

# Moderate mitral regurgitation in severe tricuspid regurgitation: innocent bystander or actionable target?

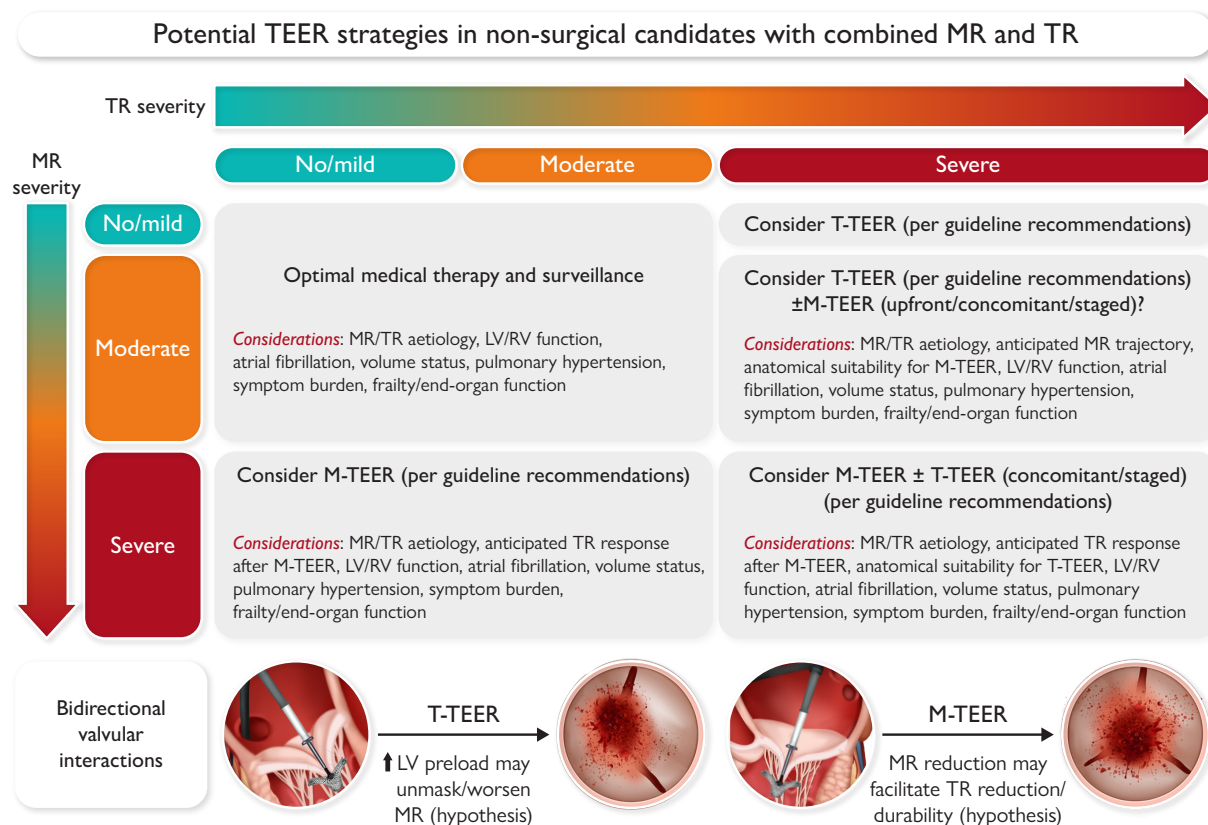
Taishi Okuno <sup>1,\*</sup>, Tetsu Tanaka <sup>1</sup>, and Shingo Kuwata <sup>1</sup>

<sup>1</sup>Department of Cardiology, St. Marianna University School of Medicine, Kawasaki, Kanagawa 216-8511, Japan

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## Graphical Abstract



LV, left ventricle; M-TEER, mitral transcatheter edge-to-edge repair; MR, mitral regurgitation; RV, right ventricle; T-TEER, tricuspid transcatheter edge-to-edge repair; TEER, transcatheter edge-to-edge repair; TR, tricuspid regurgitation

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\* Corresponding author. Tel: +81 44 977 8111, Email: [taishi.okuno@marianna-u.ac.jp](mailto:taishi.okuno@marianna-u.ac.jp)

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Over the past two decades, the therapeutic landscape of valvular heart disease has undergone a fundamental transformation. What was once a field largely restricted to open-heart surgery, with limited choice between repair or replacement, has evolved into an expanding portfolio of transcatheter options.<sup>1–3</sup> In the surgical era, concomitant correction of ‘clearly significant’ co-existing lesions was often favoured to avoid the risk of reoperation, yet the management of intermediate lesions has remained a grey zone.<sup>4</sup> The availability of staged transcatheter strategies has made this question more complex: clinicians must now decide not simply whether to treat, but which valve to treat first, whether to treat both, and whether treatment should be concomitant or staged.

