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# Highlights and advances in cardiology research

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EDITORIAL

# Highlights and advances in cardiology research

Advances in cardiovascular care are improving outcomes for conditions like congenital heart disease (CHD), atrial fibrillation (AF), and structural heart defects. Biomarkers such as B-type natriuretic peptide (BNP) aid risk assessment in CHD, while early rhythm control and catheter ablation enhance AF management [1–8]. Additionally, transcatheter closure of patent foramen ovale (PFO) and atrial septal defect (ASD) shows promise in relieving migraines, and modern imaging techniques like two-dimensional speckle tracking echocardiography (2D-STE) improve detection of coronary artery disease [9]. This article highlights key advancements in diagnostics and therapies, shaping better cardiovascular outcomes.

Obesity is closely associated with prolonged QTc intervals, which heighten the risk of sudden cardiac death. Understanding how weight loss strategies impact QTc is essential for improving cardiac outcomes in obese individuals [10]. A comprehensive meta-analysis of 20 randomised controlled trials and observational studies revealed that weight loss significantly shortens QTc intervals, regardless of the method used [11]. Subgroup analysis focusing on diet control combined with exercise showed a statistically significant reduction in QTc, although the effect size was moderate. In contrast, bariatric surgery demonstrated a more substantial and consistent QTc shortening, with significant improvements observed at both 6- and 12-month post-surgery. The reduction in QTc continued to become more pronounced with longer follow-up durations, indicating a sustained benefit of surgical weight loss. These findings suggest that while multiple weight loss methods contribute to QTc improvement, bariatric surgery yields the most significant impact.

Sex differences in cardiovascular outcomes remain a key focus, particularly in patients with AF and coronary artery disease [12, 13]. Women with acute coronary syndrome (ACS) are known to have worse short-term outcomes, but the impact on long-term prognosis remains unclear. Sex differences in outcomes, treatments, and characteristics among AF patients with ACS or stable coronary artery disease (SCAD) undergoing percutaneous coronary intervention (PCI) reveal that women face greater long-term cardiovascular risks in ACS, while sex disparities are not evident in SCAD. Addressing these differences through personalised treatments could improve outcomes for women [14].

AF is the most common supraventricular arrhythmia in adults, making timely diagnosis crucial for improving patient outcomes [15–17]. The association between peak left atrial longitudinal strain (PALS) and the risk of new-onset AF has been evaluated in multiple studies, involving 11,145 participants, which indicate that lower PALS levels are significantly linked to a higher risk of incident AF [18]. A PALS threshold of <33.4% has been identified with a sensitivity of 64% and a specificity of 69% for predicting AF. These findings suggest a moderate diagnostic performance of PALS in identifying individuals at risk of developing AF. Among relatively healthy populations, reduced PALS levels may be more suitable as an indicator for opportunistic AF screening rather than systematic programs (Figure 1).

In AF management, early intervention has become a critical strategy for improving outcomes. The EAST-AFNET 4 trial demonstrated that early rhythm control significantly reduces adverse cardiovascular events compared to usual care, primarily through the maintenance of sinus rhythm [19]. Importantly, this benefit is even more pronounced in patients with multiple comorbidities, highlighting the importance of timely intervention in high-risk groups. Additionally, studies such as STOP-AF First, Cryo-FIRST, EARLY-AF, and its 3-year follow-up trial have established that first-line catheter ablation outperforms anti-arrhythmic drug therapy in maintaining sinus rhythm [20,21]. These findings emphasise the superior efficacy and durability of catheter ablation, presenting it as a promising option for rhythm control. This growing body of evidence is driving a shift in the electrophysiology community towards adopting early rhythm control strategies, particularly with catheter ablation when feasible (Figure 2) [22]. By improving long-term rhythm outcomes, mitigating disease progression, reducing complications, and enhancing quality of life, early intervention offers a transformative approach to addressing the burden of AF and improving cardiovascular outcomes for a wider range of patients.

