

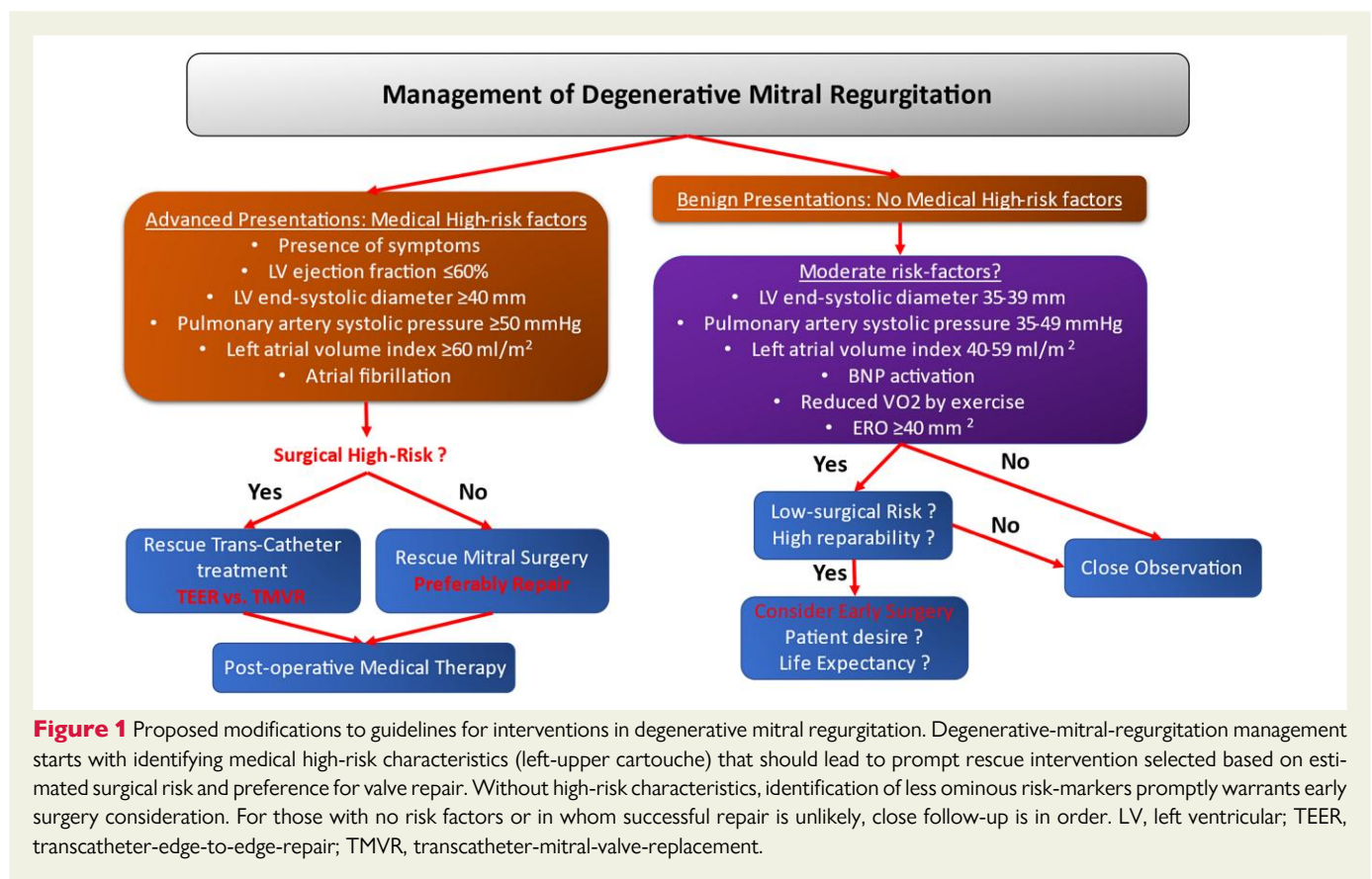
# Rescue surgery for degenerative mitral regurgitation should be recognized for what it is: indispensable but imperfect

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This commentary refers to ‘Factors influencing post-surgical survival in degenerative mitral regurgitation’, by S.C. Butcher *et al.*, <https://doi.org/10.1093/eurheartj/ehad004> and the discussion piece ‘Degenerative mitral regurgitation: improving clinical decision-making and risk stratification before valve surgery or transcatheter repair’, by M. Dandel, <https://doi.org/10.1093/eurheartj/ehad216>

We appreciate Prof. Dandel’s interest for our work on outcome determinants after mitral surgery for degenerative-mitral-regurgitation (DMR).<sup>1</sup> We agree that left-ventricular (LV) ejection fraction is imperfect, subject to notable measurement-variability and impacted by DMR regurgitant volume and LV afterload variations. Nonetheless, despite these limitations, LV ejection fraction, consistently shown to



**Figure 1** Proposed modifications to guidelines for interventions in degenerative mitral regurgitation. Degenerative-mitral-regurgitation management starts with identifying medical high-risk characteristics (left-upper cartouche) that should lead to prompt rescue intervention selected based on estimated surgical risk and preference for valve repair. Without high-risk characteristics, identification of less ominous risk-markers promptly warrants early surgery consideration. For those with no risk factors or in whom successful repair is unlikely, close follow-up is in order. LV, left ventricular; TEER, transcatheter-edge-to-edge-repair; TMVR, transcatheter-mitral-valve-replacement.