After a single valve intervention, the severity of co-existing lesions may improve, remain unchanged, or worsen, as reported across contemporary practice.<sup>5–8</sup> Anticipating these trajectories could help avoid unnecessary procedures while identifying patients who may benefit from earlier intervention. Meanwhile, declining procedural risk with minimally invasive approaches has stimulated interest in earlier treatment across valve disease,<sup>2,9</sup> raising the question of whether intermediate lesions should be addressed when they are not innocent bystanders. Yet particularly in functional mitral regurgitation (MR) and tricuspid regurgitation (TR), the lesion may reflect the advanced stages of the underlying disease rather than represent a modifiable driver of outcome. Against this background, in this issue of the *European Heart Journal*, Kassir *et al.* address a practical dilemma at the frontier of valvular intervention: when performing transcatheter edge-to-edge repair (T-TEER) for severe TR, how should clinicians interpret and manage concomitant moderate MR?<sup>10</sup>

The interdependence of MR and TR is physiologically intuitive and increasingly supported by clinical data.<sup>5,8</sup> MR promotes pulmonary venous hypertension and right ventricular afterload, whereas TR exacerbates systemic congestion and may impair left-sided filling. Residual TR after mitral TEER (M-TEER) is associated with impaired outcomes, suggesting that right-sided disease is not invariably passive.<sup>8</sup> Beyond these observations, the field has begun to explore dual-valve transcatheter strategies. In a multicentre registry analysis of high-risk patients with severe MR and severe TR, a concomitant transcatheter approach was associated with improved survival compared with isolated M-TEER, though such findings remain intrinsically vulnerable to selection bias.<sup>11</sup> Expert consensus has therefore converged on a cautious, phenotype-driven approach: concomitant vs staged repair should be considered in light of anatomy, haemodynamics, and clinical trajectory, while acknowledging that robust randomized evidence is scarce and that ‘one-size-fits-all’ algorithms are unlikely to succeed in this heterogeneous population.<sup>12</sup> Yet a critical gap persists. Most prior discussions focus on severe–severe combinations, whereas clinical practice frequently confronts severe TR with only moderate MR, where equipoise is greatest and the risk–benefit balance most uncertain. The dilemma is sharpened further by two additional considerations. First, tricuspid intervention may increase left ventricular preload and unmask clinically important MR, a phenomenon described after tricuspid surgery.<sup>13</sup> Second, treating an intermediate left-sided lesion may, at least in theory, improve the upstream haemodynamic milieu and thereby contribute to more durable reduction of TR. These bidirectional interactions

make the management of concomitant moderate MR in severe TR particularly complex (*Graphical Abstract*).

Kassar *et al.* leverage the large, contemporary EuroTR registry to ask two related questions. First, among patients undergoing T-TEER, is moderate MR associated with subsequent outcomes? Second, in those with moderate MR, is concomitant M-TEER associated with better clinical outcomes than an isolated tricuspid approach? Among 3100 patients treated with T-TEER, ~30% had concomitant moderate MR. In the primary analysis evaluating prognosis, patients with severe MR and those undergoing concomitant M-TEER were excluded, yielding a cohort of 2762 patients. In this cohort, moderate MR was independently associated with mortality (survival at 2 years: 63% vs 77%, adjusted hazard ratio [HR] 1.8; 95% confidence interval [CI] 1.5–2.2). When stratified by MR grade, outcomes worsened in a graded fashion from no/mild to moderate to moderate-to-severe MR. This pattern does not establish causality, but it strengthens the coherence of the association and supports the notion that moderate MR is not an innocent bystander in this setting.

The second component of the analysis explored treatment strategy. In patients with moderate MR, a subset underwent concomitant M-TEER alongside T-TEER. After propensity score matching, 217 matched pairs were analysed. Concomitant M-TEER was associated with more durable TR reduction and improved functional status. Survival at 2 years also favoured the concomitant strategy (81% vs 70%) with a protective association for concomitant M-TEER in adjusted analyses (adjusted HR 0.46; 95% CI 0.26–0.65). The novelty lies less in the concept that MR and TR co-exist, which is well recognized, and more in the specific focus on moderate MR as the accompanying lesion in a large cohort undergoing T-TEER. By shifting the spotlight to an intermediate grade left-sided lesion, the study frames an actionable question for heart teams; if moderate MR identifies a higher risk phenotype in severe TR, and may also influence the reduction of TR, might selected patients benefit from a dual-valve transcatheter strategy rather than a tricuspid-only approach?

