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Commentary: Prevention of incomplete resection during septal myectomy: Virtual seeing is actual believing

Edward Buratto, MBBS, PhD,^{a,b,c} and
Igor E. Konstantinov, MD, PhD, FRACS^{a,b,c,d}

Extended myectomy is the gold standard for treating hypertrophic obstructive cardiomyopathy (HOCM), and it can be achieved with low complication rates in high-volume institutions.¹⁻⁵ Of interest, recurrent obstruction is rare in such

Edward Buratto, MBBS, PhD, and Igor E. Konstantinov, MD, PhD, FRACS, at the Royal Children's Hospital, Melbourne.

CENTRAL MESSAGE

The depth, length, and width of septal myectomy are all important to prevent residual obstruction.

high-volume institutions.¹⁻⁵ It is becoming increasingly apparent that the vast majority of so-called “recurrences” are in fact consequences of incomplete initial resection. Conversely, excessive resection may result in conduction abnormalities and iatrogenic ventricular septal defects.² The matter is further complicated by the variable morphology of HOCM and the relative scarcity of these patients at many institutions. Traditionally, septal morphology is assessed primarily with 2-dimensional (2D) echocardiography, with magnetic resonance imaging used in selected cases.⁵

From the ^aDepartment of Cardiac Surgery, Royal Children's Hospital, Melbourne, Australia; ^bDepartment of Paediatrics, University of Melbourne, Melbourne, Australia; ^cHeart Research Group, Murdoch Children's Research Institute, Melbourne, Australia; and ^dMelbourne Centre for Cardiovascular Genomics and Regenerative Medicine, Melbourne, Australia.

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Address for reprints: Igor E. Konstantinov, MD, PhD, FRACS, Royal Children's Hospital, Flemington Rd, Parkville 3052, Australia (E-mail: igor.konstantinov@rch.org.au).

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FIGURE 1. Pitfalls of incomplete resection. Intraoperative view of the left ventricular cavity during transaortic septal myectomy is obscured (A1). The surgical view (arrow) allows clear visualization of only the “tip of the iceberg” (A2). In as much as surgical blade is directed toward the apex of the left ventricle (B1), the width, depth, and length of resection may be underappreciated, resulting in intracavitary residual obstruction due to incomplete resection (B2). With proper resection, good visualization of the papillary muscle should be achieved (C and C1). RCA, Right coronary artery; LCA, left coronary artery; Ao, aorta; RV, right ventricle; RA, right atrium; LPA, left pulmonary artery; PVs, pulmonary veins.

More recently, 3-dimensional (3D) computed tomography (CT) has emerged as a useful tool for precise delineation of septal and ventricular anatomy.⁶ The left ventricular outflow tract is a complex 3D structure, and the 2D slices provided by traditional imaging methods might not provide adequate information for accurately planning septal myectomy.

Extensive experience with septal myectomy has been accumulated by the Mayo Clinic.²⁻⁴ In this issue of the *Journal*, the Mayo Clinic team describes a novel interactive tool for preoperative assessment of the left ventricular outflow tract in patients with HOCM.⁷ Using multiphasic cardiac CT scans and easily accessible interactive software, they were able to generate 3D models of the heart for precise diagnosis and preoperative planning. The model could subsequently be exported as an interactive PDF file or printed using a 3D printer. This technique has the potential to simplify preoperative planning, making it easier for the surgeon to visualize the extent of muscle needing to be resected, and as such, it could be particularly helpful in children, who may require a more extensive ventriculoseptoplasty for bilateral obstruction.^{8,9} This approach also could be helpful for assessing recurrent

obstruction, which is very rare.¹⁰ Furthermore, abnormalities of accessory papillary muscle that are often not clearly identified on conventional imaging¹¹ could be properly assessed for preoperative planning.

As the view of the septal area is naturally obscured (Figure 1, A1) and the surgeon in fact sees only the “tip of the iceberg” (Figure 1, A2), the importance of preoperative virtual visualization and thorough planning cannot be overemphasized.¹² The natural tendency to resect only visible septum (Figure 1, B1) would result in incomplete resection in most cases (Figure 1, B2). Because width (Figure 1, B1 and C1), length, and depth (Figure 1, C2) of the septal myectomy are all equally important to achieve complete relief of obstruction, preoperative appreciation of the 3D spatial anatomy is crucial. Achieving the appropriate depth, length, and width in septal myectomy is the key to success. Virtual seeing is believing!

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