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News and innovations in heart failure

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EDITORIAL

News and innovations in heart failure

Heart failure (HF) remains a critical area of research and innovation in cardiology, as it poses significant challenges due to its complex pathophysiology and high morbidity and mortality rates [1–3]. Recent advancements in HF management, ranging from novel pharmacological treatments to cutting-edge technologies and biomarkers, are reshaping the landscape of patient care. Ongoing research is also exploring new avenues for early diagnosis, personalised medicine, and more effective interventions to improve outcomes and quality of life for HF patients [4–6]. These developments highlight the dynamic nature of HF research and the ongoing quest to address this global health burden.

Thyroid-stimulating hormone (TSH) is a predictor of poor outcomes in acute myocardial infarction (AMI) patients, especially those with diabetes mellitus (DM) [7,8]. The study by Liu et al. evaluated 432 AMI patients, including 209 with DM, and found that subclinical hypothyroidism (SCH) was more prevalent in diabetic AMI patients [9]. SCH in these patients was associated with worse in-hospital outcomes, including higher rates of acute HF, acute kidney injury, and atrial fibrillation. Additionally, SCH increased both 30-day and long-term mortality rates in diabetic AMI patients (Figure 1). Therefore, monitoring thyroid function is crucial, as SCH is an independent risk factor for poor outcomes in this population.

Age-related macular degeneration (AMD) is a leading cause of visual impairment and is linked to cardiovascular diseases (CVDs) due to shared pathologic and genetic factors. The observational study by Feng et al. using data from 5523 participants in the NHANES database, employed binary logistic regression to assess the relationship between AMD and various CVDs [10]. The analysis revealed that AMD increases the risk of CVDs, even after adjusting for confounding factors. Preventing AMD could significantly reduce the incidence of CVDs, particularly stroke. The findings suggest that targeting AMD could also benefit cardiovascular health, with late-stage AMD posing a higher risk than early-stage AMD.

The retrospective study by Sanjurjo et al. assessed whether patients with pectus excavatum (PEX) have reduced functional exercise capacity, measured by the six-minute walk test (6MWT) [11]. The analysis included 43 PEX patients, with a mean age of 17.8 years, who showed a significantly lower walked distance compared to predicted values from various reference equations. On average, PEX patients walked 190 to 222 metres less than expected, indicating a notable reduction in their submaximal exercise capacity (Figure 2). Additionally, there was a small but significant drop in oxygen saturation after exercise. These findings suggest that the 6MWT could be a simple tool to assess functional capacity in PEX patients.

B-type natriuretic peptide (BNP) is a biomarker widely used in diagnosing and managing HF, as elevated levels indicate cardiac stress and fluid overload. BNP levels correlate with the severity of HF and help guide treatment decisions. Monitoring BNP can also provide insights into prognosis and the effectiveness of therapeutic interventions in HF patients [12]. The study by Dogheim et al. assessed the diagnostic and prognostic value of neopterin and NT-pro BNP in HF [13]. A systematic review of eleven studies indicated that both biomarkers were significantly elevated in HF patients compared to healthy controls, with even higher levels observed in patients with advanced HF and more severe disease states. Elevated biomarker levels were also linked to a greater likelihood of cardiovascular adverse events. Additionally, two studies demonstrated that treatment led to a decrease in neopterin and/or NT-pro BNP levels, suggesting their potential utility in monitoring therapy effectiveness. The results highlight the usefulness of these biomarkers in diagnosing HF, assessing disease severity, and predicting patient outcomes. However, further research is required to fully establish their role in determining treatment efficacy and guiding clinical decision-making in HF management.

Cardiac troponin is a key biomarker for detecting myocardial injury and is increasingly recognised for its role in HF management. Elevated troponin levels in HF patients indicate ongoing cardiac damage and are associated with worse prognosis and higher mortality risk. Regular monitoring of troponin can help assess disease progression and guide treatment strategies in HF [14]. The study by Tanriverdi et al. investigated the relationship between left ventricular (LV) function and high-sensitivity cardiac troponin T (hs-cTnT) levels in prediabetic patients [15]. The study included 96 prediabetic individuals and an equal number of healthy controls, evaluating their LV systolic and diastolic functions using tissue Doppler imaging (TDI). Prediabetic patients showed significantly impaired LV function, with higher mitral annular plane systolic excursion (MAPSE), E/Em ratio, and systolic velocities compared to controls. Additionally, hs-cTnT levels were higher in prediabetics and were independent predictors of both LV diastolic and systolic dysfunction. The findings suggest that hs-cTnT may be a useful marker for detecting subclinical LV dysfunction in prediabetic patients.

