

Evolving paradigms in cardiovascular interventions: from procedural innovation to patient-centred outcomes

Patrizio Lancellotti, Alain Nchimi & Cécile Oury

To cite this article: Patrizio Lancellotti, Alain Nchimi & Cécile Oury (2026) Evolving paradigms in cardiovascular interventions: from procedural innovation to patient-centred outcomes, Acta Cardiologica, 81:3, 265-269, DOI: [10.1080/00015385.2026.2664284](https://doi.org/10.1080/00015385.2026.2664284)

To link to this article: <https://doi.org/10.1080/00015385.2026.2664284>



Published online: 11 May 2026.



Submit your article to this journal [↗](#)



Article views: 295



View related articles [↗](#)



View Crossmark data [↗](#)

EDITORIAL



Evolving paradigms in cardiovascular interventions: from procedural innovation to patient-centred outcomes

Patrizio Lancellotti, Alain Nchimi and Cécile Oury

Department of Cardiology, University of Liège Hospital, GIGA Institutes, Cardiovascular Sciences and Metabolism, CHU Sart Tilman, Liège, Belgium

ABSTRACT

Over the past two decades, cardiovascular interventions have undergone major transformation, extending indications while improving safety and efficiency. The focus has progressively shifted from procedural feasibility towards complications, durability, and patient-centred outcomes. This editorial integrates recent data across transcatheter aortic valve implantation (TAVI), coronary interventions, and aortic diseases. Procedural simplification, personalised strategies, and improved mechanistic understanding are reshaping clinical practice and supporting a more integrated approach to cardiovascular care.

KEYWORDS

TAVI; coronary artery disease; valve durability; personalised care

Cardiovascular medicine is progressively moving away from a purely procedural vision towards a more integrated model of care. Diagnostic strategies, complication profiles, and economic considerations are increasingly interrelated and must be considered together when guiding clinical decisions [1–3]. This is particularly relevant in coronary artery disease, where the continuum from acute to chronic presentations requires a flexible and individualised approach [4].

In this evolving landscape, transcatheter aortic valve implantation (TAVI) has become a central therapeutic option for severe aortic stenosis (AS). Initially reserved for inoperable or high-risk patients, it is now widely used across all risk categories [5–7]. Beyond clinical efficacy, cost-effectiveness analyses have confirmed its sustainability in modern healthcare systems [8]. Over time, procedural outcomes have improved, reflecting both technological advances and growing operator experience [9].

As TAVI expands, new challenges emerge. Valve-in-valve procedures now represent a practical solution for degenerated surgical bioprostheses, with consistent improvements in valve performance despite early hemodynamic differences between balloon-expandable valves (BEVs) and self-expandable valves (SEVs) [10]. However, long-term durability remains a critical issue. Although bioprosthetic valve degeneration (BVD) is relatively infrequent, its association with adverse

outcomes highlights the importance of careful procedural planning and follow-up (Figure 1) [11].

At the same time, procedural simplification has significantly altered clinical practice. The minimalist approach, based on local anaesthesia and early mobilisation, has reduced hospital stay and resource utilisation without compromising safety [12]. This evolution parallels a broader temporal trend, with a shift towards lower-risk patients and improved short- and mid-term outcomes over time [13]. Changes in post-procedural management, including haemostatic balance, have also been shown to influence outcomes [14].

Despite these advances, complications remain part of routine practice. Cerebrovascular events, although uncommon, have a major prognostic impact, particularly when occurring early after the procedure [15]. Preventive strategies such as embolic protection devices have been proposed, but their precise role remains to be clarified [16]. In parallel, conduction disturbances and pacemaker implantation continue to be important considerations following valve replacement procedures [17].

