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Alcohol septal ablation for obstructive hypertrophic cardiomyopathy

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Chapter 7.2

editorial

Revisiting Arrhythmic Risk After Alcohol Septal Ablation

Is the Pendulum Finally Swinging Back to Myectomy?*

Barry J. Maron, MD, Rick A. Nishimura, MD

For the past 10 years, a debate has raged within the international cardiovascular medicine community regarding treatment options for severely symptomatic and drug-refractory patients with obstructive hypertrophic cardiomyopathy (HCM) (1–21). Surgical myectomy has been the gold-standard treatment for this relatively small HCM subset since the early 1960s, with proven efficacy in abolishing left ventricular (LV) outflow gradients and heart failure symptoms, enhancing quality of life associated with long-term survival equivalent to the general population, and recently with low operative mortality (<1%) when performed by highly experienced surgeons (1–6,20–22) (Figure 1).

Catheter-based alcohol septal ablation entered the therapeutic arena for HCM about 10 years ago, also with the capability for reducing gradient and symptoms, and became widely available, performed by many interventional cardiologists trained in standard percutaneous coronary interventions (7–18). This introduction of alcohol ablation triggered a polarized and sometimes contentious debate focused on defining the most practical and effective strategy for severely symptomatic patients with obstructive HCM (1–22). Advocates for septal ablation have underscored the less invasive nature of the technique, the shorter recovery time, as well as its widespread availability. However, concern has been raised regarding the extensive use of alcohol ablation, given that it produces a sizable transmural myocardial infarction (on average 10% of LV mass and 30% of septum), potentially leading to increased arrhythmogenicity (23) (Figure 2). In addition, ablation is associated with an increased risk for complications such as heart block (requiring permanent pacing), generally less efficacious relief of gradient and symptoms, and the limited length of follow-up available for comparison with surgical myectomy.

Proponents of each strategy have argued their respective positions, and an extensive literature of almost 500 published papers has emerged. Notably, international consensus panels of the American Heart Association, the American College of Cardiology, and the European Society of Cardiology have weighed in on the debate by interrogating the assembled data, unanimously judging septal myectomy to be the primary treatment option for most patients with HCM (particularly the young) experiencing unrelenting symptoms due to marked LV outflow tract gradients at rest and/or with physiologic (exercise) provocation, despite maximal medical management (1–6,19,20,22,24). Alcohol septal ablation is regarded as a selective alternative to myectomy reserved for patients at unacceptable operative risk because of comorbidities, advanced age, or with strong aversion to surgery (1–3).

Despite these recommendations, selection of patients for these management options has varied considerably in geographic terms. Surgical myectomy has been virtually abolished and

replaced by alcohol ablation in much of Europe, including countries such as Germany and Switzerland, where myectomy programs had previously been robust. There is, however, recent evidence of a resurgence in surgery for obstructive HCM in Italy, United Kingdom, and the Netherlands (25). In the United States, alcohol septal ablation has been performed by interventional cardiologists at many institutions across the country, some of whom learn the technique from attending a conference. This is in contrast to septal myectomies performed primarily by the highly trained surgeons at HCM centers of excellence. The decision regarding which procedure a patient will undergo may depend more on the location, referral pattern, and current knowledge of the managing cardiologist rather than scientific evidence and shared decision-making.

In the report by Vriesendorp et al. (26) in this issue of *JACC: Heart Failure*, investigators from 3 tertiary institutions have joined together to describe their experience with HCM in >1,000 patients, including 566 with either myectomy or ablation: Thoraxcenter in Rotterdam, St. Antonius Hospital Nieuwegein (also in the Netherlands), and University Hospital Leuven in Belgium. This ambitious analysis focuses on the sudden death risk associated with both septal reduction procedures. Because HCM is characteristically a low-event-rate disease, it is not surprising that the investigators observed that the sudden death rate was generally low in patients with either surgery or ablation, as well as in a medically treated group with nonobstructive HCM.

However, most importantly, there are several novel observations in the Vriesendorp et al. (26) report regarding the arrhythmogenic potential of alcohol septal ablation compared to myectomy. First, on the basis of a multivariate analysis, there was a 2-fold increase in sudden death risk with alcohol ablation (hazard ratio: 2.1; 95% confidence interval: 1.0 to 4.4; $p = 0.04$) over the duration of the study, which could have been much higher if the investigators had included early life-threatening periprocedural arrhythmic complications (i.e., 11:1 for ablation to myectomy). The sudden death rate per year associated with alcohol ablation was 25% greater than with myectomy (1.0% vs. 0.8%). In terms of individual patients, sudden death events were 80% more common with ablation (16 vs. 9 with myectomy), including appropriate implantable cardioverter-defibrillator shocks for ventricular tachycardia or ventricular fibrillation that were 8:1 more frequent post-ablation. Finally, myectomy patients had a greater number of independent risk markers for sudden cardiac death but paradoxically fewer events than in the septal ablation patients.