The study by Vargas-Alarcón et al. investigated the association between DEFB1 gene polymorphisms and coronary artery disease (CAD) [16]. Researchers analysed two specific polymorphisms, rs11362 A/G and rs1800972 C/G, in 219 CAD patients and 522 healthy controls. The rs1800972 C/G polymorphism showed no significant difference between the two groups. However, the rs11362 AA genotype was linked to a higher risk of developing

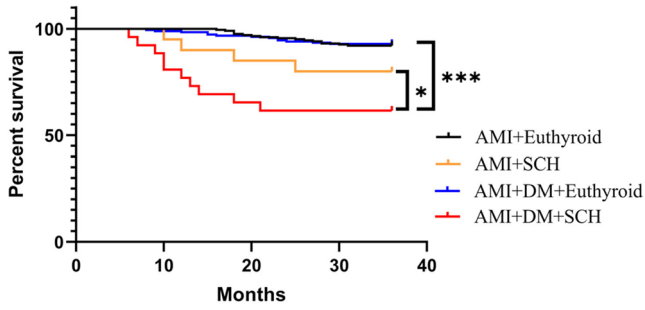

Figure 1. Survival curves to demonstrate the association of SCH with long-term mortality in AMI patients.393AMI: acute myocardial infarction; DM: diabetes mellitus; SCH: subclinical hypothyroidism (from reference Liu et al. [9]).

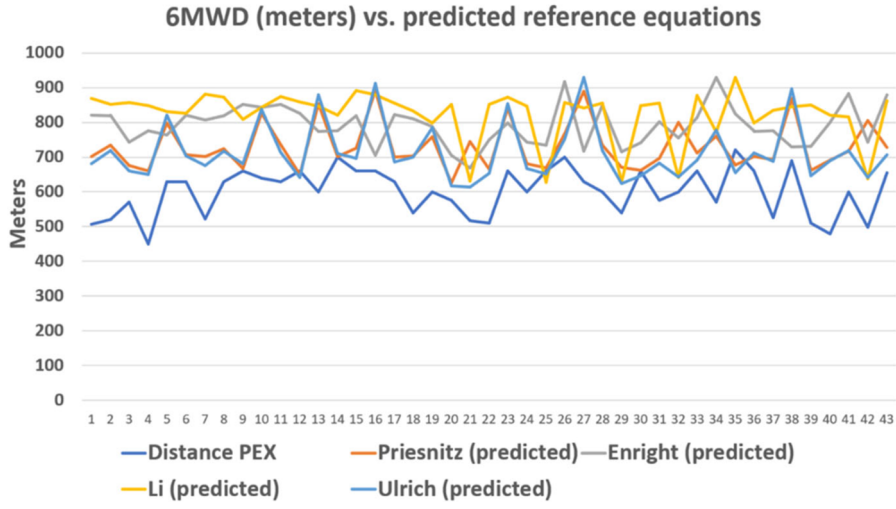

Figure 2. Individual six-minute walked distance in patients with pectus excavatum (dark blue) compared with predicted distance by different equations (from reference Sanjurjo et al. [11]).

CAD across several genetic models. Data from the Genotype-Tissue Expression (GTEx) consortium revealed that the rs11362 AA genotype was associated with lower mRNA expression of β-defensin-1 in key heart tissues. These findings suggest that the rs11362 A/G polymorphism in the DEFB1 gene plays a role in increasing CAD risk, potentially through reduced β-defensin-1 expression in the heart.

