



## Advancing cardiovascular care: innovations and insights

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## Advancing cardiovascular care: innovations and insights

Advances in cardiac care, metabolic impact, and structural interventions explores the latest breakthroughs in heart disease treatment, including the impact of metabolic disorders and innovations in structural therapeutic interventions [1–3]. This title highlights the interconnected nature of these areas and showcases how emerging therapies are transforming patient care and improving outcomes for those with both cardiac and metabolic conditions.

Atherosclerosis and aortic stenosis share common risk factors, highlighting the need for a deeper understanding of their underlying associations and potential shared mechanisms [4]. This study investigates the relationship between serum trace elements and aortic valve sclerosis, a condition linked to higher cardiovascular risk. Analysing data from 1,533 patients with and without aortic valve sclerosis, the authors found that serum magnesium levels had a protective effect against the condition, while both low and high serum calcium levels were associated with increased risk. Specifically, low serum magnesium was correlated with a lower risk of aortic valve sclerosis, whereas high serum calcium was linked to a higher risk. These findings suggest that serum magnesium and calcium levels may serve as indicators for assessing cardiovascular risk and highlight the need for further research to explore their potential role in prevention and early intervention [5].

Alcohol-related cardiovascular complications are increasingly prevalent among young and middle-aged adults, with limited comprehensive studies addressing this issue [6]. Analysing Global Burden of Disease Study 2019 data, Danpanichkul P et al. found that stroke had the highest age-standardised death rate (0.84 per 100,000), followed by alcoholic cardiomyopathy (0.57). While the global burden of alcohol-associated cardiovascular issues has generally decreased, atrial fibrillation and hypertensive heart disease have risen, notably in Southeast Asia, the Western Pacific, and lower-middle Sociodemographic Index countries, with the highest rates in Europe. The increasing impact of these conditions highlights the urgent need for targeted public health strategies to mitigate cardiovascular risks from alcohol [7].

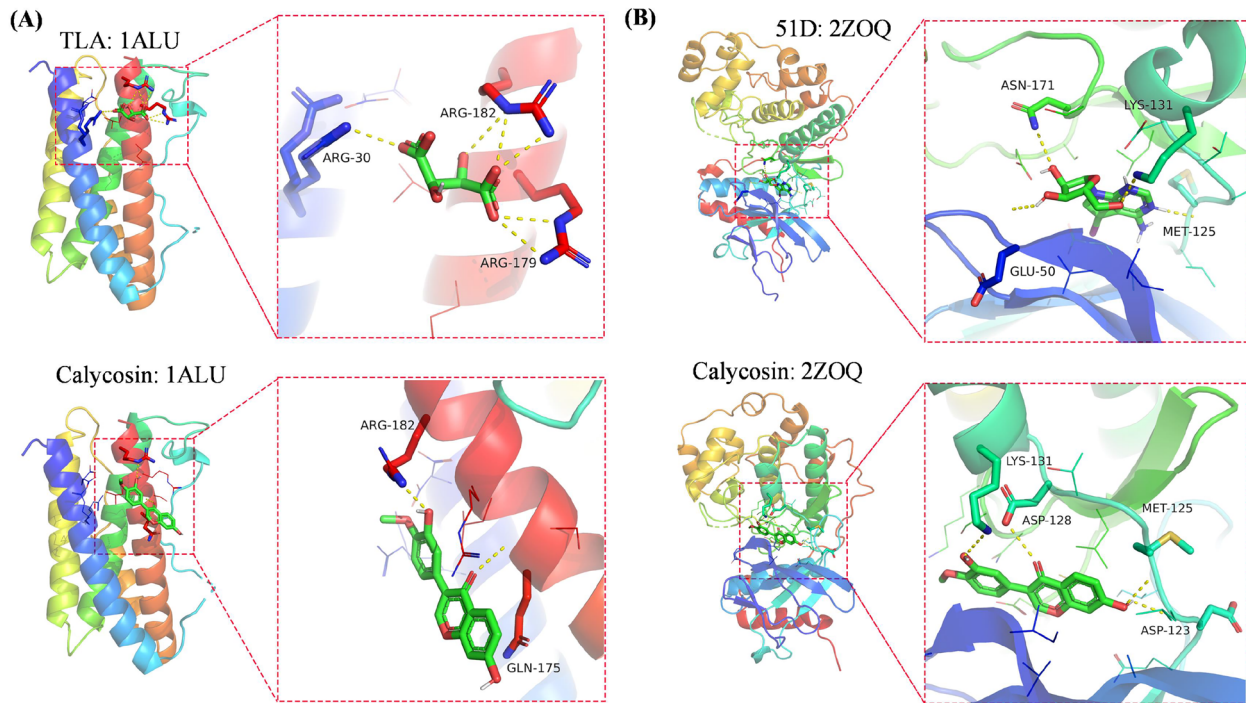
Atherosclerosis, characterised by lipid accumulation in arterial walls, heightens the risk of heart failure and is potentially insufficiently managed by current therapies with notable side effects [8–10]. Calycosin, a bioactive compound derived from natural sources, has shown potential for cardiovascular protection, though its mechanisms against atherosclerosis are not well elucidated [11]. This study employed systematic network pharmacology