Assessing the severity of coronary artery disease (CAD) in stable angina remains challenging [23]. While echocardiography detects myocardial ischaemia, it primarily evaluates radial mechanics and relies on subjective wall motion analysis. 2D-STE offers an objective assessment of longitudinal mechanics. In 70 patients, 2D-STE results correlated with coronary angiography findings [24]. Global longitudinal strain (GLS) was significantly reduced in CAD patients, with a mean of −13.2% for significant lesions versus −18.7% in normal cases. A GLS cut-off of −17.4% showed excellent diagnostic performance (sensitivity 97.6%, specificity 93.3%). These results demonstrate that 2D-STE, using GLS and SLS, provides superior accuracy in detecting significant coronary stenosis and identifying specific artery involvement, improving CAD diagnosis and management.

Chronic kidney disease (CKD) patients undergoing maintenance haemodialysis (MHD) often develop significant abnormalities in left ventricular (LV) structure and function. 2D-STE reveals that CKD patients have impaired LV mechanics despite preserved LV ejection fraction

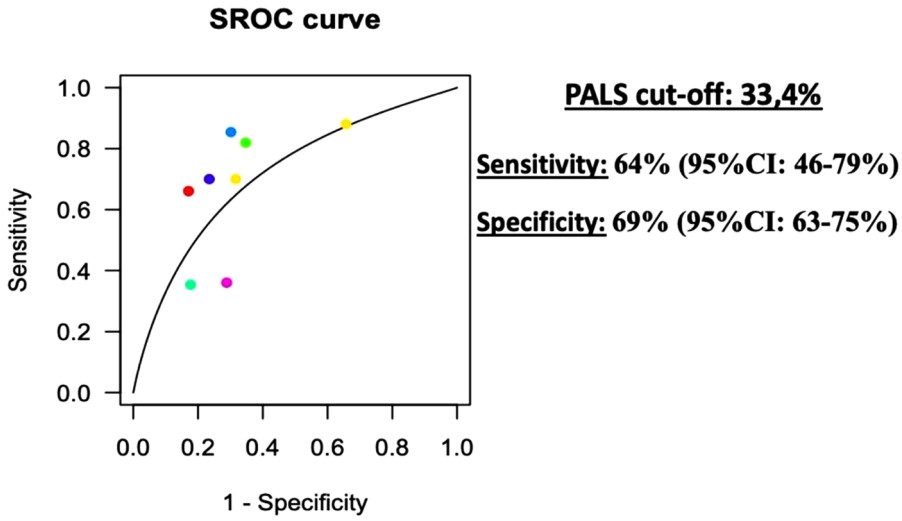


**Figure 1.** Diagnostic accuracy of peak left atrial longitudinal strain (PALS) to predict new-onset atrial fibrillation (AF). CI: Confidence interval; ROC: Receiver operating characteristics curve (from reference [18]).

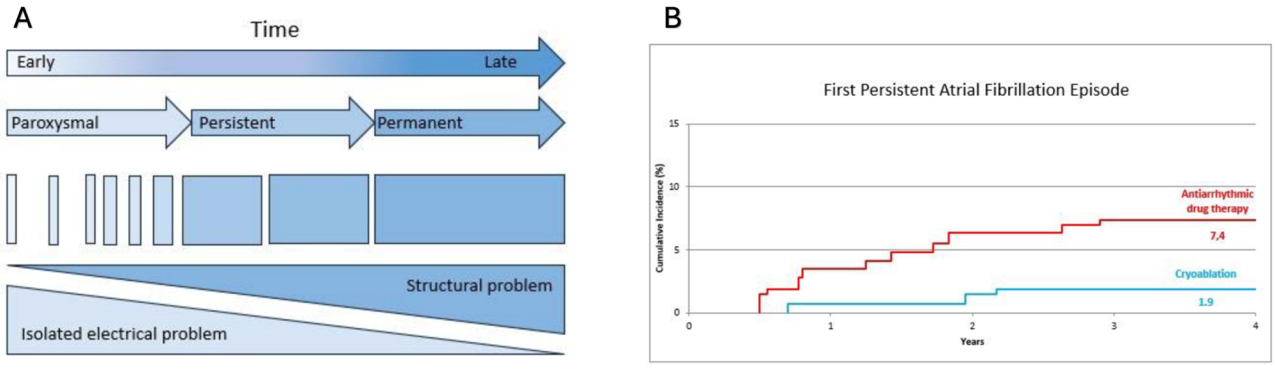


**Figure 2.** A: AF Is a chronic and progressive disease; B: Progression of AF after cryoablation or drug therapy (from reference [22]).

