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## Commentary: Robotic approach to mitral annular calcification—Are we doing more with less, or is less still more?

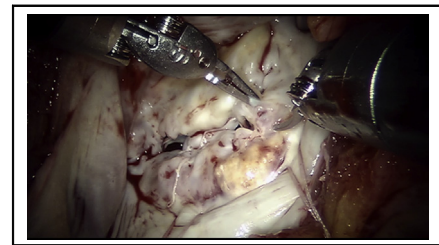
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Video clip is available online.

In the current issue of the *Journal*, Loulmet and Grossi<sup>1</sup> report their experience of patients with severe mitral annular calcification (MAC) and primary degenerative mitral regurgitation who underwent attempted isolated robotic mitral valve (MV) repair between 2011 and 2017. Their important contribution can be summarized by noting the significance of posterior mitral leaflet pliability as a determinant of successful robotic repair and the importance of a 2-surgeon team with advanced experience for optimal outcomes. Their innovative robotic application of Carpentier's en bloc resection technique<sup>2</sup> is most laudable, as they took on 64 complex patients, 57 of whom had a successful outcome.

The mechanism of MAC is multifactorial, and its presence is seen in as many as 20% of patients undergoing MV surgery.<sup>3,4</sup> Robotic MV repair has been shown to be durable and cost neutral to sternotomy, with excellent 1-year outcomes in an all-comers approach, including patients with MAC.<sup>5</sup> Once the learning curve of robotic MV repair surgery has been crested, and the operative team is duly experienced, many advanced centers now regularly apply robotic techniques to essentially all pathoanatomic presentations.<sup>1,5</sup>

The management of MAC and concomitant severe MV disease has evolved to include complex repair and conventional MV replacement with or without annular



Mitral annular calcification often requires targeted solutions for a successful robotic approach.

### CENTRAL MESSAGE

Approaching mitral annular calcification robotically requires significant open surgical experience, with alternative strategies to ensure patient safety and a durable outcome.

reconstruction, percutaneous transcatheter MV replacement, and hybrid operations that may include open valve-in-MAC off-label placement of an inverted transcatheter aortic valve device.<sup>4,6</sup> Because of MAC's anatomic complexity, however, its variations in depth and severity, and the inherent risks to adjacent structures and atrioventricular continuity when intervened on, no technique has demonstrated marked superiority to another for this vexing problem. Loulmet and Grossi<sup>1</sup> note correctly that advanced experience is important for successful robotic approach to MAC. This recommendation should be further clarified, however, to note that surgeons should have significant open sternotomy experience with MAC reconstruction before embarking on these techniques in a minimally invasive or robotic fashion.

The current experience of Loulmet and Grossi,<sup>1</sup> although impressive, pertains essentially to a radical en bloc approach that used electrocautery complete resection, often requiring annular reconstruction with either primary atrio-ectomy or patch, as advocated by Carpentier more than 30 years ago.<sup>2</sup> In the open approach, this en bloc technique has been associated with an operative mortality of 9% and early repair failure of 11%, even in experienced hands.<sup>7-9</sup> Although the experience of Loulmet and Grossi<sup>1</sup> of 2 operative mortalities, 2 operative conversions, and 3 acute failures requiring reoperation before discharge may be interpreted as slightly better than historical reports, one must question whether the en bloc technique is the only

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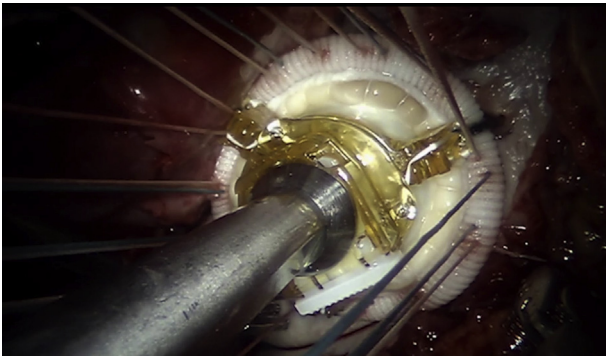
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**VIDEO 1.** A 64-year-old woman on home oxygen therapy with severe regurgitation and stenosis secondary to mitral annular calcification was turned down for conventional surgery and transcatheter mitral replacement after heart team assessment. The patient was discharged home on the seventh postoperative day after a targeted robotic approach to her mitral calcification. Video available at: [https://www.jtcvs.org/article/S0022-5223\(20\)30443-8/fulltext](https://www.jtcvs.org/article/S0022-5223(20)30443-8/fulltext).

way to navigate MAC and yet obtain a successful patient outcome.

Given the variations of the depth and degree of impingement of the posterior mitral leaflet, a selective and less radical resection of MAC has been a successful and less morbid alternative.<sup>10</sup> A targeted and segmental approach to regions that most impair leaflet mobility in less severe MAC can be quite successful in safe MV repair. In patients with advanced age, focal resection of MAC can facilitate successful MV repair or replacement. In patients otherwise at high risk for sternotomy, segmental annular resection and debulking the MAC, perhaps by using the anterior mitral leaflet as a patch, may afford a simplified pathway to secure annular sutures and a well-seated MV prosthesis performed robotically (Video 1).

Preoperative planning with transesophageal echocardiography and computed tomographic imaging is essential to ensure the necessary preparedness when approaching patients with severe MAC. Although the approach to MAC and MV surgery can indeed be performed with less invasive means, with an ability to do even more robotically, when approaching patients with advanced disease, we must focus on a safe and effective outcome, perhaps with more targeted resection. Thus for MAC, sometimes less is still more.

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