and molecular docking to investigate calycosin's interaction with atherosclerosis. The authors identified 409 potential targets of calycosin, with 71 implicated in atherosclerosis, and observed strong binding affinities with key proteins such as interleukin-6 (IL6) and mitogen-activated protein kinase 3 (MAPK3). The results suggest that calycosin may exert its anti-atherosclerotic effects through modulation of inflammatory responses and oxidative stress, indicating its potential as a therapeutic agent for atherosclerosis (Figure 1) [12].

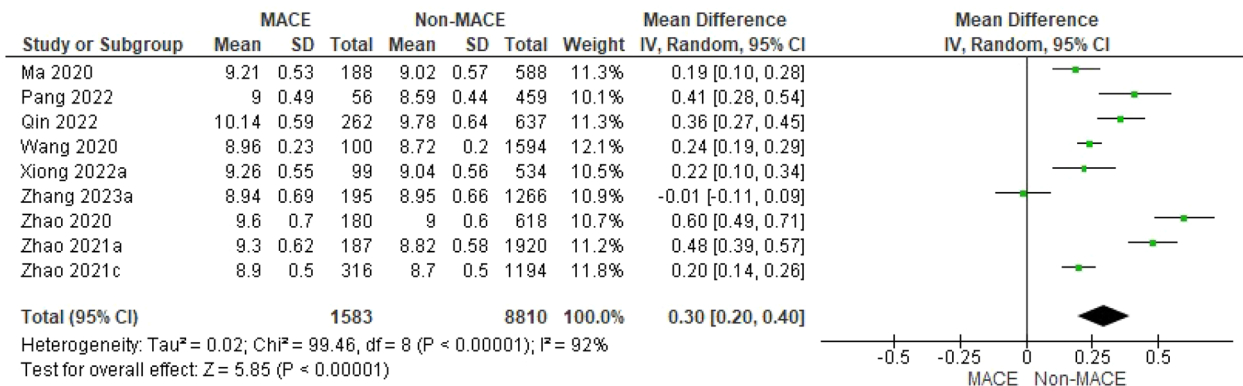
Midodrine, an FDA-approved treatment for orthostatic hypotension, is also used off-label for dialysis patients, including those with heart failure. However, its safety in hospitalised patients with heart failure and reduced ejection fraction (HFrEF) is not well-studied [13]. An analysis of the TriNetX database revealed that patients with HFrEF and/or right heart failure who were administered midodrine had a significantly higher 6-month mortality risk (RR 1.53, HR 1.54) compared to those who were not. These findings suggest that midodrine may be associated with increased mortality, possibly due to adverse effects from vasoconstriction or other factors. Given the limitations of the observational study and the lack of detailed data, further research is needed to fully understand the risks and explore alternative treatments [14].