Beyond clinical endpoints, there is growing interest in understanding the physiological consequences of TAVI. The abrupt relief of left ventricular outflow obstruction induces systemic and microvascular adaptations. Observations from retinal circulation studies suggest a transient autoregulatory response, followed

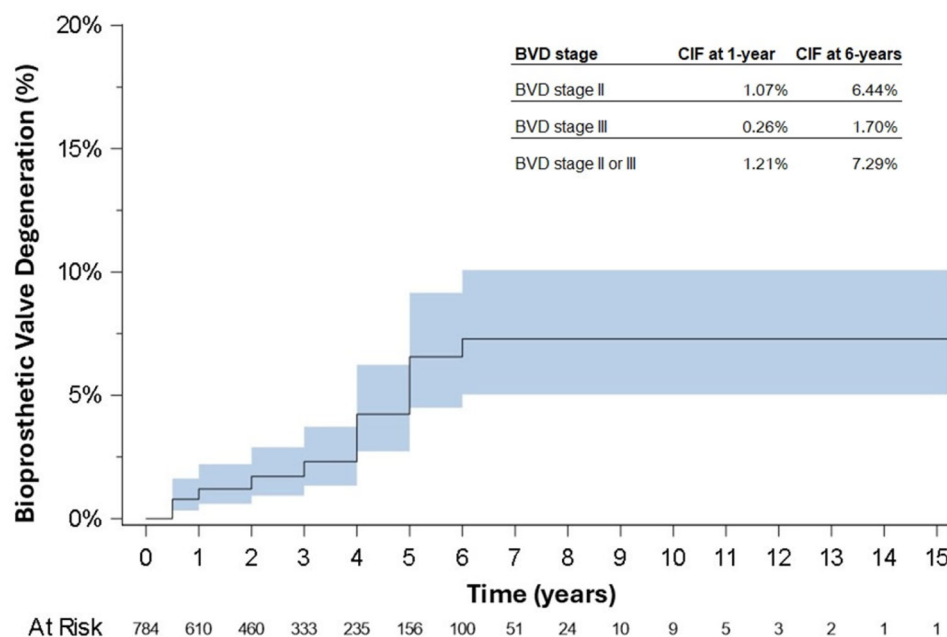


Figure 1. Cumulative incidence of bioprosthetic valve degeneration (class II and III combined) over time 12 accounting for the competing risk of death. BVD: bioprosthetic valve degeneration; CIF: cumulative incidence function (from reference [11]).

