

EDITORIAL COMMENT

Surgical Myectomy for Symptomatic Obstructive Hypertrophic Cardiomyopathy

Still Highly Relevant (and Innovating) After 65 Years

Barry J. Maron, MD, Martin S. Maron, MD

Obstruction to the left ventricular (LV) outflow tract occurs at rest or with provocative maneuvers in 70% of patients with hypertrophic cardiomyopathy (HCM) at referral centers, including many with limiting heart failure symptoms.¹⁻³ Since the earliest inception of HCM >60 years ago, the standard and most effective (“gold standard”) strategy to reverse outflow obstruction has been the transaortic surgical septal myectomy operation first introduced by Andrew G. Morrow at the National Institutes of Health (Bethesda, MD) in the 1960s⁴ and still practiced worldwide.³

Recently, cardiac myosin inhibitors (CMIs) have been introduced to HCM patients capable of non-invasively reducing outflow gradients and mitigating the symptom burden of exertional dyspnea. There are currently 2 approved CMI drugs, first-in-class mavacamten and more recently aficamten,^{5,6} with 2 other in-class agents currently under investigation in clinical trials. This represents a much welcomed innovation in the management of HCM as the first novel drugs introduced to this patient population in 40 years.

Notably, in this issue of *JACC*, there is also evidence of innovation with the myectomy operation. The highly regarded cardiac surgeon Paolo Ferrazzi and his team in Monza, Italy,⁷ report an extensive contemporary experience with transaortic surgical myectomy performed over 6 years in 350 severely

symptomatic patients (median age: 55 years) with a modification of the original Morrow procedure⁴ in which selective cutting of thickened or retracted secondary chordae tendinae of the anterior mitral leaflet releases and reorients the mitral valve away from the ventricular septum allowing for a more limited septal resection, thereby minimizing risk for iatrogenic ventricular septal defect.⁸

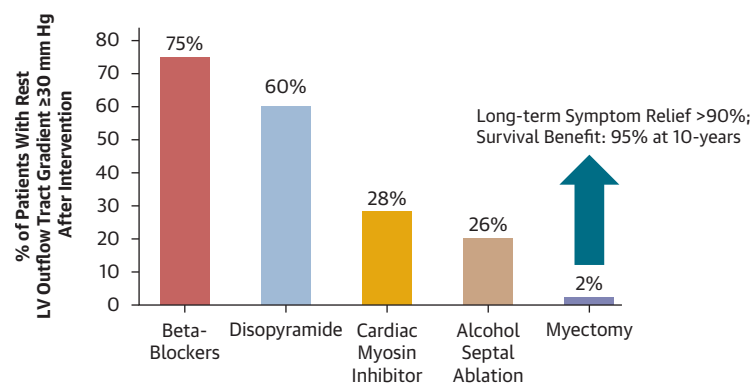
Excellent clinical results were achieved by this technique, with >95% of patients experiencing permanent abolition of the outflow gradient, normalizing intracavitary LV pressure and substantially reducing or abolishing mitral valve regurgitation (**Figure 1**).

Long-term, ≥95% of patients have benefited with no or only mild symptoms including a prominent subset experiencing striking restoration to normal activity and lifestyle, a magnitude of symptom improvement considered to exceed most other cardiovascular interventions. Fully 98% of patients survived to the end of follow-up (annual mortality: 0.4%) no different than for a matched general Italian population.

These favorable results are also associated with very low operative mortality (<0.5%), consistent with results from expert centers worldwide.⁹ Indeed, when performed in high-volume centers, myectomy is the safest open-heart procedure practiced today (including valve replacement and coronary artery bypass grafting).³ Furthermore, there was no evidence that this operative approach involving resection of mitral valve chordae was associated with development of systolic dysfunction. Indeed, LV ejection fraction remained preserved (>55%) over long-term follow-up in >90% of the study patients, supporting the principle noted in other operative series that myectomy does not promote end-stage HCM.³

From the HCM Center, Lahey Hospital and Medical Center, Burlington, Massachusetts, USA.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

FIGURE 1 Surgical Myectomy Produces Complete and Permanent Relief of Left Ventricular Outflow Gradient in the Vast Majority of Hypertrophic Cardiomyopathy Patients

Historical data comparing relief of resting left ventricular outflow obstruction by various treatment interventions most significant with surgery. Myectomy is also associated with excellent long-term survival and reliable relief of heart failure symptoms. Modified from Maron et al¹² with permission.

“Excellent clinical results were achieved by this technique, with >95% of patients experiencing permanent abolition of the outflow gradient, normalizing intracavitary LV pressure and substantially reducing or abolishing mitral valve regurgitation.”

Therefore, the Ferrazzi et al⁷ Italian data substantiate surgery as an innovative high benefit-low risk treatment option for those obstructed HCM patients who are refractory to medical therapies and prefer surgery, a treatment strategy that has contributed to the lowering of overall HCM-related mortality to <0.5%/year.¹⁰ In addition, this surgical experience underscores the principle that operative approaches to relieve outflow obstruction are evolving, resulting in strategies that may be performed with greater ease by experienced surgeons.