Despite its clinical appeal, the interpretation of these findings requires caution. This is, by design, an observational analysis; therefore, the results should be viewed as hypothesis-generating. Several limitations deserve emphasis because they directly influence clinical translation. Most importantly, MR aetiology is not captured in this registry. This is not a minor detail. Primary MR and secondary (ventricular or atrial) MR represent distinct disease entities with different haemodynamic consequences, natural history, and thresholds for transcatheter intervention. Mixing these phenotypes risks residual confounding and may distort both the prognostic association of moderate MR and the apparent benefit of concomitant mitral intervention. In real-world practice, the decision to pursue concomitant M-TEER is likely to be shaped by the mechanism of MR and anatomical suitability, and these factors are unlikely to be fully represented by baseline covariates in this registry. For instance, secondary MR is often managed more conservatively, yet it is generally associated with worse prognosis than primary MR.<sup>14</sup> If secondary mechanisms were over-represented in the group that did not receive concomitant M-TEER, this imbalance could contribute to the observed survival difference without implying a causal benefit of the intervention. Second, the apparent ‘synergy’ effect of concomitant M-TEER on TR reduction may reflect true haemodynamic interaction;

reducing MR could lower pulmonary pressures and improve right ventricular loading, thereby stabilizing tricuspid coaptation and supporting durability. Yet an alternative explanation is equally plausible. Patients in whom T-TEER is technically straightforward, with favourable anatomy and efficient imaging, may also be those in whom the incremental procedural burden of concomitant M-TEER is acceptable. In that scenario, better outcomes could be driven in part by procedural feasibility and patient selection, rather than by a causal benefit of treating MR. Third, the registry does not systematically adjudicate staged mitral interventions. If patients in the 'isolated T-TEER' group subsequently underwent M-TEER, or if complex cases were deferred to staged treatment because of procedural constraints, the contrast becomes less clean and could bias results in either direction. Finally, competing risks, including non-cardiac death and progressive frailty, remain substantial in this population and complicate conventional survival comparisons. Taken together, these limitations do not diminish the importance of the work; rather, they define the boundary of inference. The data convincingly reinforce that moderate MR in patients undergoing T-TEER is associated with worse outcomes, while it remains uncertain whether treating MR at the time of T-TEER improves hard endpoints across phenotypes.

Importantly, the concept of 'concomitant' intervention warrants careful interpretation to avoid undue emphasis. This registry does not capture detailed information on prior mitral valve interventions before T-TEER, and it is therefore plausible that a proportion of patients classified as having mild or less MR at the time of T-TEER had already undergone upfront M-TEER. This highlights that simultaneous treatment is not necessarily required; rather, the clinically relevant objective may be to avoid leaving moderate MR after T-TEER, regardless of procedural sequencing.

What, then, should clinicians do today? The most immediate implication is conceptual: in patients referred for T-TEER, moderate MR should not be dismissed as a trivial accompaniment. Instead, its presence should trigger more deliberate phenotyping and haemodynamic reasoning. When determining the need for concomitant M-TEER, heart teams should consider what mechanism is driving MR and whether the mitral valve anatomy is suitable for transcatheter intervention. They should also reflect on whether MR is likely to improve or worsen after T-TEER and whether MR reduction might plausibly contribute to TR reduction and durability. However, the current evidence base provides limited guidance on these trajectories in individual patients. For now, the most pragmatic approach is careful, patient-tailored decision-making that integrates valve severity, mechanism, haemodynamics, comorbidities, procedural suitability, and patient goals. The expansion of transcatheter options has increased the need for multidisciplinary heart teams that can navigate complexity rather than apply rigid thresholds (*Graphical Abstract*).

The study by Kassir *et al.*<sup>10</sup> provides an important first step. Before the field can confidently define when concomitant treatment should be preferred to staged reassessment, it must assemble the signals required to design informative trials and prospective studies. Given the historical difficulty of generating decisive evidence in multivalvular disease, the pathway to randomized trials will be challenging and may require intermediate milestones: richer phenotyping in registries; consistent mechanism-based classification of MR and TR; systematic

capture of staged interventions; and haemodynamic profiling that can support testable hypotheses. In that sense, EuroTR offers a valuable contemporary signal that should hone clinical attention and stimulate better study design. The transcatheter toolbox has expanded rapidly; evidence and phenotyping must now catch up so that the right patients receive the right combination of therapies at the right time.