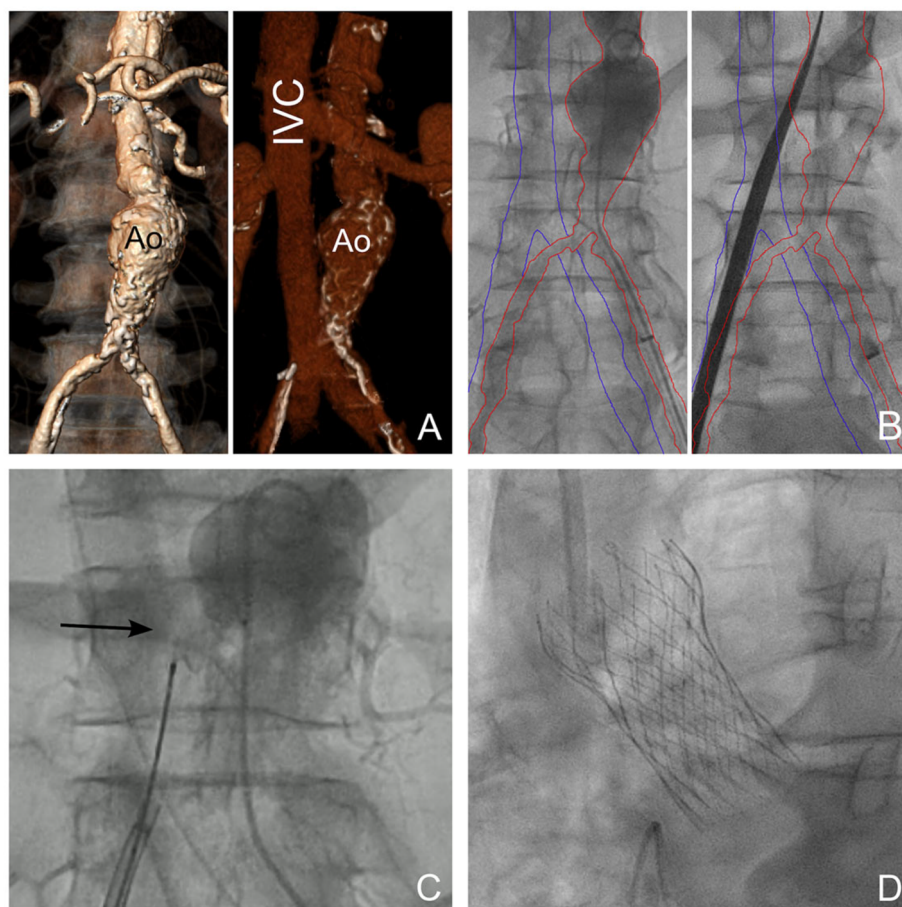


Figure 2. Transcaval TAVI in a patient with abdominal aortic aneurysm. (A) Preprocedural CT showing the infrarenal aneurysm and the relationship between the aorta (Ao) and inferior vena cava (IVC). (B) Fluoroscopic guidance with overlay for transcaval crossing and device advancement. (C) Closure of the caval-aortic tract with an Amplatzer Duct Occluder (arrow). (D) Final angiography demonstrating adequate sealing and satisfactory valve result (from reference [30]).

by a return to baseline as systemic regulatory mechanisms prevail [18,19]. These findings provide a useful framework for interpreting broader vascular responses.

The scientific landscape reflects this evolution. Recent analyses highlight a shift from feasibility studies towards a greater focus on complications, frailty, and multimorbidity [20]. At the same time, advances in imaging and modelling techniques are enabling more precise procedural planning. In aortic disease, for example, 3D printing-guided interventions have demonstrated improved perioperative outcomes and more favourable vascular remodelling [21]. Experimental

work further supports the role of matrix degradation pathways, particularly involving metalloproteinases, in aortic wall fragility [22].

Optimisation of peri-procedural strategies is also progressing. In aortic dissection, platelet transfusion strategies appear to influence survival, suggesting the need for more individualised management [23]. In advanced heart failure, risk stratification tools such as the LEVO-D score may help identify patients most likely to benefit from intermittent levosimendan therapy [24]. Similarly, in mitral valve prolapse, disease progression seems to reflect the interaction of multiple

