Editorial

Predicting postoperative atrial fibrillation after off-pump coronary artery bypass surgery—an ongoing story

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Despite significant advancements in cardiac surgery, perfusion techniques, anaesthesia and intensive care over the past few decades, postoperative atrial fibrillation (POAF) remains the most common complication after cardiac surgery, with varying incidence depending on the type of procedure. The incidence of POAF in isolated coronary artery bypass grafting (CABG) ranges from 13–33% (1-5). In patients undergoing isolated off-pump coronary artery bypass grafting (OPCABG), the incidence of POAF ranges from 8–20% (1,2,6-8).

The pathogenesis of POAF is incompletely understood and likely involves interplay between pre-existing physiological components and the postoperative inflammatory processes. Understanding the complex pathophysiological processes and dynamic changes of atrial fibrillation (AF)-associated inflammation might help to identify specific anti-inflammatory strategies for the prevention of AF (9). Effective prophylaxis and management of POAF is necessary to reduce adverse outcomes.

Previous studies have recognized multiple risk factors for POAF after CABG. These include older age, renal failure, impaired left ventricular ejection fraction, diabetes mellitus, chronic obstructive pulmonary disease, use of cardiopulmonary bypass and left atrial size (1,5,6,10,11). Although POAF after cardiac surgery was historically thought to be benign and self-limiting, several studies have now shown that it is associated with a substantial risk for adverse outcomes, including increase in both early and late mortality, morbidities such as postoperative stroke, congestive heart failure, gastrointestinal dysfunction as well as increased length of hospitalization and healthcare costs (2,12-14). Considerable efforts have been directed towards the prevention of POAF, mainly focusing on pharmacological agents. However, the routine use of anti-arrhythmic approaches has drawbacks. For patients who do not develop POAF, they are exposed to the costs and potential side effects of unnecessary prophylaxis. Hence, a strategy to accurately identify patients susceptible to POAF would be crucial to negate these complications and to enable targeted preventive interventions.

The recent study by Zhang *et al.* should be commended on their efforts to evaluate the incidence and elucidate risk factors associated with POAF in 749 patients who underwent OPCABG (8). The authors report results from a high-volume centre over a 9-month period (1 May, 2021 to 1 Feb, 2022). The incidence of POAF was 25% (188 of 749 patients). Compared to patients without POAF, those with POAF had a greater prevalence of comorbidities and higher CHA_2DS_2-VASc (2.90±1.69 *vs.* 2.25±1.50, P<0.001), HATCH (1.44±1.36 *vs.* 1.12±1.08, P=0.001) and POAF (1.29±0.87 *vs.* 0.78±0.79, P<0.001) scores. Multivariable analysis identified older age [odds ratio (OR) =1.05, 95% confidence interval (CI): 1.02–1.08, P<0.001], left atrial diameter (OR =1.03, 95% CI: 1.00–1.05, P=0.039) and the postoperative use of a calcium sensitizer (levosimendan) (OR

=3.14, 95% CI: 1.10–9.21, P=0.033) as predictors of AF after OPCABG.

Currently, there is no widely accepted predictive model for POAF after cardiac surgery. Several studies have examined the predictive value of the CHA_2DS_2-VASc, POAF and HATCH scores for POAF after cardiac surgery. These scores were designed as simple, accurate bedside tools to predict POAF. The CHA_2DS_2-VASc score was originally developed to guide anti-thrombotic treatment in patients with AF or flutter in the general population, hence intraoperative data were not included in the scoring system. It was subsequently validated, both prospectively and retrospectively, for the prediction of POAF in cardiac surgery (15-17). A CHA_2DS_2-VASc score ≥2, POAF score ≥3 and HATCH score >2 were predictive of POAF (15,17-19). In patients undergoing elective OPCABG, a CHA_2DS_2-VASc score of 3 had a high sensitivity of 90% and specificity of 77% in predicting POAF (20).

Zhang *et al.* further explored the role of adding left atrial diameter to these existing predictive scores for AF post-cardiac surgery (CHA_2DS_2-VASc, POAF and HATCH). The authors found that the addition of left atrial diameter improved the predictive value of the POAF and HATCH scores but not the CHA_2DS_2-VASc score (8). With progressive left atrial dilatation, electrical remodelling of the left atrium leads to poor coordination of atrial contraction and the inability to maintain normal sinus rhythm. The remodelled left atrium is also more susceptible to increased adrenergic stress and dynamic volume changes associated with surgery. Left atrial volume index ≥36 mL/m^2 predicted POAF after CABG with a sensitivity of 85% and specificity of 69% (10).

The recently published study by Zhang *et al.* (8) contributes to the limited evidence regarding left atrial diameter as a predictor of POAF after OPCABG. It highlights the potential of incorporating the preoperative left atrial diameter, which is an easily derived echocardiographic parameter, to improve the performance of existing predictive scores for POAF. There are important limitations of this study, including its retrospective nature and relatively small sample size. The study population was limited to OPCABG at a single centre. Hence the risk factors identified may not be generalizable to on-pump CABG or other cardiac surgical procedures. Prospective multi-centre studies with larger patient populations are required to further investigate this topic, address regional variations and validate the findings of this study. While focusing on developing better predictive models, it is also imperative to identify effective prophylactic treatment strategies.

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