Conduction System Pacing Versus Biventricular Pacing for Cardiac Resynchronization Therapy: A Systematic Review and Meta-analysis of Randomized Trials

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Background: Randomized comparisons of conduction system pacing (CSP) versus biventricular pacing (BiVP) for cardiac resynchronization therapy (CRT) have yielded heterogeneous results across pacing modalities and trial populations. We performed a randomized trial-only systematic review and meta-analysis to evaluate short-term remodeling and electrical outcomes with CSP versus BiVP.

Methods: We searched PubMed, Embase, and Cochrane CENTRAL for randomized controlled trials comparing CSP-based CRT with BiVP in adults with heart failure or CRT-eligible wide-QRS phenotypes. The main prespecified quantitative remodeling analysis was absolute change in left ventricular ejection fraction (LVEF) at approximately 6 months using directly reported randomized-group change scores. A supportive 6-month LVEF model incorporated imputed change standard deviations when required, using an empirically derived within-person correlation coefficient (r = 0.659). QRS duration at approximately 6 months was the main secondary electrical outcome. Exploratory overlap-safe pooled analyses assessed procedural success, crossover, and complications.

Results: Nine randomized studies were included in the qualitative synthesis, and 7 contributed to at least one quantitative analysis (695 patients; 348 CSP, 347 BiVP). In the primary 6-month direct-change model (5 study contributions), CSP was associated with greater improvement in LVEF versus BiVP (mean difference [MD] 3.45%, 95% confidence interval [CI] 0.28 to 6.62; p = 0.039). In the supportive 6-month imputed-variance model (6 study contributions), the pooled estimate was similar (MD 4.08%, 95% CI 1.60 to 6.56; p = 0.008). QRS duration at approximately 6 months was shorter with CSP across 4 studies (MD −4.08 ms, 95% CI −5.30 to −2.85; p = 0.0018). Exploratory pooled analyses showed no significant differences in procedural success, crossover, or complications.

Conclusions: In randomized trials, CSP was associated with improved short-term remodeling and shorter QRS duration compared with BiVP. However, the evidence base remains small and heterogeneous, and clinical-event data remain limited, supporting cautious interpretation.