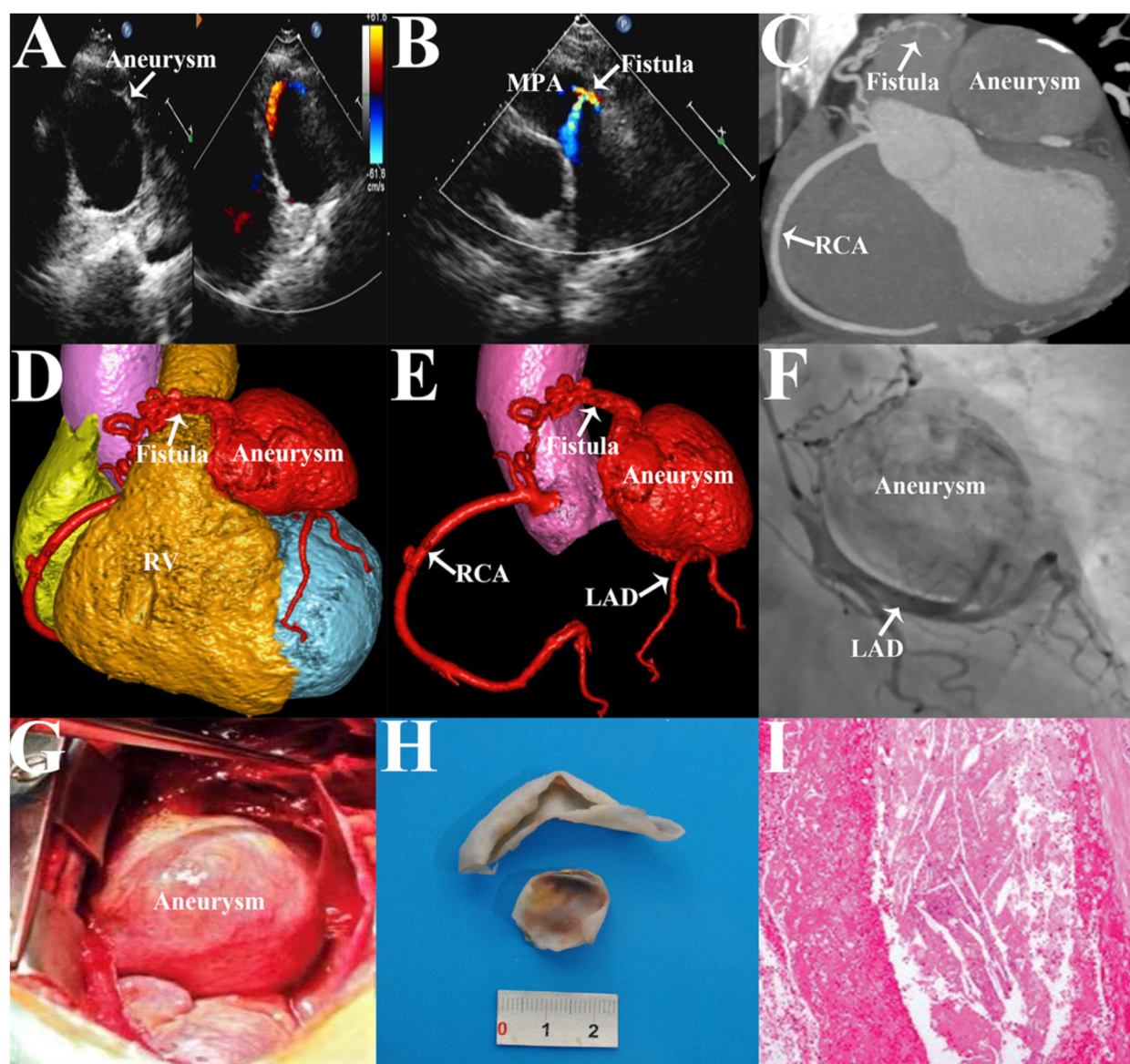


Figure 3. Multimodality imaging of a coronary–pulmonary artery fistula (CPAF) with giant aneurysm: (A, B) echocardiography showing CPAF with giant coronary artery aneurysm (CAA) and high-velocity shunt to the pulmonary artery. (C) Computed tomography angiography (CTA) showing aneurysm with thrombus. (D, E) 3D volume rendering CTA showing compression of the left coronary artery and main pulmonary artery (MPA). (F) Coronary angiography confirming CPAF with giant CAA. (G) Intraoperative view. (H, I) Histopathology showing medial degeneration with thrombosis. LAD: left anterior descending; RCA: right coronary artery (from reference [30]).

structural parameters rather than a single determinant [25].

Coronary artery disease continues to illustrate the heterogeneity of cardiovascular pathology. Early-onset myocardial infarction is often driven by metabolic factors such as dyslipidaemia, whereas later presentations reflect a broader burden of comorbidities [26]. Residual cardiovascular risk remains an important issue, with lipoprotein(a) increasingly recognised as a contributor to repeat revascularisation after percutaneous coronary intervention [27]. Economic considerations and diagnostic strategies further contribute to the complexity of decision-making in this setting [3,28].

Finally, innovation in interventional cardiology continues to evolve. Drug-coated balloons, within the concept of 'leaving nothing behind', offer an attractive alternative in selected coronary bifurcation lesions. Available evidence supports improved angiographic outcomes and favours hybrid strategies combining drug-eluting stents and balloons [29].

In this issue of *Acta Cardiologica*, some focus images highlighting interesting cases have also been reported (Figures 2 and 3) [30–34].