(LVEF). Compared to healthy controls, CKD patients showed significantly reduced global longitudinal strain (GLS), global circumferential strain, LV apical rotation, and LV twist, indicating substantial myocardial dysfunction. Additionally, a high prevalence of LV hypertrophy (77.8%) and diastolic dysfunction was observed, further highlighting the cardiac burden in these patients [25]. While the prognostic value of reduced GLS is well established, future research is essential to explore the implications and reversibility of impaired LV circumferential mechanics, particularly following renal transplantation.

Mediastinal cysts, often asymptomatic and incidentally discovered, lack standardised management guidelines. Willemse et al.'s case series highlights the role of thoracic computed tomography (CT) in diagnosing thymic, bronchogenic, and pericardial cysts, confirmed histopathologically [26]. Four symptomatic patients underwent successful surgical removal *via* uniportal video-assisted thoracoscopy, with symptom relief. Surgical removal is recommended for large, symptomatic, or suspicious cysts, with contrast-enhanced CT as the primary diagnostic tool. Further research is needed to optimise patient selection and treatment timing.

Aortic valve sclerosis is a significant marker of cardiovascular risk, and understanding its contributing factors may aid in early prevention [27,28]. Serum magnesium and calcium levels have been investigated for their potential roles in the development of aortic valve sclerosis. In a population of patients diagnosed through echocardiography, those with higher serum magnesium levels were found to have a lower risk of developing aortic valve sclerosis. In contrast, both low and high serum calcium levels were associated with an elevated risk, indicating a U-shaped relationship [29]. These findings highlight the protective role of magnesium and the potential dangers of calcium dysregulation in cardiovascular health. Monitoring these serum micronutrient levels may provide an opportunity for improved risk prediction and preventive strategies. Further research is necessary to confirm these associations and determine effective interventions for mitigating cardiovascular disease risk.

Benoit's article on a 17-year-old with Kearns-Sayre syndrome (KSS) and recurrent syncope highlights several gaps [30]. Alternative causes of syncope, such as CNS, PNS, metabolic, or endocrine issues, were not ruled out. The genetic basis of KSS, whether a single mtDNA