Coronary angiography (CA) is increasingly performed in Belgium, prompting a review of its financial implications at a large tertiary hospital to assess if current reimbursement rates are adequate [15]. This analysis, conducted in spring 2023, assessed the financial aspects of coronary angiography (CA) at a large tertiary hospital, focusing on catheterisation laboratory use, personnel, and materials. Minten et al. found that each cathlab must perform 8.21 CA procedures to cover costs [16]. To achieve a modest surplus of €200 per procedure, nine CA procedures per cathlab day are necessary. The hospital in question averages  $7 \pm 0.75$  CA procedures per day, which is below the break-even point. Additionally, their calculations do not account for the costs of coronary physiological interrogation with fractional flow reserve (FFR), a cost-effective technique [17,18] not currently eligible for extra reimbursement under the Belgian system.

Despite percutaneous coronary intervention (PCI) being the preferred reperfusion strategy, major adverse cardiovascular events (MACE) remain common [19–21]. The GRACE score currently predicts PCI outcomes but does not include the TyG (triglyceride-glucose) index, which is based on insulin resistance. This study aimed to evaluate the TyG index's potential in predicting cardiovascular outcomes post-PCI by reviewing literature from five



**Figure 1.** Molecular docking data showing effective binding capabilities in core target proteins with calycosin. (A) Calycosin: 1ALU =  $-7.4$  kcal/mol (B) Calycosin: 2ZOQ =  $-8.5$  kcal/mol (from reference [12]).



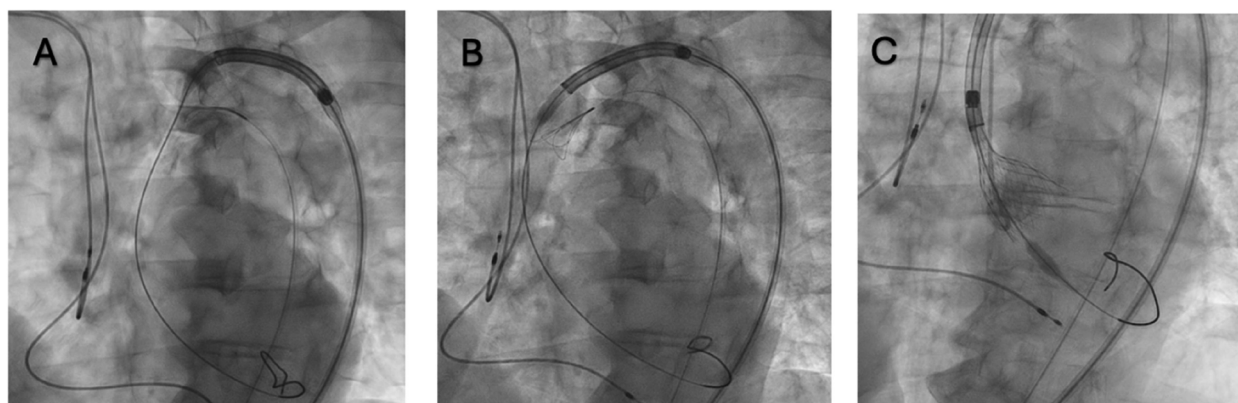
**Figure 2.** MD in TyG index between patients with MACE and patients with Non-MACE (from reference [22]).

databases. Analysing 31,671 patients, the study found that a higher TyG index was significantly associated with increased MACE risk and improved the GRACE score's predictive accuracy from 0.746 to 0.809. Thus, integrating the TyG index into the GRACE score could enhance outcome prediction in PCI patients (Figure 2) [22].

Cardiovascular involvement is common in rheumatoid arthritis (RA) and can lead to significant morbidity [23]. This study investigated the impact of steroids and methotrexate (Mtx) on cardiac function in newly diagnosed RA patients. In a cohort of 36 patients, echocardiographic parameters were assessed before treatment, after 1 month of steroid treatment, and after 3 months of Mtx treatment. Results showed significant reductions in inflammatory markers and disease activity, with improvements in left ventricular systolic function and right ventricular diastolic function, especially after Mtx treatment.