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

- [1] Lancellotti P, Cosyns B. Highlights of *Acta Cardiologica*. *Acta Cardiol*. 2022;77(6):469–470. doi:10.1080/00015385.2022.2143092.
- [2] Lancellotti P, Cosyns B, Cools F, et al. Rare cardiovascular diseases: diagnostic progress and organizational gaps: the Belgian perspective. *Acta Cardiol*. 2026;17:1–5. doi:10.1080/00015385.2026.2645456.
- [3] Minten L, Dubois C, Desmet W, et al. Economical aspects of coronary angiography for diagnostic purposes: a Belgian perspective. *Acta Cardiol*. 2024;79(1):41–45. doi:10.1080/00015385.2023.2281105.
- [4] Sdogkos E, Xanthopoulos A, Giamouzis G, et al. Diagnosis of coronary artery disease: potential complications of imaging techniques. *Acta Cardiol*. 2022;77(4):279–282. doi:10.1080/00015385.2021.1911467.
- [5] Park DY, An S, Kassab K, et al. Chronological comparison of TAVI and SAVR stratified to surgical risk: a systematic review, meta-analysis, and meta-regression. *Acta Cardiol*. 2023;78(7):778–789. doi:10.1080/00015385.2023.2218025.
- [6] Dubois C, Adriaenssens T, Annemans L, et al. Transcatheter aortic valve implantation versus surgical aortic valve replacement in severe aortic stenosis patients at low surgical mortality risk: a cost-effectiveness analysis in Belgium. *Acta Cardiol*. 2024;79(1):46–57. doi:10.1080/00015385.2023.2282283.
- [7] Lancellotti P, Fattouch K, Modine T. Is transcatheter aortic valve implantation for aortic stenosis cost-effective? *Acta Cardiol*. 2024;79(1):95–97. doi:10.1080/00015385.2023.2281110.
- [8] De Paepe J, Lamberigts M, Meuris B, et al. Transcatheter aortic valve implantation versus sutureless aortic valve replacement: a single-centre cost analysis. *Acta Cardiol*. 2024;79(1):30–40. doi:10.1080/00015385.2023.2268441.
- [9] Bezeccheri A, Vermeersch P, Verheye S, et al. Trends and outcomes in transcatheter aortic valve implantation in Belgium: a 13-year single centre experience. *Acta Cardiol*. 2022;77(10):960–969. doi:10.1080/00015385.2022.2130444.
- [10] Noé D, Van Langenhoven L, Lesizza P, et al. Valve-in-valve transcatheter aortic valve implantation with balloon-expandable versus self-expandable valves in degenerated surgical bioprostheses. *Acta Cardiol*. 2025;28:1–12. doi:10.1080/00015385.2025.2576446.
- [11] Meylaers M, Minten L, Van Langenhoven L, et al. Hemodynamic performance and durability of transcatheter valves for the treatment of native aortic valve stenosis. *Acta Cardiol*. 2025;5:1–11. doi:10.1080/00015385.2025.2576449.
- [12] Germinal F, Raone L, Petrone D, et al. The minimalist approach in transcatheter aortic valve implantation: insights from European healthcare professionals. *Acta Cardiol*. 2025;18:1–6. doi:10.1080/00015385.2025.2582398.
- [13] Van Lint V, Minten L, Lesizza P, et al. Temporal trends of transcatheter aortic valve implantation in a single Belgian centre over 15 years: 30-day and 1-year outcomes. *Acta Cardiol*. 2026;10:1–14. doi:10.1080/00015385.2026.2614642.
- [14] Nguyen Trung ML, Postolache A, Petitjean H, et al. Haemostatic changes and outcomes in transcatheter aortic valve implantation. *Acta Cardiol*. 2025;80(6):681–688. doi:10.1080/00015385.2025.2491157.
- [15] Vandermeersch I, Van Langenhoven L, Lesizza P, et al. Incidence, risk factors and prognostic impact of cerebrovascular events after transcatheter aortic valve implantation. *Acta Cardiol*. 2026;23:1–14. doi:10.1080/00015385.2026.2617492.
- [16] Deveci OS, Okutucu S, Fatihoglu SG, et al. Cerebral embolic protection devices during transcatheter aortic valve implantation, the current state of the art. *Acta Cardiol*. 2022;77(3):196–203. doi:10.1080/00015385.2021.1909276.
- [17] Lempereur M, Nguyen-Trung ML, Petitjean H, et al. Leading trends in pacemaker implantation after aortic valve replacement in Italy. *Acta Cardiol*. 2024;79(1):101–102. doi:10.1080/00015385.2023.2287305.
- [18] Davidsen C. The great uncorking and rush to adapt – comment on the impact of transcatheter aortic valve implantation on retinal hemodynamics. *Acta Cardiol*. 2025;28:1–2. doi:10.1080/00015385.2025.2576431.
- [19] Demirtola A, Erdöl MA, Mammadli A, et al. Impact of transcatheter aortic valve implantation on retinal hemodynamics: a Doppler imaging study. *Acta Cardiol*. 2025;80(8):921–928. doi:10.1080/00015385.2025.2554404.
- [20] Cui X, Ye Y, Zhou Z, et al. Research on postoperative complications following transcatheter aortic valve replacement: a bibliometric and visual analysis from 2006 to 2025. *Acta Cardiol*. 2026;24:1–15. doi:10.1080/00015385.2026.2631258.