This is supported by an increasing implementation of the chordal cutting technique as well as other surgical innovations, including the transapical beating-heart septal myectomy (Wuhan, China), an off-pump approach to septal resection via an image-guided minimally invasive thoracotomy. Such technical initiatives are designed to overcome the unique practical constraints of the transaortic myectomy approach with its limited operative window, requiring a steep learning curve. Therefore these

efforts may ultimately help to address the important unmet need for training a new generation of myectomy surgeons.¹¹

These innovative surgical data are particularly relevant in the context of the evolving management of obstructive HCM. The increasing penetration of highly effective CMI drugs into general cardiology practice could potentially have the impact of significantly reducing the absolute number of referred operative candidates, thereby raising concern regarding future sustainability of the operation. This is not a trivial point, given the continued need for expert surgical myectomy, even in this evolving pharmacologic era.

Indeed, in our experience an important proportion of symptomatic patients maintain a preference for pursuing intervention with a “one and done” surgical option,³ to eliminate the requirement for long-term postoperative drug therapy and echocardiographic monitoring.

In addition, given the complex and diverse anatomy responsible for outflow obstruction in HCM, some patients may not experience sufficient or sustained relief of subaortic gradients and symptoms with CMI therapy and ultimately require referral to an experienced myectomy surgeon, or alternatively have associated cardiac abnormalities that can be addressed effectively only with surgical intervention, eg, aortic valve stenosis and mitral regurgitation, subaortic membrane, multivessel coronary artery disease, or coronary arterial bridging. Also, CMI availability may be limited for patients in some parts of the world, or prohibited by cost.

Together, these considerations define an evolving crossroads for HCM management and the surgical myectomy option. Nevertheless, as evidenced by a vast network of published data and clinical experience over >6 decades in thousands of patients from a multitude of centers worldwide, and underscored by the current experience of Ferrazzi et al,⁷ it is of utmost importance that surgical septal myectomy continue as a necessary high benefit–low risk option in the management of symptomatic obstructive HCM.

Indeed, there will always be the need for available myectomy expertise even within a clinical environment for which novel drugs represent an effective medical treatment option for many patients. Both

myosin inhibitors and the option of surgery should be allowed to flourish in the best interests of the HCM patient population.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

Dr M.S. Maron has been a steering committee member for Cytokinetics; has served as a consultant for Imbria and Edgewise; and owns equity in Braveheart. Dr B.J. Maron has reported that he has no relationships relevant to the contents of this paper to disclose.

ADDRESS FOR CORRESPONDENCE: Dr Barry J. Maron, HCM Center, Lahey Hospital and Medical Center, 41 Mall Road, Burlington, Massachusetts 01805, USA. E-mail: barrymaron1@gmail.com.

REFERENCES

1. Maron BJ, Olivetto I, Zenovich AG, et al. Hypertrophic cardiomyopathy is predominantly a disease of left ventricular outflow tract obstruction. *Circulation*. 2006;114:2232–2239.
2. Maron BJ, Maron MS, Wigle ED, Braunwald E. The 50 year history, controversy and clinical implications of left ventricular outflow tract obstruction in hypertrophic cardiomyopathy from idiopathic hypertrophic cardiomyopathy. *J Am Coll Cardiol*. 2009;54:191–200.
3. Maron BJ, Dearani JA, Smedira NG, et al. Ventricular septal cardiomyopathy (analysis spanning 60 years of practice): AHA expert panel. *Am J Cardiol*. 2022;180:124–139.
4. Maron BJ, Roberts WC. The father of septal myectomy for obstructive HCM, who also had HCM: the unbelievable story. *J Am Coll Cardiol*. 2016;67:2900–2903.
5. Maron MS, Masri A, Nassif ME, et al. Aficamten for symptomatic obstructive hypertrophic cardiomyopathy. *N Engl J Med*. 2024;390:1849–1861.
6. Olivetto I, Oreziak A, Barriales-Villa R, et al. Mavacamten for treatment of symptomatic obstructive hypertrophic cardiomyopathy (EXPLORER-HCM): a randomized, double-blind, placebo-controlled, phase 3 trial. *Lancet*. 2020;396:759–769.
7. Ferrazzi P, Spirito P, Binaco I, et al. Long-term outcome of myectomy associated with secondary mitral valve chordal cutting in obstructive hypertrophic cardiomyopathy. *J Am Coll Cardiol*. <https://doi.org/10.1016/j.jacc.2026.04.049>
8. Spirito P, Binaco I, Poggio D, et al. Role of perspective cardiovascular magnetic resonance in planning ventricular septal myectomy in patients with obstructive hypertrophic cardiomyopathy. *Am J Cardiol*. 2019;9:1517–1526.
9. Maron BJ, Dearani JA, Ommen SR, et al. Low operative mortality achieved with surgical septal myectomy: role of dedicated hypertrophic cardiomyopathy centers in the management of dynamic subaortic obstruction. *J Am Coll Cardiol*. 2015;66:1307–1308.
10. Maron BJ, Ommen SR, Nishimura RA, et al. Evolution and transformation of hypertrophic cardiomyopathy from a high risk to a treatable low mortality disease with contemporary clinical research strategies. *J Am Heart Assoc*. 2026: e047462.
11. Fang J, Chen Y, Liu Y, et al. First in-human transapical beating-heart septal myectomy in patients with hypertrophic obstructive cardiomyopathy. *J Am Coll Cardiol*. 2023;82:575–586.
12. Maron MS, Ommen SR. Exploring new and old therapies for obstructive hypertrophic cardiomyopathy: mavacamten in perspective. *Circulation*. 2021;143(12):1181–1183.

KEY WORDS cardiac myosin inhibitors, heart failure, hypertrophic cardiomyopathy, myectomy, obstruction, surgery