Clinical outcomes of left bundle branch area pacing compared with biventricular pacing in patients with heart failure requiring cardiac resynchronization therapy: systematic review and meta-analysis

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Background: Biventricular pacing (BVP) is recommended from the most recent ESC guidelines as the first line pacing strategy in patients with heart failure (HF) that require cardiac resynchronization therapy (CRT). (1) Many studies have shown its beneficial effects regarding morbidity and mortality in this population. (2, 3) However, 10% of patients cannot be treated by BVP due to unsuitable coronary sinus vein, while 30-40% are non-responders to BVP and experience no benefit from this treatment.(4) Left bundle branch area pacing (LBBAP) is a new pacing modality (5) that can achieve narrow QRS and improve left ventricular function in patients with HF, by engaging the intrinsic conduction pathway of the heart. Also, it appears to have better results in electrical and mechanical synchrony compared with BVP.

Purpose: We conducted a systematic review and meta-analysis to compare the two pacing modalities in terms of hard clinical outcomes, in patients with heart failure that require CRT.

Methods: Medline, Embase, Cochrane Central Register of Controlled Trials and Web of Science databases were systematically searched for studies comparing LBBAP with BVP for CRT in patients with HF. Outcomes of interest were all-cause mortality, Heart Failure Hospitalizations (HFH) and New York Heart Association (NYHA) class improvement. Two independent investigators identified studies, extracted data, and assessed the risk of bias using the Cochrane Risk of Bias 2 tool for randomized clinical trials and the Newcastle-Ottawa-Scale for observational studies. Pairwise meta-analysis was conducted using random and fixed effects models. Risk Ratios (RRs) and weighted mean difference (WMD) with 95% confidence intervals (CIs) were used to report dichotomous and continuous variables respectively. Heterogeneity was assessed with the I² statistic.

Results: In total, 764 studies were retrieved and finally 9 trials with 992 individuals (365 in LBBAP and 627 in BVP group) were included in the analysis. The mean follow-up duration was 13 ± 5.82 months and the average procedural success rate in the LBBAP group was 89.8%. The baseline characteristics were similar between the two groups. Pooled analysis showed that the two methods had no difference in terms of all-cause mortality (RR:0.87 CI 95%:0.38 to 2.02; I²=0%; p=0.750, Figure 1) with 8 (2.4%) vs 17 (2.9%) events occurring in LBBAP and BVP group respectively. However, LBBAP was found to have significantly lower risk for HFH (RR:0.58 CI 95%:0.38 to 0.91; I²=0%; p=0.020, Figure 2A) and to achieve more improvement in NYHA class compared with BVP (WMD: -0.40, CI 95%: -0.68 to -0.12; I²=72%; p=0.005; Figure 2B).

Conclusions: To the best of our knowledge this is the first meta-analysis that assesses exclusively the clinical outcomes of LBBAP compared to BVP in such an important number of patients. LBBAP presents better outcomes in HFH and NYHA class improvement, but it has no difference in all-cause mortality in comparison with BVP.

Figure 1. All-cause mortality
Figure 2. A. HFH B. NYHA class improvement