- [21] Liu S, Sha E, Duan L, et al. 3D printing-guided stent grafting vs. Sun procedure in type B aortic dissection: a propensity score-matched comparison. *Acta Cardiol.* 2026;10:1–10. doi:[10.1080/00015385.2026.2636261](https://doi.org/10.1080/00015385.2026.2636261).
- [22] Yang L, Wu J, Lu H. From inflammation to degeneration: role of MMPs, IL6, and TIMP-1 in systemic sclerosis and aortic dissection. *Acta Cardiol.* 2026;20:1–10. doi:[10.1080/00015385.2025.2597115](https://doi.org/10.1080/00015385.2025.2597115).
- [23] Wan H, Wei B, Yang H, et al. Critical value of platelet transfusion to reduce the risk of death in aortic dissection (AD) patients: a study based on the MIMIC-IV database. *Acta Cardiol.* 2026;25:1–9. doi:[10.1080/00015385.2026.2633916](https://doi.org/10.1080/00015385.2026.2633916).
- [24] Manrique-Samer M, Medina NR, Mariño A, et al. Performance of the LEVO-D score in patients with advanced heart failure at a referral hospital. *Acta Cardiol.* 2026;26:1–13. doi:[10.1080/00015385.2026.2633465](https://doi.org/10.1080/00015385.2026.2633465).
- [25] Vriz O, Landi I, Abdelkader AE, et al. Mitral valve prolapse from childhood to adulthood: morphologic characteristics and mitral regurgitation development. A single-centre echocardiographic study. *Acta Cardiol.* 2025;6:1–9. doi:[10.1080/00015385.2025.2580794](https://doi.org/10.1080/00015385.2025.2580794).
- [26] Sierra-Castillo S, Aristizabal-Colorado D, Muñoz-Ordoñez JA, et al. Young and elderly patients with acute myocardial infarction: a comparative study of percutaneous coronary intervention. *Acta Cardiol.* 2026;26:1–7. doi:[10.1080/00015385.2026.2643420](https://doi.org/10.1080/00015385.2026.2643420).
- [27] Srikulmontri T, Pantarote S, Kulthamrongsri N, et al. The influence of lipoprotein(a) on coronary revascularization after percutaneous coronary intervention. *Acta Cardiol.* 2026;17:1–10. doi:[10.1080/00015385.2026.2643431](https://doi.org/10.1080/00015385.2026.2643431).
- [28] Lancellotti P. Acute and chronic coronary artery disease. *Acta Cardiol.* 2024;79(2):105–108. doi:[10.1080/00015385.2024.2339011](https://doi.org/10.1080/00015385.2024.2339011).
- [29] Carapelluci M, Bertrand O, Lancellotti P. Drug-coated balloons for coronary bifurcations lesions: a new approach in the 'BioPCI' era? *Acta Cardiol.* 2026;14:1–2. doi:[10.1080/00015385.2026.2614204](https://doi.org/10.1080/00015385.2026.2614204).
- [30] Ku L, Liu K, Ma X. Multimodality imaging assessment of a coronary-to-pulmonary artery fistula with giant aneurysm. *Acta Cardiol.* 2026;12:1–3. doi:[10.1080/00015385.2026.2621454](https://doi.org/10.1080/00015385.2026.2621454).
- [31] De Cock E, Van der Heyden J, Geerts B, et al. 'All vessels lead to the heart': a transcaval TAVR through an aortic aneurysm. *Acta Cardiol.* 2025;12:1–2. doi:[10.1080/00015385.2025.2576454](https://doi.org/10.1080/00015385.2025.2576454).
- [32] El Mallouli M, Dimov I, Mansour S, et al. Severe mitral regurgitation with myocarditis and malignant eosinophilia with PDGFRB–NDE1 gene fusion. *Acta Cardiol.* 2026;27:1–2. doi:[10.1080/00015385.2026.2620934](https://doi.org/10.1080/00015385.2026.2620934).
- [33] Tang M, Zhang Y, Ma X, et al. The dual masquerade of the headache culprit: unravelling the collaborative crime of patent foramen ovale and multiple pulmonary arteriovenous malformations. *Acta Cardiol.* 2026;17:1–2. doi:[10.1080/00015385.2026.2621469](https://doi.org/10.1080/00015385.2026.2621469).
- [34] Vicente M, Morais G, Cristóvão I, et al. Atrial myxoma in a patient with acute myeloid leukaemia. *Acta Cardiol.* 2026;3:1–2. doi:[10.1080/00015385.2026.2634433](https://doi.org/10.1080/00015385.2026.2634433).