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be an important determinant of pre- and post-operative DMR outcome,<sup>2,3</sup> cannot be ignored. Our interpretation is that while any drop in LV ejection fraction is a harbinger of poor outcome, it is not sensitive enough to identify all patients with DMR at risk for excess mortality under medical management and post-operatively. We also concur that research identifying new indices of myocardial function should be pursued, with the caveat that many similar limitations may remain in patients with DMR (e.g. LV global-longitudinal-strain),<sup>4</sup> and it is unlikely that any measure will ever be perfect.

Alternatively to searching for the 'perfect' index of LV function, a more proactive approach is warranted. At present, the major deficit in caring for patients with DMR is related to undertreatment and delayed treatment.<sup>5</sup> We suggest that the entire clinical picture should be considered in 'staging' or 'scoring' risk linked to DMR. The concept of a 'minor' (or Class II) complication is fraught, with each complication associated with outcome abysmal under medical management and remaining poor after successful surgery. We also believe that the current concept of Class I intervention indications is also a misnomer, as it suggests that these are ideal indications for intervention in these patients. However, studies such as ours clearly demonstrate poor post-operative outcome of patients who meet such indications.<sup>1</sup> Indeed, presence of symptoms or LV ejection fraction  $\leq 60\%$ , LV end-systolic diameter  $\geq 40$  mm, pulmonary artery systolic pressure  $\geq 50$  mmHg, left atrial volume index  $\geq 60$  mL/m<sup>2</sup>, and atrial fibrillation should all be in the same category of high-risk markers and of the need for 'rescue surgery', whereby mitral valve surgery should be promptly performed (or transcatheter intervention in patients at high surgical risk), but with the understanding, as our study shows, that long-term outcome of these patients remains generally mediocre. For patients who are not presenting with these markers of high or considerable risk under medical management and do not warrant 'rescue surgery', evaluation of appropriateness of 'early surgery' is indicated. It is a decision based on presence of risk-markers that approach thresholds for rescue surgery and have lesser consequences on post-operative outcome but also accounts for mitral repair feasibility, intervention risks, comorbidity, life-expectancy, and patients' desires (Figure 1).

We all agree that the field should be evolving towards more patients treated, better and earlier indications, to ultimately provide patients affected by DMR with best possible outcomes.

## Data availability

No data to be shared.

## Conflict of interest

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## References

1. Butcher SC, Essayagh B, Steyerberg EW, Benfari G, Antoine C, Grigioni F, et al. Factors influencing post-surgical survival in degenerative mitral regurgitation. *Eur Heart J* 2023;**44**: 871–881. <https://doi.org/10.1093/eurheartj/ehad004>
2. Enriquez-Sarano M, Tajik AJ, Schaff HV, Orszulak TA, Bailey KR, Frye RL. Echocardiographic prediction of survival after surgical correction of organic mitral regurgitation. *Circulation* 1994;**90**:830–837. <https://doi.org/10.1161/01.CIR.90.2.830>
3. Tribouilloy C, Rusinaru D, Grigioni F, Michelena HI, Vanoverschelde JL, Avierinos JF, et al. Long-term mortality associated with left ventricular dysfunction in mitral regurgitation due to flail leaflets: a multicenter analysis. *Circulation. Cardiovascular imaging* 2014;**7**: 363–370. <https://doi.org/10.1161/CIRCIMAGING.113.001251>
4. Hiemstra YL, Tomsic A, van Wijngaarden SE, Palmén M, Klautz RJM, Bax JJ, et al. Prognostic value of global longitudinal strain and etiology after surgery for primary mitral regurgitation. *JACC Cardiovasc Imaging* 2020;**13**:577–585. <https://doi.org/10.1016/j.jcmg.2019.03.024>
5. Dziadzko V, Dziadzko M, Medina-Inojosa JR, Benfari G, Michelena HI, Crestanello JA, et al. Causes and mechanisms of isolated mitral regurgitation in the community: clinical context and outcome. *Eur Heart J* 2019;**40**:2194–2202. <https://doi.org/10.1093/eurheartj/ehz314>