Predictors of Postoperative Atrial Fibrillation in Robotic CABG: A Regression Analysis

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Background

Postoperative atrial fibrillation (POAF) remains a common complication after coronary artery bypass grafting (CABG), and is associated with increased risk of stroke, prolonged ICU stay, and greater hospital resource utilization. It most commonly develops within the first two to four postoperative days, driven by mechanisms including perioperative inflammation, oxidative stress, and autonomic dysregulation.

Robotic CABG has been associated with reduced inflammatory response and faster recovery compared to open surgery. However, evidence regarding POAF incidence and its predictors specific to the robotic approach remains limited.

This study sought to define the incidence of POAF and identify independent predictors in patients undergoing robotic CABG.

Methods

Out of 347 robotic CABG procedures between July 2021 and July 2025, we retrospectively analyzed 301 consecutive patients without a prior history of atrial fibrillation. POAF was defined as new-onset atrial fibrillation occurring during the index hospitalization. Univariable logistic regression was used to screen potential predictors, and variables with p<0.20 were entered into a multivariable model. Firth's bias-reduced logistic regression was applied for rare events. Variance inflation factor (VIF) investigated possible collinearity of the model.

Characteristic	N=301
Age, years, mean (SD)	67.2 (10.3)
Male sex, n (%)	237 (78.7)
STS score, median [IQR]	0.81 [0.46, 1.44]
BMI, kg/m², median [IQR]	28.9 [25.6, 33.8]
Status, n (%)	
Elective	189 (62.8)
Urgent	111 (36.9)
Emergent	1 (0.3)
Preoperative IABP, n (%)	20 (6.6)
eGFR (median [IQR])	81.7 [66.5, 95.6]
Dialysis, n (%)	5 (1.7)
History of smoking, n (%)	164 (54.5)
Chronic lung disease, n (%)	50 (16.6)
Diabetes, n (%)	131 (43.5)
HbA1C, %, median [IQR]	5.9 [5.5, 6.9]
Hypertension, n (%)	276 (91.7)
CVA, n (%)	34 (11.3)
PAD, n (%)	37 (12.3)
Liver disease, n (%)	6 (2.0)
Liver cirrhosis, n (%)	3 (1.0)
Immunocompromised, n (%)	12 (4.0)
History of cancer, n (%)	25 (8.3)
Mediastinal radiation, n (%)	5 (1.7)
Prior MI, n (%)	110 (36.5)
Previous PCI, n (%)	81 (26.9)
Prior CABG, n (%)	0 (0.0)
Prior valve, n (%)	1 (0.3)
Redo chest, n (%)	3 (1.0)
Paced rhythm, n (%)	4 (1.3)
Heart failure, n (%)	104 (34.6)
CAD (%)	
One	63 (20.9)
Two	100 (33.2)
Three	137 (45.5)
Four	1 (0.3)
LVEF, %, median [IQR]	60.0 [55.0, 65.0]

Results

The mean age was 67.2 ± 10.3 years, 78.7% of patients were male, and the median STS score was 0.81 [0.46–1.44]. Most procedures were elective (62.8%), with a high prevalence of hypertension (91.7%), prior smoking (54.5%), and diabetes (43.5%). Hybrid coronary revascularization was performed in 53.5% of cases, and 15.9% underwent totally endoscopic coronary artery bypass (TECAB). POAF occurred in 51 patients (16.9%).

Outcome	N=301
OR time, hours, median [IQR]	5.00 [4.42, 5.80]
TECAB, n (%)	48 (15.9)
LAAO, n (%)	6 (2.0)
Second arterial, n (%)	25 (8.3)
Total arterial, n (%)	21 (7.0)
RITA, n (%)	6 (2.0)
LRAD, n (%)	2 (0.7)
Hybrid, n (%)	161 (53.5)
Reverse hybrid, n (%)	40 (13.3)
Patients transfused OR, n (%)	9 (3.0)
Extubation in the OR, n (%)	197 (65.4)
POAF, n (%)	51 (16.9)

Variable	Univariable OR, 95%CI, p-value	Multivariable OR, 95%CI, p-value
Age	1.06, 95%CI: 1.03-1.10, **p=0.001**	1.05, 95%CI: 1.01-1.09, **p=0.013**
STS Score	1.19, 95%CI: 1.02-1.42, **p=0.044**	0.97, 95%CI: 0.80-1.14, p=0.737
Male sex	1.86, 95%CI: 0.84-4.71, p=0.154	1.90, 95%CI: 0.84-4.86, p=0.129
PAD	2.77, 95%CI: 1.25-5.88, **p=0.009**	2.12, 95%CI: 0.89-4.84, p=0.087
Mediastinal radiation	7.17, 95%CI: 1.36-44.1, **p=0.022**	5.07, 95%CI: 0.83-35.95, p=0.078
Prior MI	1.70, 95%CI: 0.92-3.12, p=0.089	1.45, 95%CI: 0.74-2.85, p=0.280
Heart failure	2.29, 95%CI: 1.24-4.24, **p=0.008**	1.55, 95%CI: 0.78-3.07, p=0.211
TECAB	0.29, 95%CI: 0.07-0.82, **p=0.042**	0.51, 95%CI: 0.13-1.47, p=0.227
Hybrid revascularization	1.75, 95%CI: 0.95-3.32, p=0.080	1.40, 95%CI: 0.73-2.72, p=0.313

Conclusions

In this contemporary robotic CABG cohort, POAF occurred in approximately one in six patients. Increasing age was the sole independent predictor at multivariable regression analysis, while procedural strategy and some comorbidities were only independently associated with POAF at the univariable model.