## Declarations

### Disclosure of Interest

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### References

- Mack MJ, Leon MB, Thourani VH, Makkar R, Kodali SK, Russo M, *et al.* Transcatheter aortic-valve replacement with a balloon-expandable valve in low-risk patients. *N Engl J Med* 2019;**380**:1695–705. <https://doi.org/10.1056/NEJMoa1814052>
- Anker SD, Friede T, von Bardeleben RS, Butler J, Khan MS, Diek M, *et al.* Transcatheter valve repair in heart failure with moderate to severe mitral regurgitation. *N Engl J Med* 2024;**391**:1799–809. <https://doi.org/10.1056/NEJMoa2314328>
- Sorajja P, Whisenant B, Hamid N, Naik H, Makkar R, Tadros P, *et al.* Transcatheter repair for patients with tricuspid regurgitation. *N Engl J Med* 2023;**388**:1833–42. <https://doi.org/10.1056/NEJMoa2300525>
- Praz F, Borger MA, Lanz J, Marin-Cuartas M, Abreu A, Adamo M, *et al.* 2025 ESC/EACTS guidelines for the management of valvular heart disease: developed by the task force for the management of valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). *Eur Heart J* 2025;**46**:4635–736. <https://doi.org/10.1093/eurheartj/ehaf194>
- Cortés C, Amat-Santos IJ, Nombela-Franco L, Muñoz-García AJ, Gutiérrez-Ibanes E, De La Torre Hernández JM, *et al.* Mitral regurgitation after transcatheter aortic valve replacement: prognosis, imaging predictors, and potential management. *JACC Cardiovasc Interv* 2016;**9**:1603–14. <https://doi.org/10.1016/j.jcin.2016.05.025>
- Tomii D, Okuno T, Praz F, Heg D, Wild MG, Lanz J, *et al.* Potential candidates for transcatheter tricuspid valve intervention after transcatheter aortic valve replacement: predictors and prognosis. *JACC Cardiovasc Interv* 2021;**14**:2246–56. <https://doi.org/10.1016/j.jcin.2021.07.030>
- Matsumoto S, Ohno Y, Noda S, Miyamoto J, Kamioka N, Murakami T, *et al.* Tricuspid regurgitation and outcomes in mitral valve transcatheter edge-to-edge repair. *Eur Heart J* 2025;**46**:1415–27. <https://doi.org/10.1093/eurheartj/ehae924>
- Cannata F, Sticchi A, Russo G, Stankowski K, Hahn RT, Alessandrini H, *et al.* Mitral regurgitation evolution after transcatheter tricuspid valve interventions—a sub-analysis of the TriValve registry. *Eur Heart J Cardiovasc Imaging* 2024;**26**:135–47. <https://doi.org/10.1093/ehjci/jeae227>
- Généreux P, Schwartz A, Oldemeyer B, Pibarot P, Cohen DJ, Blanke P, *et al.* Transcatheter aortic-valve replacement for asymptomatic severe aortic stenosis. *N Engl J Med* 2025;**392**:217–27. <https://doi.org/10.1056/NEJMoa2405880>
- Kassar M, Praz F, Gerçek M, Fortmeier V, Kresoja K-P, von Stein J, *et al.* Combined transcatheter mitral and tricuspid edge-to-edge repair or tricuspid edge-to-edge repair alone in moderate mitral regurgitation: a propensity-matched analysis. *Eur Heart J* 2026;**47**:4113–28. <https://doi.org/10.1093/eurheartj/ehag186>
- Mehr M, Karam N, Taramasso M, Ouarrak T, Schneider S, Lurz P, *et al.* Combined tricuspid and mitral versus isolated mitral valve repair for severe MR and TR. *JACC Cardiovasc Interv* 2020;**13**:543–50. <https://doi.org/10.1016/j.jcin.2019.10.023>

12. Sisinni A, Taramasso M, Praz F, Metra M, Agricola E, Margonato A, *et al*. Concomitant transcatheter edge-to-edge treatment of secondary tricuspid and mitral regurgitation: An expert opinion. *JACC Cardiovasc Interv* 2023;**16**: 127–39. <https://doi.org/10.1016/j.jcin.2022.11.022>
13. Kim D-Y, Cho I, Hong G-R, Ha J-W, Shim CY. Factors associated with the occurrence of significant mitral regurgitation after tricuspid valve surgery for severe isolated tricuspid regurgitation. *J Am Soc Echocardiogr* 2023;**36**: 118–21. <https://doi.org/10.1016/j.echo.2022.10.015>
14. Okuno T, Izumo M, Kuwata S, Akashi YJ, Yamamoto M, Kubo S, *et al*. Early-versus newer-generation transcatheter mitral valve edge-to-edge repair systems: Insights from the OCEAN-Mitral registry. *JACC Asia* 2025;**5**:1110–20. <https://doi.org/10.1016/j.jacasi.2025.05.013>