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Original Research Article

Arrhythmia Post Coronary Artery Bypass Surgery in Early Post Operative Period and in a Follow Up of One Year in a Tertiary Care Hospital of Eastern India

Bhaskar Das[1], Madhur Sahay[2], Rajarshi Basu[3]

[1]Associate Professor, Dept. of CTVS, R. G. Kar Medical College, Kolkata
[2]Senior Resident, Dept. of CTVS, R. G. Kar Medical College, Kolkata
[3]Associate Professor, Dept. of CTVS. R. G. Kar Medical College, Kolkata

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Corresponding Author: Dr. Bhaskar Das
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Abstract:

Cardiac arrhythmias are common in the post operative period following cardiac surgery. The aim of the study is to assess the incidence, etiology, best possible management and effects on outcome like morbidity and mortality in patients having arrhythmia Post CABG in the early post-operative period and in a follow up over one year at a tertiary level hospital in eastern India.

Introduction

The reported prevalence of arrhythmia following cardiac surgery may vary between 7.5% and 48% [1,2,3]. Atrial Fibrillation (AF) is the most frequently encountered arrhythmia following coronary artery bypass graft (CABG) surgery affecting 16-30% of patients in the post-operative period. Most events occur during the early postoperative period as a result of direct injury or manipulation to cardiac conduction system during the surgery or due to myocardial edema and inflammation adjacent to the conducting system. High catecholamine levels and electrolyte disturbances during the postoperative period are also a likely cause. The longstanding myocardial dysfunction from pressure or volume overload also makes these patients especially vulnerable to arrhythmias. Reported risk factors include older age and low body weight at surgery, longer cardiopulmonary bypass time (CPB) and aortic cross-clamp time, electrolyte imbalance, use of deep hypothermia and circulatory arrest along with suboptimal revascularization and presence of stunned myocardium. The borderline zone between stunned myocardium and viable myocardium is often a beginning point of an arrhythmia; it may be self-limiting or in some cases may lead to intractable arrhythmia with hemodynamic instability.

Materials and Methods

A hospital based, prospective, observational study was undertaken at R. G. Kar Medical College, Kolkata, West Bengal, a tertiary level public hospital in eastern India over a period of six years since 2017. Patients undergoing elective isolated CABG surgery were recruited in this study. Perioperative ECG, echocardiography, mode of surgery – off pump/on pump and number of grafts placed were noted. Patients with pre-existing arrhythmias and patients undergoing concomitant other cardiac surgical procedures (like CABG along with valve replacement surgery) were excluded from this study.

Statistical Analysis: Quantitative data was presented with the help of Mean and Standard deviation. Qualitative data was represented with the help of frequency and percentage table. Results were graphically represented where deemed necessary. Appropriate statistical software, including but not restricted to MS-Excel. SPSS version 20 was used for statistical analysis. Graphical representation was done in MS-Excel 2010.

Ethical Approval: Ethical approval was taken from the Institutional Ethics Committee of R. G. Kar medical College and Hospital, Kolkata with vide memo no. RMC/SS/756 on 23rd March 2017 and Institutional Scientific Committee of R. G. Kar medical College and Hospital, Kolkata with vide memo no. RMC/SS/755 on 23rd March 2017

Results

Out of 72 patients in the study the most common arrhythmia encountered was Atrial Fibrillation (29.2%) followed by Premature atrial complex (9.7%), Atrial Flutter (6.9%), Paroxysmal Supraventricular Tachycardia (PSVT) (5.5%),

Ventricular Tachycardia (VT) (5.5%), Junctional tachycardia (4.2%) and Ventricular Fibrillation (1.4%).

In our study majority of the patients (30.5%) were in the age group of 51-60 years followed by 25% in the age group of 71-80 years, 23.6% in the age group of 61-70 years, 16.7% in the age group of 41-50 years and 4.2% in the age group of 31-40 years. The mean age of the patients was 60.93 ± 12.50 years. 53 (73.6%) patients were male while 19 (26.4%) patients were female in our study.

In the echocardiography finding, mean E wave and A wave value of patients was 0.66±0.18 cm/s and 0.64±0.15 cm/s respectively while the mean E/A ratio was 1.11±0.50. The mean Deceleration Time (DT) and Isovolumic Relaxation Time (IVRT) value of patients was 202.61±18.80 msec and 73.24±9.76 msec respectively found in echocardiography. 24 (33.3%) patients had mild left ventricular dysfunction while 13 (18.1%) and 16 (22.2%) patients had moderate and severe dysfunction respectively. 19 (26.4%) patients had normal LV function.

34 (47.2%) patients underwent On-Pump CABG while 38 (52.8%) patients underwent Off-Pump CABG. The mean Cardiopulmonary Bypass Time (CPB) and Cross clamp time of patients undergoing on pump CABG was 96.61 ± 12.10 minute and 67.96 ± 11.71 minute respectively. 1 and 2 grafts were placed in 10 (13.9%) and 16 (22.2%) patients respectively while ≥3 grafts were placed in 46 (63.9%) patients.

