A META-ANALYSIS ON THE USE OF INTRACARDIAC ECHOCARDIOGRAPHY IN PERCUTANEOUS CATHETER ABLATION: IMPACT ON EFFICIENCY, EFFECTIVENESS, AND SAFETY OUTCOMES

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Introduction: Intracardiac echocardiography (ICE) has multiple real-time applications during catheter ablation, including the ability to guide transseptal puncture, visualize the location of the esophagus, provide guidance of cardiac anatomy, and detect overheating. Optimal use of ICE may reduce fluoroscopy time and procedural complications, but there is limited evidence in this area of research. A systematic review and meta-analysis were conducted to evaluate the use of ICE for real-time imaging during percutaneous ablation of cardiac arrhythmias.

Methods: PubMed was searched from January 1, 1996 through October 31, 2018 for comparative (randomized or non-randomized) studies reporting the use of ICE in ablation procedures, versus cases where ICE is not used. Fluoroscopy time (primary outcome), fluoroscopy dose, procedure time, acute procedure success, periprocedural complications, and freedom from arrhythmia were extracted from studies. Efficiency outcomes were compared using Hedges’ g. Effectiveness and safety outcomes were compared using risk ratios (RR). Sensitivity and subgroup analyses were performed to understand the robustness of the initial effect size estimates and to assess potential sources of study heterogeneity.

Result: Nineteen studies (2,186 patients) met study selection criteria and were included in the meta-analysis. Use of ICE was associated with significant reductions in fluoroscopy time (Hedges’ g -1.06; 95% confidence interval [CI] -1.81 to -0.32; p < 0.01), fluoroscopy dose (Hedges’ g -1.27; 95% CI -1.91 to -0.62; p < 0.01), and procedure time (Hedges’ g -0.35; 95% CI -0.64 to -0.05; p = 0.02) versus ablation without the use of ICE, with significant heterogeneity among studies. Overall effect size estimates for reductions in fluoroscopy time and fluoroscopy dose were robust, with similar effect sizes demonstrated across sensitivity analyses. Ablation procedures using ICE were associated with a 6.95 minute reduction in fluoroscopy time and a 15.2 minute reduction in procedure time compared to ablation without the use of ICE, as demonstrated by mean difference analyses. Reductions in fluoroscopy and procedure times were not accompanied by any evident decrease in effectiveness (ICE vs. comparator, RR for freedom from arrhythmia 1.04, 95% CI 0.97 to 1.11) or safety (RR for periprocedural complications other than vascular access 0.66; 95% CI 0.42 to 1.05).

Conclusion: Use of ICE in ablation of cardiac arrhythmias is associated with significant reductions in fluoroscopy time and dose, and shorter procedure time compared to ablation without the use of ICE. These reductions were not accompanied by decreases in effectiveness or safety.