

Non-Alcoholic Septal Ablation in Symptomatic Obstructive Hypertrophic Cardiomyopathy: A Meta-Analysis

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Introduction: Symptomatic obstructive hypertrophic cardiomyopathy (HOCM) is characterized by asymmetric septal hypertrophy, left ventricular outflow tract (LVOT) obstruction, and significant functional limitation. Alcohol septal ablation (ASA) is an established therapy but is limited by procedure-related complications and relatively high rates of permanent pacemaker implantation. Non-alcoholic septal ablation (NASA) techniques have emerged as alternative options, potentially offering improved safety and efficacy. We conducted a systematic review and single-arm meta-analysis to evaluate the pooled outcomes of this novel therapeutic approach.

Material and Methods: Systematic searches were performed in PubMed, Embase, and the Cochrane Central Register of Controlled Trials up to May 2025 for studies evaluating non-alcoholic agents for percutaneous septal reduction in HOCM, regardless of follow-up duration. Case reports, conference abstracts, studies with overlapping populations, and those lacking post-procedure data were excluded. Two independent reviewers conducted data screening and extraction. The search strategy combined terms related to ("hypertrophic cardiomyopathy" OR HOCM OR "obstructive hypertrophic cardiomyopathy") AND ("septal ablation" OR "septal embolization" OR "septal reduction" OR "septal myocardial ablation") AND (microsphere* OR onyx* OR "ethylene-vinyl*" OR copolymer OR polymer OR squid OR EVOH OR cyanoacrylate OR polidocanol OR glue OR nonalcohol OR coil). Comparative groups were not required. Data were pooled using a random-effects model in OpenMeta [Analyst]. Outcomes included all-cause mortality, permanent pacemaker implantation, symptomatic improvement (NYHA functional class), and reduction of LVOT gradient during follow-up.

Results: Eight studies were included, comprising a total of 209 patients who underwent NASA using various agents (coils, polidocanol, ethylene-vinyl alcohol [EVOH], and mi-

crosspheres). The study populations were predominantly male (52–68%), with mean ages ranging from 48 to 61 years, and most presented with advanced symptoms (NYHA III–IV). The mean follow-up period ranged from 3 to 12 months, with limited long-term data. There was one death (0.5%). The pooled rate of permanent pacemaker implantation was 5.3% (95% CI: 2.3–8.3; $p = 0.794$; $I^2 = 0\%$). Improvement to NYHA class I–II was achieved in 96.2% of patients (95% CI: 93.5–98.8; $p = 0.835$; $I^2 = 0\%$). The pooled mean post-procedure LVOT gradient at 3 months was 29.6 mmHg (95% CI: 19.2–40.1; $p = 0.003$; $I^2 = 75.1\%$).

Conclusion: In this single-arm meta-analysis, non-alcoholic septal ablation was associated with low mortality and pacemaker implantation rates, along with marked symptomatic and hemodynamic improvement. These findings suggest that this technique may serve as a safe and effective alternative for selected patients with HOCM, particularly in cases where ASA is contraindicated or considered high risk. However, important limitations include the small number of studies and patients, methodological heterogeneity, and limited follow-up. Large-scale randomized clinical trials are warranted to confirm long-term efficacy and safety.

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