Out of 21 (29.2%) patients who developed Atrial Fibrillation (AF), 5 (6.9%) and 10 (13.9%) patients developed AF after 1 day and 2 days post-operatively respectively while 6 (8.3%) patients developed AF after ≥3 days post-operatively.

21 (46.7%) patients having arrhythmias were treated with I.V. Amiodarone while 18 (40%) and 13 (28.9%) patients were treated with β-Blocker. Electrolyte correction (for potassium and magnesium) was done in patients needing them. 5 (11.1%) patients were treated with DC cardioversion and 4 (8.9%) were treated by I.V. Lidocaine.

The duration of ICU stays in 18 (25%) and 16 (22.2%) patients was 1 day and 2 days respectively while the duration of ICU stay in 38 patients (52.8%) was ≥ 3 days. The mean duration of ICU stay was 2.53 ± 1.13 days. The duration of hospital stay was < 7 days in 12 (16.7%) patients and > 7 days in 60 (83.3%) patients. The mean duration of hospital stay was 9.22 ± 3.0 days.

The incidence of arrhythmia at 1 month and 4 months follow-up was 51.4% and 40.3% respectively while the incidence of arrhythmia at 7 months and 1 year follow-up was 26.4% and 8.3% respectively. 70 (97.2%) patients survived while 2 (2.8%) patients died in the postoperative period, however, cause of mortality in none of the patients could be attributed to cardiac arrhythmia.

Table 1: Types of arrhythmias following CABG

Types of Arrhythmias	N	%
Atrial Fibrillation	21	29.2%
Premature atrial complex	7	9.7%
Atrial Flutter	5	6.9%
PSVT	4	5.5%
Ventricular Tachycardia	4	5.5%
Junctional tachycardia	3	4.2%
Ventricular Fibrillation	1	1.4%
Total	45	62.5%

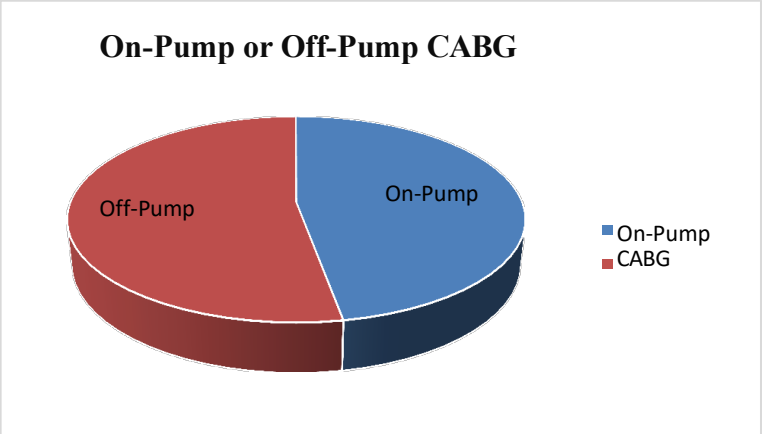

Figure 1: Type of CABG surgery performed

Table 2: Comparison of patients with and without arrhythmia

Parameters	With arrhythmia		Without arrhythmia		P-value
	N	%	N	%	
LVEF					
Mild dysfunction	14	19.4%	10	13.9%	<0.05
Moderate dysfunction	7	9.7%	6	8.3%	
Severe dysfunction	14	19.4%	2	2.8%	
Normal	10	13.9%	9	12.5%	
CPB (mins)	96.14 ± 12.25		97.50 ± 11.87		N.S.
Cross clamp time (mins)	68.81 ± 12.04		66.14 ± 12.25		
ECHO Characteristics					
E wave (cm/s)	0.65 ± 0.17		0.67 ± 0.21		N.S.
A wave (cm/s)	0.66 ± 0.15		0.63 ± 0.17		
E/A ratio	1.15 ± 0.44		1.20 ± 0.58		
DT (Msec)	202.40 ± 18.17		202.96 ± 20.22		
IVRT(Msec)	71.47 ± 9.43		71.31 ± 9.72		