Taken together, these observations support a level of arrhythmogenicity that is a direct consequence of the alcohol-induced transmural myocardial infarct. In addition, such a

significant sustained occurrence of ventricular tachyarrhythmias after alcohol ablation in the Vriesendorp et al. (26) study is consistent with prior data from important centers at the Massachusetts General Hospital (15) and the Thoraxcenter (14,18), as well as in a study by Cuocco et al. (16) in which a large alcohol ablation population implanted with cardioverter-defibrillators is reported. In addition, a particularly low risk for sudden death and potentially lethal ventricular tachyarrhythmias has been reported after septal myectomy from the Mayo Clinic (21,27). Indeed, the arrhythmogenic risk associated with alcohol septal ablation has been an issue of concern since the inception of this procedure (28,29), repeatedly raised by many clinicians and HCM experts, as well as by guideline and consensus panels.

The 250 patients with myectomy reported here from 3 institutions in the Netherlands and Belgium could reflect an emerging profile for this surgery in parts of Europe, although this is difficult to assess in precise terms because the investigators do not specify the period of time over which the procedures were performed. Nevertheless, myectomy was 2-fold more common in the Leuven group, and also constituted the majority of septal reduction procedures in Rotterdam. Indeed, in the United States, paradoxically, myectomy operations appear to have increased concomitant with the introduction of alcohol septal ablation (30) (Figure 1).

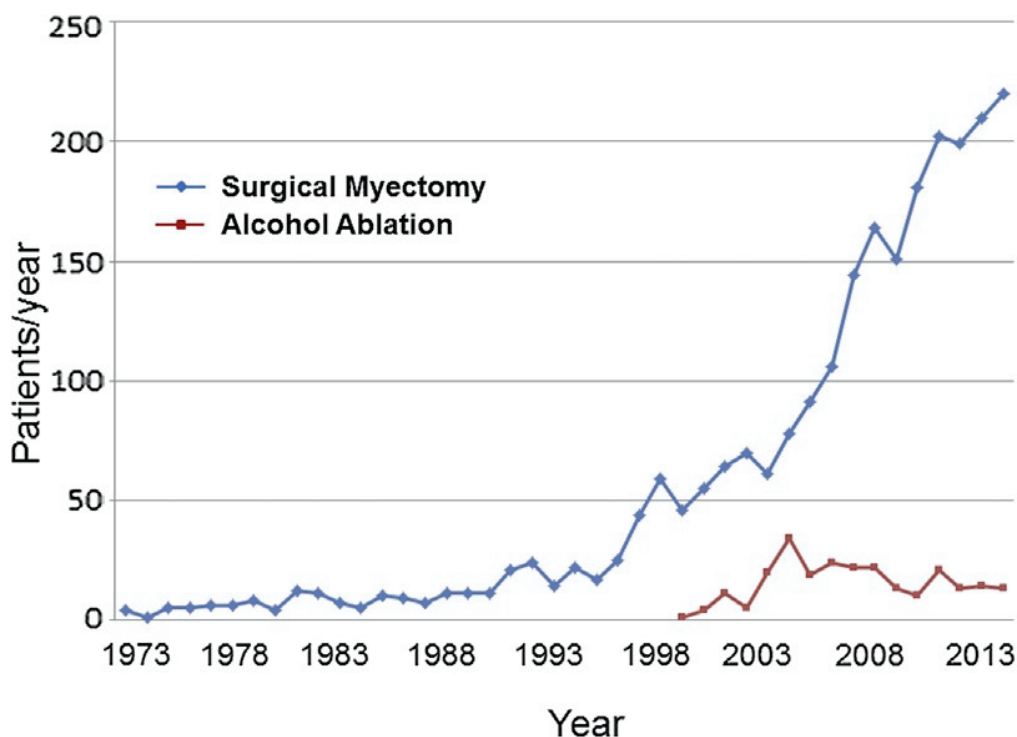
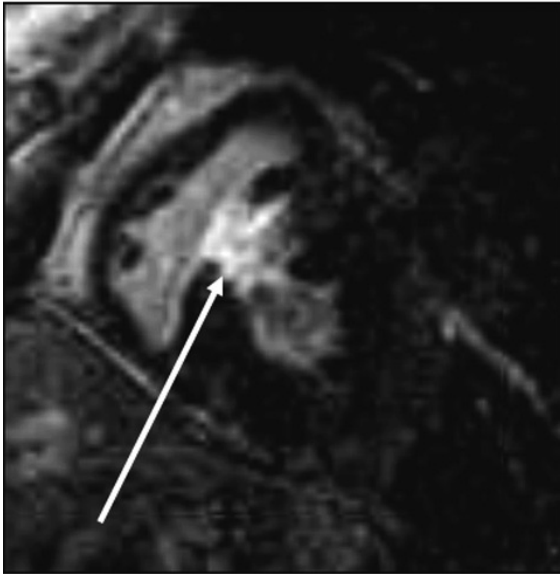