COVID-19 poses a significant risk to HF patients, as the virus can exacerbate pre-existing cardiovascular conditions, leading to worsened outcomes. HF patients infected with COVID-19 are more likely to experience severe complications, including acute decompensation and increased mortality. The pandemic has also disrupted routine care for HF, making management and timely treatment more challenging [17,18]. The study by Van Echelpoel et al. examined the effect of COVID-19 public containment measures on hospital admission rates for AMI during two COVID-19 waves in 2020 [19]. Researchers compared AMI admissions during the COVID-19 period (March 2020 to March 2021) with the previous year. A total of 1349 AMI patients were hospitalised, with a significant 32% reduction in admissions during the first wave (March-May 2020) but a slight 3% increase during the second wave (October-December 2020). A similar pattern was observed for acute coronary syndrome (ACS) with cardiac arrest, with a 92% reduction in the first wave and no change in the second. Even after adjusting for factors like temperature and air quality, the COVID-19 epidemic was still linked to a decrease in AMI hospitalisations. The reperfusion strategies and in-hospital mortality rates between the pre-COVID and COVID periods were comparable, though COVID-19-positive ACS patients had a notably higher mortality rate (14%). The study concludes that COVID-19 containment measures significantly reduced AMI hospitalisations during the first wave, but this effect was not observed during the second wave [19].

The study by Peng et al. explored the relationship between serum anion gap (AG) levels and all-cause mortality in congestive HF patients, focusing on short-, medium-, and long-term outcomes [20]. Using data from 4840 critically ill congestive HF patients with a mean age of 72.5 years, researchers analysed mortality risks using Kaplan-Meier survival curves and Cox proportional risk analysis. The results showed that higher AG levels were significantly associated with increased all-cause mortality at 30 days, 90 days, 1 year, and 4 years, even after adjusting for other factors. Subgroup analyses confirmed the consistency of these findings, and Kaplan-Meier curves demonstrated that elevated AG levels corresponded to

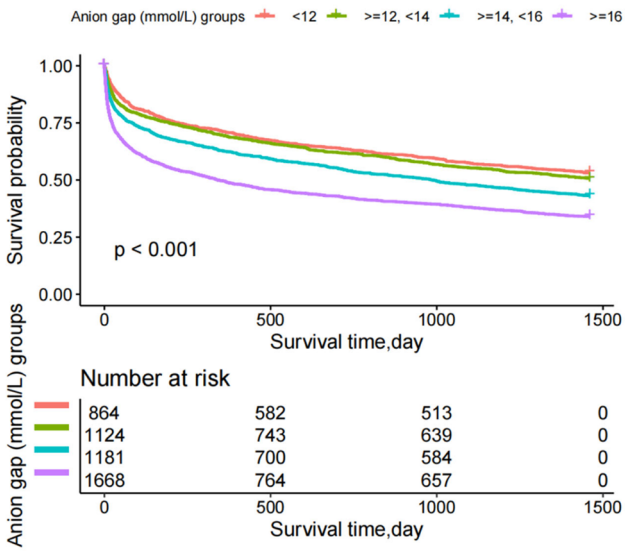

Figure 3. Kaplan–Meier survival curves demonstrating differences in overall survival according to the level of anion gap (4 years) (from reference Peng et al. [20]).

lower survival probabilities (Figure 3). The study concluded that AG levels have a non-linear relationship with mortality in congestive HF patients, suggesting that monitoring AG could be important for predicting patient outcomes [20].

Left ventricular (LV) hypertrophy, a common clinical finding, can be caused by various conditions, including the rare and treatable Fabry disease, which results from a deficiency of α-galactosidase A. Diagnosing Fabry disease is challenging due to its clinical heterogeneity, overlap with other causes of LV hypertrophy, and lack of clinician awareness [21,22]. The review by Paelinck et al. highlights the importance of using clinical data, family history, electrocardiograms (ECG), and imaging techniques like echocardiograms and cardiovascular magnetic resonance (CMR) to differentiate the causes of LV hypertrophy, with specific clues pointing to Fabry disease [23]. In Fabry, LV hypertrophy is usually progressive and concentric but can mimic other forms of hypertrophic cardiomyopathy. Key diagnostic features include low myocardial CMR T1-map values early on, midwall late gadolinium enhancement, and global longitudinal strain depression in the inferolateral wall in later stages. Additionally, voltage criteria for LV hypertrophy, a short PQ interval, and right ventricular (RV) hypertrophy are common. Multisystemic symptoms such as neuropathic pain, hypohidrosis, proteinuria, renal insufficiency, and familial early strokes further suggest Fabry disease. Therefore, unexplained LV hypertrophy, especially when associated with RV hypertrophy or systemic symptoms, should prompt consideration of Fabry disease.

