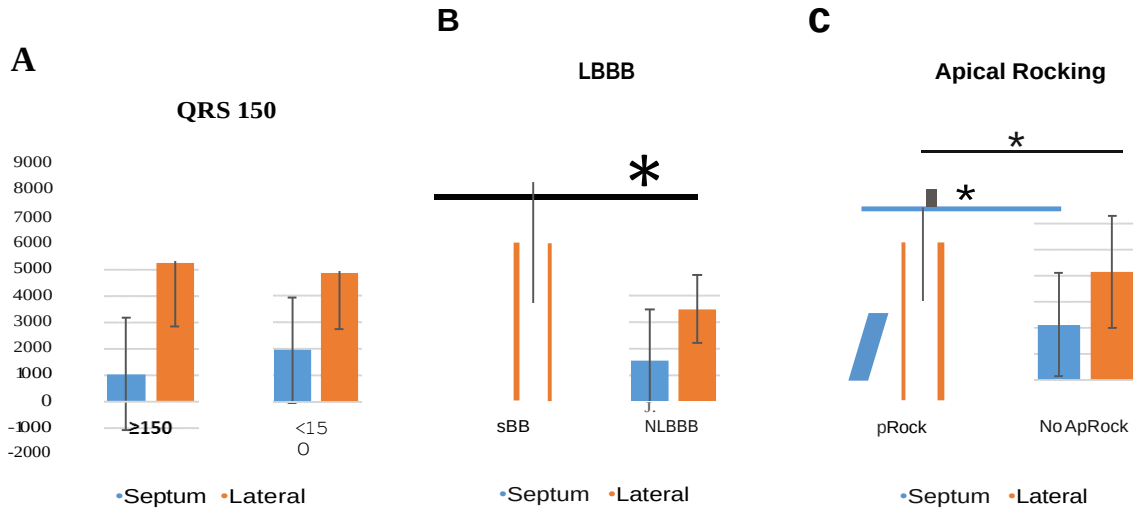
The ECGs of 55 patients with a QRS duration of at least 120 ms were stratified based on the QRS duration and pattern of BBB. Of them 40 patients (73%) had a QRS ≥150 ms and 36 patients (65%) had a QRS pattern of LBBB. Additionally, Apical rocking (ApRock) was identified visually using 2D echocardiograpy in 30 patients (55%) and was defined as an early septal contraction during the isovolumetric contraction phase followed by a late lateral wall contraction during the LV ejection phase. Segmental myocardial work was non-invasively quantified using pressure-strain loops, by combining myocardial strain curves using 2D speckle tracking of the 3 apical views with non-invasive blood pressure readings. Septal work refers to the average of the 6 septal segment (mid, basal and apical anteroseptal [3CH] and inferospetal [4CH]), while the lateral work refers to the average wok of the 6 lateral segments (mid, basal and apical anterolateral [4CH] and inferolateral [3CH]).

RESULTS

Neither septal nor lateral work differed significantly among patients with a QRS duration of longer or shorter than 150 ms (P=0.2 and 0.6 for septal and lateral work respectively, Figure A). On the other hand, the lateral wall performed significantly more work in patients with LBBB (P<0.01) than in patients with NLBBB, while septal work did not differ significantly between both groups (P=0.5, Figure B). Alternatively, in patients with ApRock the work of the lateral wall was significantly higher than in patients with no ApRock, while septal work was significantly lower (P<0.01 for both comparisons, Figure C).

CONCLUSION

In patients with LBBB, the inhomogeneous activation of myocardial segments for the septal and lateral walls results in different myocardial workload in the corresponding segments, where the earlier activation of the septum results in less work and the later activation of the lateral wall results in more work. ApRock as a surrogate of mechanical dyssynchrony can reflect true LBBB pattern of myocardial activation and workload distribution and hence, can be used for candidate selection for cardiac resynchronization therapy (CRT).



bars reflects standard error,* refers to P<0.05,LBBB: left bundle branch block