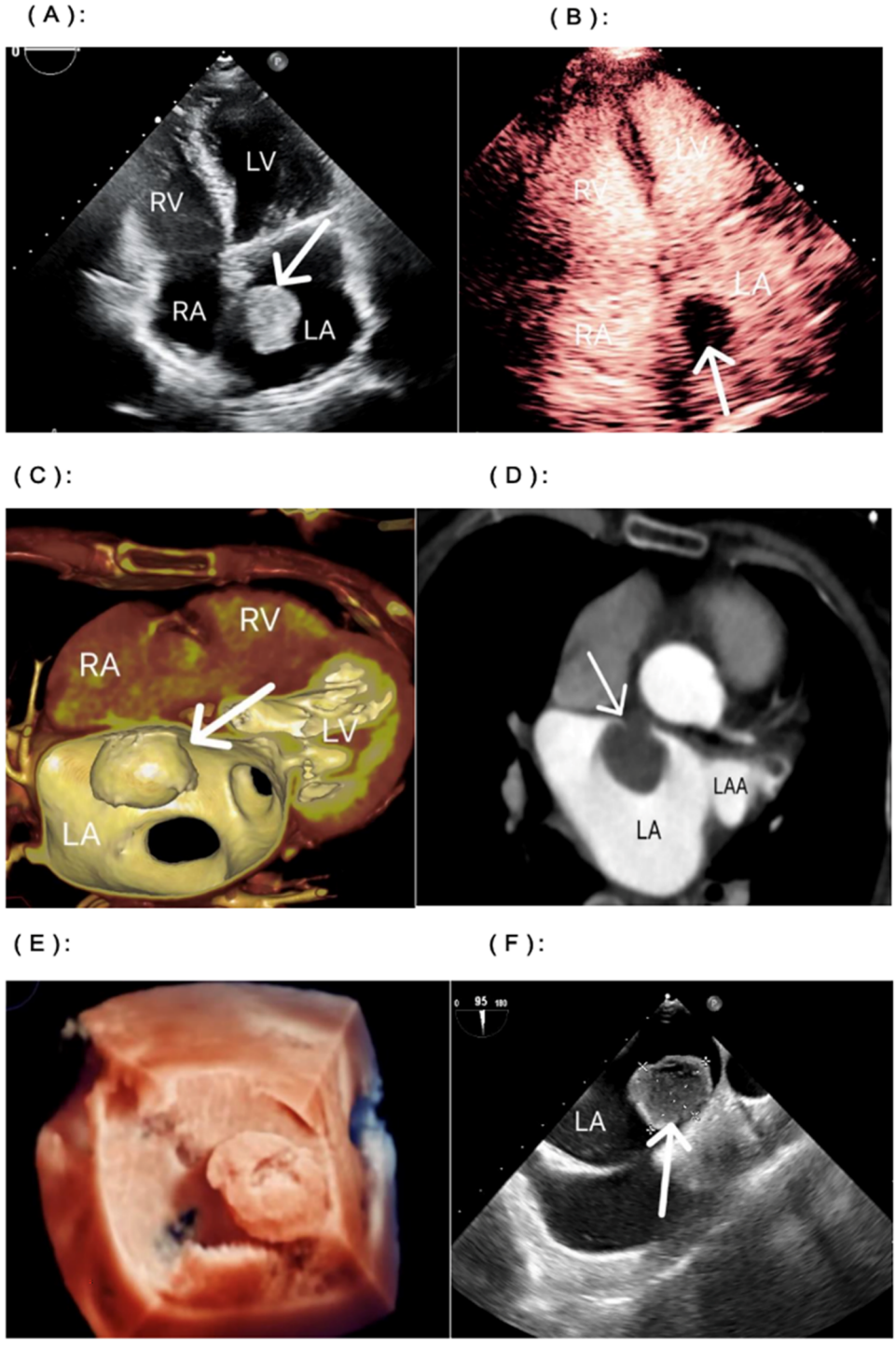


**Figure 3.** A: TTE Demonstrated a mass of unknown origin; B: Left heart contrast echocardiography showed a filling defect of the left atrium; C-D: CTA showed a mural mass in the left atrium, attached to the anterior wall; E: Three-dimensional echocardiography identified the diagnoses of thrombus; F: TEE revealed the location and size of thrombus (from reference [39]).

deletion or POLG1 variant, was unclear, impacting prognosis and counselling. Cardiac screening for malignant ventricular arrhythmias (MVAs) was omitted, raising questions about ICD suitability [31]. Additionally, structural heart diseases were not excluded due to a lack of echocardiographic evaluation. These gaps underscore the need for a thorough workup before attributing syncope solely to heart block in KSS.

The effectiveness of PFO or ASD closure in relieving migraine symptoms, particularly in the long term, remains a topic of interest [32]. In patients with disabling and medication-resistant migraines, transcatheter closure of PFO or ASD has shown significant improvement in migraine symptoms over extended follow-up periods [33]. Aura was completely abolished in all patients, and migraine severity notably decreased, as reflected by

reduced disability scores. Factors associated with better outcomes included a shorter migraine history, severe thrombophilic profiles, larger right-to-left shunts (RLS), and increased left atrial dimensions in PFO patients, while bidirectional shunts were key predictors in ASD patients. These findings suggest that structural heart defects, such as PFO or ASD, may play a role in triggering migraines by facilitating abnormal blood flow and embolic phenomena. In the long term, closure of these defects has been associated with substantial relief of migraine symptoms, especially in patients with significant shunting, providing a promising approach for selected individuals suffering from refractory migraines.

Advancements in medical care have increased survival rates for individuals with CHD, resulting in a growing adult CHD (ACHD) population. Despite this, ACHD patients remain at risk for adverse cardiovascular events, highlighting the importance of early detection and management. B-type natriuretic peptide (BNP), a key biomarker of cardiac stress, has proven effective in predicting adverse outcomes in ACHD. Elevated BNP levels and their changes over time are strongly linked to mortality, regardless of disease complexity [34].

In this issue of Acta Cardiologica, several focus images highlighting interesting cases have also been reported (Figure 3) [35–43].

## Disclosure statement

Nothing to disclose.

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