Left atrial (LA) strain is an important measure of atrial function that can provide valuable insights into HF. It assesses the deformation of the left atrium during cardiac cycles, reflecting its reservoir, conduit, and contractile functions. Reduced LA strain is often observed in HF patients, indicating impaired atrial mechanics and worse overall cardiac function. This measure can help in evaluating disease severity, predicting outcomes, and guiding treatment strategies. Monitoring LA strain provides additional information beyond traditional echocardiographic assessments, offering a more comprehensive understanding of atrial involvement in HF [24–26]. The study by Erard et al. explored the relationship between left atrial (LA) strain and various cardiac functions in patients who underwent arterial switch operation (ASO) for transposition of the great arteries (TGA) [27]. In a cohort of 44 patients, LA strain was measured and compared to normal values, with correlations made to left ventricular (LV) function and atrial size. LA reservoir and contractile strains were impaired in many patients and correlated with LV ejection fraction and LA volume index. However, none of the LA strain parameters were linked to cardiopulmonary exercise testing (CPET) outcomes. The findings suggest that while LA strain is impaired in TGA patients post-ASO and relates to cardiac structure, its clinical significance remains uncertain and warrants further investigation. The study by Ozturk et al. explored the relationship between anxiety disorders (ADs) and left atrial function index (LAFI), as well as other cardiac parameters, in AD patients compared to a control group [28]. A total of 48 AD patients and 33 healthy subjects were assessed using echocardiographic measures. Results showed that LAFI, the velocity-time integral of the left ventricular outflow tract (LVOT-VTI), and left atrial (LA) conduit volume were significantly lower in AD patients. Additionally, atrial electromechanical delay (AEMD) times were higher in the AD group. Univariate analysis identified several factors, including body surface area (BSA) and LVOT-VTI, as significant in association with AD, but multivariate analysis revealed that only BSA and LVOT-VTI were independently associated with AD. LAFI, while impaired in AD patients, was not independently linked to AD when adjusted for other factors. The study concludes that LVOT-VTI, rather than LAFI, is the key echocardiographic parameter independently associated with anxiety disorders.

An intracardiac defibrillator (ICD) is indicated for patients at high risk of sudden cardiac death due to life-threatening arrhythmias, such as ventricular tachycardia or ventricular fibrillation. ICD lead implantation is crucial for the device to sense and deliver therapeutic shocks effectively, restoring normal heart rhythm when dangerous arrhythmias occur. Lead failure, although rare, can compromise the ICD's function, necessitating careful monitoring and sometimes replacement or the addition of a new lead to maintain the device's life-saving capabilities [29–31]. The study by Baskovski et al. compared the outcomes of patients with intracardiac defibrillator (ICD) lead failure (LF) who either received a pacing sensing lead (PSL) or a new ICD lead [32]. In a retrospective case-control study of 60 patients, follow-up durations were similar between both groups, and there was no significant difference in total failure rates or high-voltage conductor dysfunction. The results suggest that adding a PSL for ICD LF with normal high-voltage conductor function is as effective as implanting a new ICD lead. This PSL approach may be less costly, technically simpler, and associated with fewer acute complications during extraction procedures.

Alcohol-related cardiovascular complications encompass a spectrum of conditions, including hypertension, arrhythmias, cardiomyopathy, and increased risk of ischaemic heart disease and stroke. Chronic alcohol consumption, particularly in high quantities, leads to the development of alcoholic cardiomyopathy, characterised by ventricular dilation and impaired systolic function, which may progress to HF. Alcohol-induced arrhythmias, such as atrial fibrillation, occur due to the electrophysiological disruption caused by alcohol's effects on ion channels and autonomic tone, often observed in binge-drinking scenarios. Furthermore, excessive alcohol intake contributes to the pathogenesis of hypertension through mechanisms involving increased sympathetic activity, altered baroreceptor function, and vascular endothelial dysfunction. Collectively, these cardiovascular complications significantly elevate the morbidity and mortality associated with alcohol abuse, underscoring the need for targeted prevention and management strategies [33,34].

In this issue of Acta Cardiologica, several focus images highlighting interesting cases have also been reported [35–38].

Disclosure statement

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

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