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Minimally Invasive versus Conventional Sternotomy for Aortic Valve Replacement: A Systematic Review and Meta-Analysis

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Abstract : Objectives: We aimed to compare the safety and outcomes of the minimally invasive approaches versus conventional sternotomy procedures for aortic valve replacement. Methods: We conducted a PRISMA-compliant systematic review and meta-analysis. We ran an electronic search of PubMed, Cochrane CENTRAL, Scopus, and Web of Science to identify the relevant published studies. Data were extracted and pooled as standardized mean difference (SMD) or risk ratio (RR) using StataMP version 17 for macOS. Results: Forty-one studies with a total of 15,065 patients were included in this meta-analysis (minimally invasive approaches n=7231 vs. conventional sternotomy n=7834). The pooled effect size showed that minimally invasive approaches had lower mortality rate (RR 0.76, 95%CI [0.59 to 0.99]), intensive care unit and hospital stays (SMD -0.16 and -0.31, respectively), ventilation time (SMD -0.26, 95%CI [-0.38 to -0.15]), 24-h chest tube drainage (SMD -1.03, 95%CI [-1.53 to -0.53]), RBCs transfusion (RR 0.81, 95%CI [0.70 to 0.93]), wound infection (RR 0.66, 95%CI [0.47 to 0.92]) and acute renal failure (RR 0.65, 95%CI [0.46 to 0.93]). However, minimally invasive approaches had longer operative time, cross-clamp, and bypass times (SMD 0.47, 95%CI [0.22 to 0.72], SMD 0.27, 95%CI [0.07 to 0.48], and SMD 0.37, 95%CI [0.20 to 0.45], respectively). There were no differences between the two groups in blood loss, endocarditis, cardiac tamponade, stroke, arrhythmias, pneumonia, pneumothorax, bleeding reoperation, tracheostomy, hemodialysis, or myocardial infarction (all P>0.05). Conclusion: Current evidence showed higher safety and better operative outcomes with minimally invasive aortic valve replacement compared to the conventional approach. Future RCTs with long-term follow-ups are recommended.

Keywords : aortic replacement, minimally invasive, sternotomy, mini-sternotomy, aortic valve, meta analysis
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