Post-operative atrial fibrillation after off-pump coronary artery bypass grafting

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Post-operative atrial fibrillation (POAF) after cardiac surgery is a common complication. The incidence of POAF varies from 20 to 60% as reported in the literature, being 20–30% in isolated coronary artery bypass surgery (CABG), 35–40% in isolated valve surgery and 35–60% in combined CABG and valve surgery. There is a reported twofold increase in all-cause 30-day and 6-month mortality after POAF. There is higher risk of stroke, reoperation for bleeding, infection, renal or respiratory failure, cardiac arrest, cerebral adverse events and a need for permanent pacemaker implantation in patients who have this complication, thus elevating the cost of hospitalisation [1].

POAF is multifactorial in origin. Causes are further classified as acute factors related to surgical procedure and chronic factors associated with advanced age and structural heart disease. Several proarrhythmogenic mechanisms, inflammation and β -adrenergic activation play an important role in POAF [2]. Increased susceptibility of POAF has been found in patients with diabetes and metabolic syndrome as a result of decreased mitochondrial function [3]. The Bioenergetic Health Index has recently been used to characterise decreased mitochondrial function following cardiac surgery and it may presage as a predictor of POAF [4].

Pericardial fluid collection and removal of anterior pericardial fat pad have also been attributed in causation [1]. Correction of electrolyte imbalance—hypokalaemia and hypomagnesaemia—is widely practised for the prevention of POAF. However, some studies have shown that potassium and magnesium supplementation does not protect against atri-

al fibrillation and higher magnesium levels even may increase the risk of POAF [5]. Similarly, milrinone use, which is frequent following cardiac surgery, may lead to POAF [6].

Some studies have shown reduced incidence of atrial fibrillation (AF) in off-pump CABG. Current data, however, do not emphatically answer the question of whether the incidence of post-CABG AF is reduced by off-pump surgery. Decreased incidence of AF following off-pump CABG has been attributed to the avoidance of cardiopulmonary bypass-associated inflammatory response and global myocardial ischemia. Ischemia with off-pump CABG is regional, whereas it is global with cardioplegic arrest. The latter may jeopardise supply to the sub-endocardium and interventricular septum and is especially risky in patients with severe left ventricle dysfunction and acute myocardial infarction, as atrial dilatation may occur leading to the risk of AF. Atrial dilatation is the final pathway mechanism of AF, which is less likely to happen in off-pump CABG, as there is less manipulation of the right atrium due to avoidance of cannulation. Less blood loss and decreased pericardial collections after off-pump CABG may be protective against AF, as a result of less direct pressure on the right atrium [7].

For preoperative prophylaxis, current guidelines recommend β -blockers 24 h prior to surgery for patients undergoing CABG or who have an ejection fraction greater than 30%. In other patients predisposed to POAF, amiodarone should be administered for 7 days preoperatively. Corticosteroids, although may prevent AF, are not advocated due to the risk of hyperglycaemia, immunosuppression, impaired wound healing and increased gastrointestinal complications. The use of statins, from 4 weeks preoperatively to the evening before surgery, has conflicting data and thus, recommendations for preoperative statin prophylaxis cannot be made at present. Diltiazem is reasonable in high-risk patients who are not taking β -blockers. Digoxin is not recommended for preoperative prophylaxis. The role of anticoagulants and angiotensin-converting enzyme (ACE) inhibitors is not clear [1] and omega-3 fatty acids, as per OPERA trial 2017, too have no role [8].

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Intraoperatively, posterior pericardiotomy and preservation of anterior fat pad may significantly reduce the incidence of POAF. Left atrial appendage (LAA) exclusion has emerged as a target for stroke prevention and an alternative to long-term anticoagulation therapy. Quite often there may not be a requirement for the treatment of POAF, as episodes may resolve without intervention. Persistent AF and occurring in haemodynamically unstable patients require management with one or more of the three medications: β -blockers, amiodarone and calcium channel blockers, usually using a single agent and addition of a second medication as per requirement. Concurrent use of all three may lead to bradycardia and hypotension. Between rate control or rhythm control strategy, neither treatment strategy showed a net clinical advantage over the other. Immediate electrical cardioversion should be done for hemodynamically unstable patients [1].

The prospective study by Ghurram et al. [9], later in this issue of the journal, in 748 patients on POAF in Indian patients undergoing off-pump CABG, is a well-conducted study with appropriately designed statistical analysis and the authors are worthy of congratulations for it. In this study, the overall incidence of POAF was 16.7%, which is lower than that of on-pump CABG, an observation reported in other studies too. It is pertinent to mention that in India, a higher percentage of patients undergo off-pump CABG in comparison to the rest of the world. The reduction in the incidence of post-operative AF may add one more point in favour of off-pump CABG.

The study however has certain limitations. AF has been detected only by serial ECGs, whereas guidelines recommend continuous telemetry or Holter monitoring to detect intermittent episodes of AF. Thus, the actual incidence may be higher, reflecting the weakness of this study. The finding of low incidence of POAF as compared with other studies globally, as claimed by the authors, should be viewed factoring the above-mentioned fact. The study has pointed out only advanced age and sepsis as risk factors for POAF. Old age is a well-known risk factor for AF. The incidence of sepsis in this study was 11.2%, with a higher incidence of 33.1% in the POAF group, leading to decreased survival. Sepsis-causing AF due to systemic inflammatory response is a new proposition in this study, as claimed by the authors. Sepsis itself can be the cause of higher morbidity and mortality and POAF may be simply a manifestation of sepsis. On the other hand, POAF can cause sepsis [1] and it is difficult to interpret this proposition like egg and hen controversy. Reduced survival in patients who develop POAF, another finding in the study, is a well-known fact and there is nothing new. Pericardial fluid collection, being highly inflammatory in nature, leads to increased oxidative stress and has been incriminated recently as an important

cause of POAF [10], but the study by Ghurram et al. is silent regarding this observation.

Interpretation of this study is further confounded by its being an observational study sans any control group and poorly defined AF monitoring. It is silent on the role of revascularisation and pericardial collection, with conflicting message of sepsis as a cause of POAF. Yet, it is a unique study from Indian subcontinent providing the much-needed data regarding POAF following off-pump CABG. However, more robust data are required about POAF in off-pump CABG to know the incidence, precise mechanisms, risk factors, prophylaxis, treatment and outcome in comparison with conventional on-pump CABG.

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