Overall, steroid and Mtx treatments positively affect cardiac function in RA patients [24].

Managing heart surgery waiting lists is crucial, especially in remote regions. This study retrospectively analysed 329 patients from 2016 to 2020, categorising them into 'Urgent' and 'Priority' groups based on surgical urgency, and assessed the occurrence of adverse events [25]. The Urgent group had a higher prevalence of smoking and greater disease acuity, with coronary artery bypass grafting and aortic valve replacement being the primary procedures. Although 15.2% of patients received treatment within the recommended time, 50.8% were from the Urgent group, who had a higher risk of adverse outcomes (HR 3.92,  $p=0.019$ ). Chronic kidney disease and previous open-heart surgery were independent predictors of adverse events, with surgical priority not affecting outcomes [25].



**Figure 3.** Successful transcatheter aortic valve implantation (TAVI) with SNARE technique (from reference [33]).

In symptomatic mitral paravalvular leak (PVL) patients, effective transcatheter PVL closure (TMPLC) can significantly enhance survival. This single-center study reviewed 45 patients who underwent TMPLC for 58 PVLs, all performed by the same operators. Technical success was achieved in 91.4% of cases, with 53 defects occluded and a clinical success rate of 75.6%. Post-procedure, patients showed significant improvements: ejection fraction increased from 45% to 50%, mitral gradients decreased, and haemoglobin levels rose while LDH levels dropped. The procedure demonstrated safety and efficacy, with 30-day and in-hospital mortality rates of 8.9% [26].

The impact of patent foramen ovale (PFO) closure on migraine relief remains debated. This retrospective study analysed long-term outcomes (over 10 years) of interatrial septal shunt repair in patients with disabling, medication-resistant migraines [27]. Out of 78 patients with PFO or significant atrial septal defect (ASD) who underwent transcatheter closure, 72 were followed up, showing significant improvement: aura was abolished, and migraine symptoms decreased, with the Migraine Disability Assessment Score (MIDAS) dropping markedly ( $p < 0.01$ ). Factors associated with complete migraine resolution included a shorter migraine history, severe thrombophilia, significant right-to-left shunt, and larger left atrial dimensions in PFO patients, and bidirectional shunt in ASD patients. Overall, PFO/ASD repair led to long-term alleviation of migraine symptoms [27].

Atrial fibrillation (AF) is a prevalent arrhythmia linked to stroke and heart failure, with catheter ablation increasingly utilised as a treatment option [28–30]. The authors assessed the efficacy and safety of persistent AF ablation performed without a circular mapping catheter (CMC), aiming to avoid femoral venous and trans-septal punctures, reduce costs, and potentially shorten procedure and fluoroscopy times [31]. Over the past 3 years, 261 CMC-free ablations were performed with no loss of efficacy or safety. At 1 year, 72% of patients were free from AF or atrial flutter episodes lasting over 30 s. These results indicate that CMC-free ablation is a cost-effective and efficient alternative, warranting further studies to confirm reductions in procedural and fluoroscopy times.

Intradialytic hypotension (IDH) and water retention are challenging complications in haemodialysis (HD) patients.

This study investigated the efficacy and safety of sequential ultrafiltration (UF) and HD versus conventional HD. A total of 53 uraemic patients with IDH and significant water retention were randomly assigned to either the control group (adjusted HD) or the treatment group (UF followed by HD). The treatment group exhibited significantly higher treatment duration, total water removal, and weight loss, alongside improved dyspnoea scores and left ventricular ejection fraction, with no IDH occurrences. In contrast, the control group had more pronounced blood pressure fluctuations and a higher IDH incidence. Safety indicators, including heart rate changes and bleeding events, did not differ significantly. Sequential UF and HD are a safe and effective methods for managing water retention and preventing IDH in dialysis patients [32].

In this issue of *Acta Cardiologica*, alongside the original article mentioned, several focus images have also been featured (Figure 2) [33–37].

### Disclosure statement

No potential conflict of interest was reported by the author.

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