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Commentary: MR is bad!

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CENTRAL MESSAGE

Regardless of the approach to mitral valve therapy (transcatheter or surgical), the most important determinant of successful repair is avoidance of residual and recurrent mitral regurgitation.

In an extensive review,¹ Badhwar summarizes the momentum behind transcatheter mitral valve (MV) therapies in treating degenerative mitral regurgitation (DMR) and secondary, functional mitral regurgitation (FMR) and eloquently describes the multidisciplinary heart team and the future mitral specialist.

For DMR, mitral valve repair (MVR) is superior to replacement and restores life expectancy for all age groups.² Furthermore, performing early MVR before class I indications leads to superior outcomes.³ As shown in long-term follow-up, avoiding residual and recurrent MR after MVR is paramount to a positive outcome.⁴ Consequently, the threshold for replacement of DMR and transcatheter substitutes is extremely high. To summarize, early repair of DMR and avoidance of residual and recurrent MR lead to success. Outcomes and guidance for transcatheter MV therapies for DMR will be no different.

For FMR, the evidence remains unresolved. While Fatouch and colleagues⁵ and Chan and colleagues⁶ each found positive outcomes with the addition of MVR to coronary artery bypass grafting for FMR, the Cardiothoracic Surgical Trials Network (CTSN) investigators found no advantage of MVR over replacement in the primary end point.⁷ However, these 2 positive trials report $\geq 2+$ recurrent MR in 0% and 4% of patients after MVR, compared with 33% at 1 year and 59% at 2 years in the CTSN trial. Closer inspection of the CTSN trial has revealed that a “good” repair appeared to be superior to replacement, which was superior to a “bad” repair. Transcatheter MV therapy results for FMR

are no different. Whereas MITRA-FR (Percutaneous Repair with the MitraClip Device for Severe Functional/Secondary Mitral Regurgitation; negative outcome for FMR clip) reported a 17% rate of $\geq 3+$ recurrent MR at 12 months,⁸ COAPT (Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation; positive outcome for FMR clip) reported 1% at 24 months.⁹ Although Badhwar correctly proposes that FMR is not amenable to a one-size-fits-all approach, data from these trials suggest that recurrent MR is bad—for all etiologies and pathoanatomic presentations (Table 1).

A significant volume–outcome relationship has been shown for surgical MVR over the past 2 decades. Unsurprisingly, the volume–outcome effect has been substantially stronger at the surgeon rather than hospital level. Recent analyses have shown that transcatheter MV therapies are no different, as operator experience for transcatheter MVR was associated with improved procedural success, time, avoidance of complications, and achieving $\leq 1+$ residual MR.¹⁰ For transcatheter MV therapies, volume still predicts outcome.

Any therapy with at least almost as good of outcomes as another, better tolerated by patients, and potentially requiring a flatter learning curve will ultimately prevail—technology replaces technique. As we move into the next era of MV intervention, transcatheter techniques, with

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TABLE 1. Surgical and transcatheter trials for FMR in heart failure

Trial	Intervention	Control	Follow-up, mo	Recurrent MR		Main outcomes for mitral repair
				2+ or worse	3+ or worse	
Positive studies for repair of FMR						
Fattouch et al, 2009 ⁵	CABG + MVr (n = 48)	CABG (n = 54)	Mean 32 ± 18	0%	0%	Lower NYHA class, LVEDD, LVESD, PAP, and LA size
Chan et al (RIME), 2012 ⁶	CABG + MVr (n = 34)	CABG (n = 39)	12	4%	0%	Greater improvement in peak oxygen consumption and in LVESVI, MR volume, and BNP reduction (study stopped early)
Stone et al (COAPT), 2018 ⁹	MitraClip + GDMT (n = 302)	GDMT (n = 312)	24	23%	1%	Lower all-cause mortality (29% vs 46%) and rate of hospitalization for heart failure (36% vs 68%)
Negative studies for repair of FMR						
Goldstein et al (CTSN), 2016 ⁷	MVr +/- CABG (n = 126, repair arm of trial)		12 24	33% 59%	4% (all 4+) 14%	No difference in LVESVI or survival between repair and replacement Moderate (2+) or worse recurrent MR worse in repair at 1 y (33% vs 2%) and 2 y (59% vs 4%)
Obadia et al (MITRA-FR), 2018 ⁸	MitraClip + GDMT (n = 152)	GDMT (n = 152)	12	49%	17%	Composite outcome of death or unplanned hospitalization did not differ 1-y echocardiographic follow-up data only available in 97/152 (64%) patients

MR, Mitral regurgitation; FMR, functional mitral regurgitation; 2+ MR, moderate; 3+ MR or worse, moderate-to-severe or severe; CABG, coronary artery bypass grafting; MVr, mitral valve repair; NYHA, New York Heart Association; LVEDD, left ventricular end diastolic diameter; LVESD, left ventricular end systolic diameter; PAP, pulmonary artery pressure; LA, left atrial; RIME, Randomized Ischemic Mitral Evaluation; LVESVI, left ventricular end systolic volume index; BNP, brain natriuretic peptide; COAPT, Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation; GDMT, guideline-directed medical therapy; CTSN, Cardiothoracic Surgical Trials Network; MITRA-FR, Percutaneous Repair with the MitraClip Device for Severe Functional/Secondary Mitral Regurgitation.

much less biologic impact, will succeed because we will intervene in earlier patients with less heart failure, leading to more “heart success.” Second, we will “guess better.” Instead of evaluating MV anatomy in an empty heart on bypass, transcatheter technology allows us to examine and intervene on the MV in a fully-loaded beating heart under 3-dimensional transesophageal echocardiogram. Nonetheless, while using improved technology to “guess better,” all mitral specialists must never forget that mitral valve biology has not changed. No matter the etiology or procedural approach, success will remain defined by elimination and avoidance of MR. MR is bad!

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