FIGURE 1 Number of Surgical Myectomies Versus Alcohol Ablation Procedures Performed at the Mayo Clinic (Rochester, Minnesota) by Year, After an Informed Discussion of Both Options and Shared Decision-Making

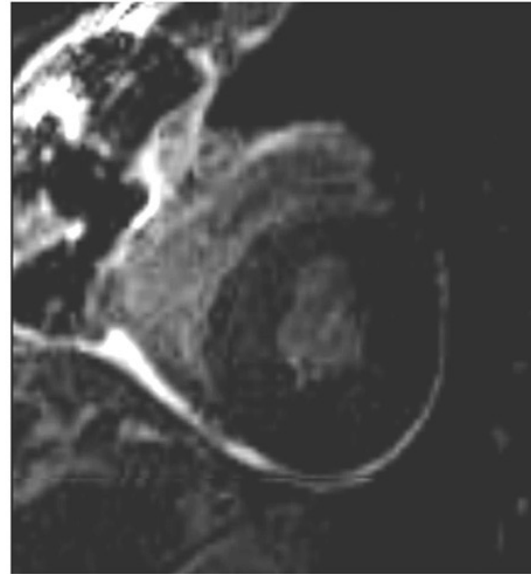
Furthermore, myectomy versus alcohol ablation decisions must be made weighing the risk with alcohol ablation for permanent pacemakers (10% to 15%), therapeutic failures with multiple procedures (12%), ineffective results in patients with particularly substantial LV hypertrophy (in whom adequate septal thinning cannot be achieved), and the potential for post-procedural arrhythmic risk, particularly in younger patients, against the inconvenience and post-operative rehabilitation required after open-heart surgery (1–23). Also important, the heterogeneous and complex LV outflow tract morphology characteristic of obstructive HCM is often most amenable to the myectomy operation, for which the skilled and experienced surgeon has the distinct advantage of direct anatomic visualization, thereby increasing the likelihood of an optimal hemodynamic and symptomatic result (1–6,19–21,28–31). In contrast, alcohol ablation is a “blind” approach restricted by the size and distribution of the septal perforator artery and its fixed anatomic relationship to the target site of outflow obstruction (where the anterior mitral leaflet contacts the septum in systole) (1–4,19,20,28,29,31). Therefore, there will be patients in whom the optimal hemodynamic benefit will not be obtained by alcohol ablation because of these anatomic considerations. Finally, Vriesendorp et al. (26) appropriately underscore the value of HCM subspecialty multidisciplinary teams at dedicated clinics and centers (e.g., with myectomy surgeons, interventional cardiologists, and cardiologists specialized in the care of patients with HCM) (32), creating an environment in which decisions between myectomy and alcohol ablation can be made effectively and in cooperation with fully informed patients (1,5,19).

In conclusion, the Vriesendorp et al. (26) data revisit the important issue of arrhythmogenicity associated with alcohol septal ablation and offer support to the consensus and guideline recommendations from the United States (2003 and 2011) (2,3) and Europe (2003) (2) panels that septal myectomy should be considered the treatment of choice for most patients with HCM and severe drug-refractory heart failure symptoms attributable to LV outflow obstruction. Although the myectomy-versus-ablation pendulum may be swinging back toward septal myectomy, the controversy will undoubtedly continue, although perhaps now in a more balanced environment, permitting greater re-penetration of surgical myectomy into contemporary care for patients with HCM. This would represent a much anticipated adjustment in the management armamentarium of HCM, in the best interests of this patient population.

Post-ablation



Post-myectomy



Septal Scar

VS = 30%

LV = 10%

No Scar

FIGURE 2 Post-Contrast CMR Images Show the Distinctly Different Morphologic Consequences of Alcohol Septal Ablation and Surgical Myectomy

Alcohol ablation (left) produces a bright dense transmurular scar (arrow), whereas intramyocardial scarring is absent after surgical myectomy and muscular resection (right).

Adapted with permission from Valeti et al. (23). CMR 1/4 cardiovascular magnetic resonance; LV 1/4 left ventricular wall; VS 1/4 ventricular septum.

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