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Commentary: The good, the bad, and the ugly

Juan P. Umana, MD, and Jaime Cabrales, MD

In this article by Gooden and colleagues,¹ the authors set out to understand how multiple MitraClips (MC) affect the hemodynamic performance of the mitral valve (MV) as it pertains to MV gradient (MVG) and effective orifice area (EOA). They use a sophisticated left heart simulator that uses porcine valves mounted on a plate fitted to the size of the annulus. The model simulates physiologic conditions within the loop at a fixed heart rate of 60 beats per minute and cardiac output of 3 L/min. Varying degrees of mitral regurgitation (MR) were induced by chordal cutting at the P2 level, as would occur with flail of the posterior leaflet in the setting of myxomatous degeneration. Mitral regurgitant fraction was calculated as regurgitant volume/stroke volume and EOA computed using the Gorlin equation.² Results show MVG increasing concomitantly with mitral regurgitant fraction as the model compensates for loss in forward flow. With MC placement, EOA decreased significantly from baseline but, even in the 2-clip configuration, MR was never abolished. An interesting associated finding was the fact that MVG progressively dropped with MC placement.

MR is the leading cause of heart valve disease in Western countries, affecting 10% of the population older than 75 years of age. In primary, severe MR, surgical repair is the standard of care, with reference centers reporting success rates >95% and mortality <1% in asymptomatic patients.³ Despite these results, transcatheter valve therapies are quickly gaining ground. MC, the first device approved

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CENTRAL MESSAGE

If surgical perfection is achievable, why insist on choosing between mitral stenosis and residual mitral regurgitation after mitral valve repair?

by the Food and Drug Administration for percutaneous MV repair, has been used in degenerative MR with high rates of residual and recurrent MR at short- and medium-term follow-up. Several groups have advocated the placement of more than 1 MC to fully correct MR, but resulting mitral stenosis can lead to greater morbidity and mortality long term.⁴ A recent study by Buzatti and colleagues⁵ suggests that 2-clip placement decreases residual and recurrent MR without significantly compromising EAO. Nevertheless, numbers are small, and valves were not evaluated under stress.⁵ Real-life placement of MC is less precise than that achieved in vitro, and technical challenges remain in the grasping of the flail segments in degenerative MR. Results of the REPAIR-MR (Percutaneous MitraClip Device or Surgical Mitral Valve REpair in PATients With PrImaRy Mitral Regurgitation Who Are Candidates for Surgery) study might change the indications for MC therapy; for now, it remains as an option for very high-risk or inoperable patients.⁶

Although we cannot ignore the fact that transcatheter therapies are likely to take over the space of MV repair, until an optimal device becomes available, a Good surgical repair remains the gold standard, and we should not settle for the Bad MR or Ugly MS. Left heart simulators such as the one presented here become invaluable in the testing of such devices and training of Heart Team members in their use.

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References

- Gooden SC-M, Hatoum H, Zhang W, Boudulas KD, Dasi LP. Multiple MitraClips: the balancing act between pressure gradient and regurgitation. *J Thorac Cardiovasc Surg*. 2022;163:1319-27.e1.
- Gorlin R, Gorlin SG. Hydraulic formula for calculation of the area of the stenotic mitral valve, other cardiac valves, and central circulatory shunts. *Am Heart J*. 1951;41:1-29.
- Nkomo VT, Gardin JM, Skelton TN, Gottdiener JS, Scott CG, Enriquez-Sarano M. Burden of valvular heart diseases: a population-based study. *Lancet*. 2006;368:1005-11.
- Nishimura RA, Vahanian A, Eleid MF, Mack MJ. Mitral valve disease—current management and future challenges. *Lancet*. 2016;387:1324-34.
- Buzatti N, Dneti P, LaCanna G, Schiavi D, Vicentini L, Scarfo IS, et al. Does implantation of a single clip provide reliable durability after transcatheter mitral valve repair? *Eur J Cardiothorac Surg*. 2017;52:137-42.
- Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Fleisher LA, et al. 2017 AHA/ACC focused update of the 2014 AHA/ACC guideline for the management of patients with valvular heart disease. *J Am Coll Cardiol*. 2017;70:252-89.

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Commentary: The importance of annulus in percutaneous mitral valve repair

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Principles for a successful and durable mitral valve repair include the preservation or restoration of normal leaflet motion, creation of a large surface of coaptation, and stabilization of the entire annulus with a remodeling annuloplasty.¹ Resection techniques and the use of artificial neochordae are the most common techniques associated with excellent long-term results. In the early 1990s, Alfieri and colleagues^{2,3} proposed an effective and reproducible technique that restores mitral valve competence through a “functional” rather than an anatomic repair. The Alfieri stitch or edge-to-edge technique involves a suture approximation of anterior and posterior mitral leaflets (double orifice) and has been adopted in different settings of mitral regurgitation (MR). It was used in developing the MitraClip system

CENTRAL MESSAGE

Annuloplasty is a primary component in mitral valve repair. MitraClip does not address the problem of annulus dilatation in chronic mitral regurgitation.

(Abbott Vascular, Temecula, Calif), the most common device used for the percutaneous treatment of MR.

Despite a simple concept, the edge-to-edge technique requires detailed echocardiographic information to avoid failure. One of major concerns associated with this procedure is the risk of mitral stenosis, especially if multiple clips are required to correct MR. Theoretically, the greater number of clips used, the higher the risk of developing a mitral valve gradient (MVG). In the MITRA-FR (Percutaneous Repair with the MitraClip Device for Severe Functional/Secondary Mitral Regurgitation) and COAPT (Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation) trials, the percentage of patients requiring at least 2 MitraClips was 54.3% and 61.5%, respectively.^{4,5} However, to date, no data have been reported on MVG.

In this issue of the *Journal*, Gooden and colleagues⁶ investigated the hemodynamic performance of the mitral

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