



A Systematic Review and Meta-Analysis of Long-Term Outcomes After Septal Reduction Therapy in Patients With Hypertrophic Cardiomyopathy

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ABSTRACT

OBJECTIVES The aim of this meta-analysis was to compare long-term outcomes after myectomy and alcohol septal ablation (ASA) in patients with hypertrophic cardiomyopathy (HCM).

BACKGROUND Surgical myectomy and ASA are both accepted treatment options for medical therapy-resistant obstructive HCM. Previous meta-analyses only evaluated short-term outcomes.

METHODS A systematic review was conducted for eligible studies with a follow-up of at least 3 years. Primary outcomes were all-cause mortality and (aborted) sudden cardiac death (SCD). Secondary outcomes were periprocedural complications, left ventricular outflow tract gradient, and New York Heart Association functional class after ≥ 3 months, and reintervention. Pooled estimates were calculated using a random-effects meta-analysis.

RESULTS Sixteen myectomy cohorts ($n = 2,791$; mean follow-up, 7.4 years) and 11 ASA cohorts ($n = 2,013$; mean follow-up, 6.2 years) were included. Long-term mortality was found to be similarly low after ASA (1.5% per year) compared with myectomy (1.4% per year, $p = 0.78$). The rate of (aborted) SCD, including appropriate implantable cardioverter defibrillator shocks, was 0.4% per year after ASA and 0.5% per year after myectomy ($p = 0.47$). Permanent pacemaker implantation was performed after ASA in 10% of the patients compared with 4.4% after myectomy ($p < 0.001$). Reintervention was performed in 7.7% of the patients who underwent ASA compared with 1.6% after myectomy ($p = 0.001$).

CONCLUSIONS Long-term mortality and (aborted) SCD rates after ASA and myectomy are similarly low. Patients who undergo ASA have more than twice the risk of permanent pacemaker implantation and a 5 times higher risk of the need for additional septal reduction therapy compared with those who undergo myectomy.

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In patients with obstructive hypertrophic cardiomyopathy (HCM) who remain highly symptomatic despite optimal medical therapy, septal reduction therapy should be considered. This can be done by either surgical myectomy or alcohol septal ablation (ASA) (1-3). Myectomy has been used for more than 5 decades (4). ASA was developed as a percutaneous alternative and was quickly adopted all over the world.

Now, 20 years after its introduction, the debate about the safety of ASA continues, especially concerning the arrhythmogenic effect of the ablation scar in patients already at an increased risk of life-threatening arrhythmias. The 2 most recent meta-analyses date back to 2010 and only evaluated short-term outcomes (5,6). The aim of this meta-analysis was to compare long-term outcomes after myectomy and ASA.

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METHODS

SEARCH STRATEGY. Specific search terms were constructed, containing all synonyms for HCM in combination with all synonyms for myectomy and/or ASA, for the following databases: Embase, MEDLINE, Cochrane, Web-of-Science, PubMed publisher, and Google Scholar. Search terms and the amount of hits per database are shown in [Online Table 1](#). Pre-determined inclusion and exclusion criteria ([Figure 1](#)) were applied by 2 independent reviewers. Because of our primary interest in long-term outcomes, a minimal mean follow-up was set at 3 years. Observational studies were included, in lack of randomized, controlled trials.

DATA EXTRACTION. Continuous variables were extracted as means or medians, and dichotomous variables were extracted in absolute numbers or percentages for each cohort.

Baseline patient characteristics of interest included age, sex, New York Heart Association (NYHA) functional class, maximal left ventricular wall thickness, maximal left ventricular outflow tract (LVOT) gradient, a history of syncope, implantable cardioverter-defibrillator (ICD), amount of alcohol used (ASA studies), and concomitant mitral valve surgery (myectomy studies).

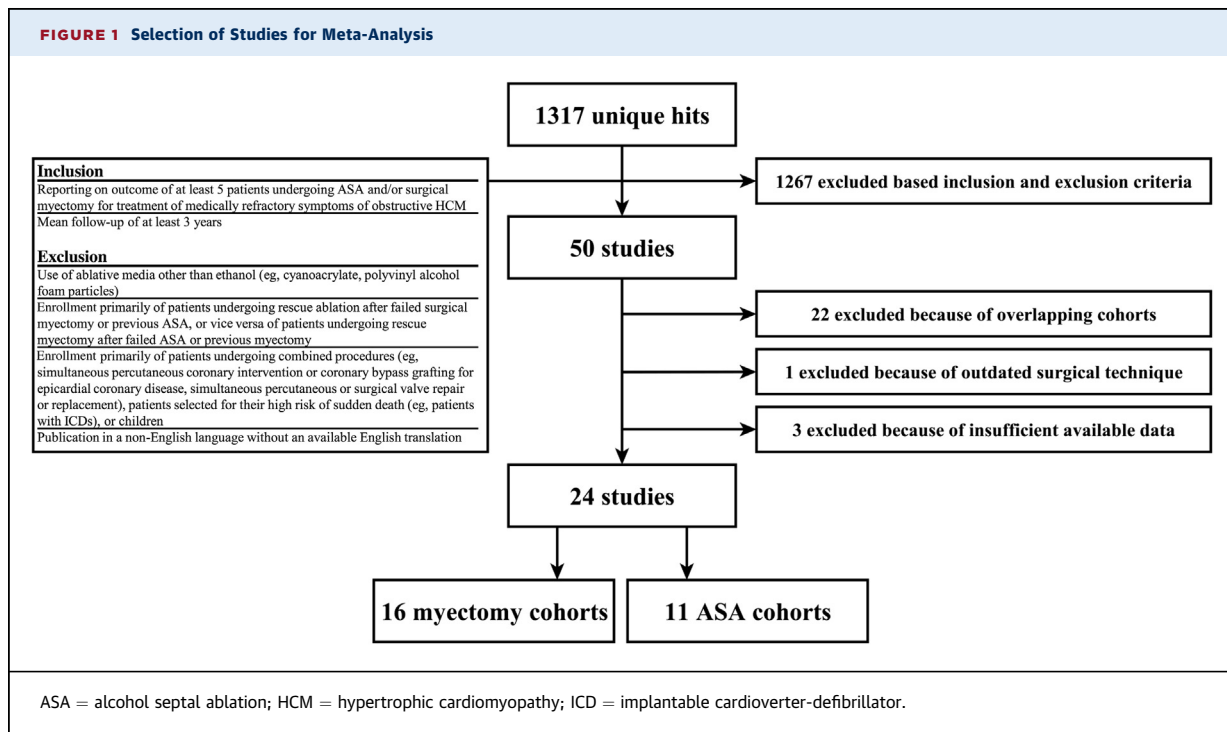
Primary outcomes of interest were mortality, cause of death (cardiac/noncardiac/unknown), sudden

cardiac death (SCD), aborted SCD, and appropriate ICD shocks. Cardiac death (i.e., HCM-related mortality) was defined as death due to heart failure, SCD, or stroke associated with atrial fibrillation; SCD was defined as instantaneous and unexpected death, and aborted SCD was defined as successful resuscitation after cardiac arrest. Secondary outcomes of interest were periprocedural complications (death, permanent pacemaker implantation, stroke, tamponade, sustained ventricular tachycardia, and ventricular fibrillation), length of hospitalization, LVOT gradient after ≥ 3 months, NYHA functional class after ≥ 3 months, and reintervention (ASA or myectomy).

STATISTICAL ANALYSIS. Descriptive statistics of patients before the intervention are weighted medians and interquartile ranges. SEs for the differences in weighted medians between the ASA and myectomy group were estimated by 10,000 bootstraps of the weighted-median differences. p Values for the pooled incidence rate differences and weighted medians were calculated using the Wald test. Random-effects meta-analysis was conducted using “metan” function with “randomi” option in Stata version 12.1 (StataCorp LP, College Station, Texas), which derives the estimates of heterogeneity from an inverse-variance fixed-effects model. Heterogeneity among

ABBREVIATIONS AND ACRONYMS

- AAE** = adverse arrhythmic events
- ASA** = alcohol septal ablation
- CI** = confidence interval
- HCM** = hypertrophic cardiomyopathy
- ICD** = implantable cardioverter-defibrillator
- LVOT** = left ventricular outflow tract
- NYHA** = New York Heart Association
- SCD** = sudden cardiac death



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