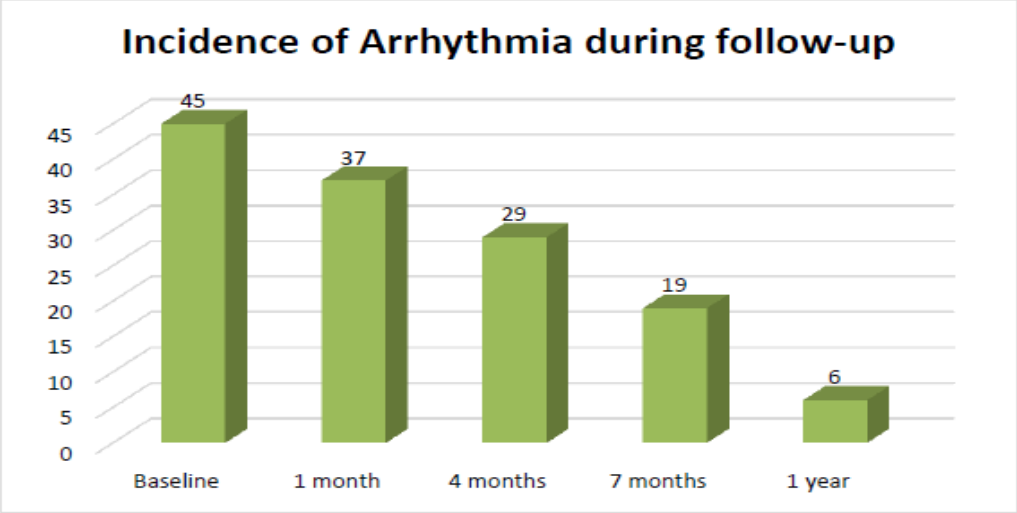

Figure 2: Incidence of Arrhythmia Post CABG during follow-up

Discussion

The commonest arrhythmia observed in our study was Atrial Fibrillation followed by other supraventricular arrhythmias whereas junctional and ventricular arrhythmias were less frequent. This is similar to the studies of Peretto P et al [5], El-Chami MF et al [6], Švagzdiene M et al [7] and Karim et al [8].

It was observed that the patients developing arrhythmias significantly belonged to older age group and male patients were significantly prone to have arrhythmias ($p<0.05$). This is comparable to the studies of Zaman AG et al [9], SvagzdieneM et al [7], Bohatch Junior MS et al [10] and Ismail MF et al [11]. Ismail MF et al [11] in a retrospective cohort study identifying the predictors of the incidence of perioperative AF found that it was directly proportional to age, where the incidence was 7% in patients less than 60 years old, 18% between 60 and 70 years and reached up to 42% for patients above the age of 70 years.

There was no correlation between the incidence of arrhythmia and electrolyte levels in our study. In echocardiography there was no significant difference between mean E wave and A wave values, mean E/A ratio, mean Deceleration Time (DT) and Isovolumic Relaxation Time (IVRT) values of patients having arrhythmia and of patients not developing arrhythmia in the post operative period. The incidence of arrhythmias was significantly higher in patients with severe left ventricular dysfunction compared to patients with moderate and mild dysfunction as per Chi-Square test ($p<0.05$). El-Chami MF et al [6] study had similarly reported that patients with post operative ventricular arrhythmias were older (63.5 vs. 51.6 years), had lower left ventricular ejection fraction (EF) (43.7 % vs. 51.3%), and had greater comorbidities. Ismail MF et al [11] in their retrospective cohort study also reported that patients

who developed postoperative AF had a lower ejection fraction (44.8%) compared to those with no postoperative AF (56.7%).

It was observed that there was no significant correlation between preoperative medications and incidence of arrhythmias in our study. There was no significant correlation found in between incidence of arrhythmia and mode of CABG (i.e. On-Pump CABG and Off-Pump CABG). There was no significant relation between cross-clamp time, cardiopulmonary bypass time, and the incidence of arrhythmias. Bohatch Junior MS et al [10] in a retrospective study made a similar observation. In the off-pump group, 18 (13.43%) patients developed AF in the postoperative period, while in the on-pump group, 19 (19.79%) developed arrhythmia with no significant statistical difference. Some authors like Auer J et al showed that prolonged bypass time and cross-clamp times to be independent predictors for perioperative AF [12]. Cox JL postulated that inadequate atrial protection with cardioplegia and extended periods of cross clamping led to atrial ischemia and probably triggered the development of AF in vulnerable patients [13]. In our study, however, no statistical significance was noted between post operative arrhythmia and CPB time.

There was no statistical difference between incidence of arrhythmias and the number of grafts performed. Ismail MF et al [11] in their retrospective cohort study observed no statistical difference in the incidence of peri operative arrhythmias among the groups regarding number of diseased vessels or the number of grafts performed.

It was observed in the present study that the duration of ICU stays in 18 (25%) and 16 (22.2%) patients was 1 day and 2 days respectively whereas the duration of ICU stay in 38 (52.8%) patients was ≥3 days. The mean duration of ICU Stay was 2.53±1.13 days. The duration of hospital stays in 12 (16.7%) and 60 (83.3%) patients was <7 days and ≥7 days respectively. The mean duration of hospital stay was 9.22 ± 3.00 days. This is concordant to the study of Zaman AG et al [9] and Bohatch Junior MS et al [10]. Zaman AG et al [9] study observed postoperative hospital stay was significantly longer in patients with AF than in those without AF. (9.2 versus 7.3 days).

It was observed in our study that the incidence of arrhythmia at 1 month and 4 months follow-up was 51.4% and 40.3% respectively while the incidence of arrhythmia at 7 months and 1 year follow-up was 26.4% and 8.3% respectively. There was significant decrease in incidence of arrhythmia during follow-up over 1 year time. This is consistent with the studies of Thorén E et al [14] which found non arrhythmia cohort showed no increase in incidence of AF beyond the first postoperative year. Further, perioperative AF was associated with long-term AF, ischemic stroke, heart failure, overall mortality, cardiac mortality, and cerebrovascular mortality.

Summary and Conclusion

A tertiary level hospital based prospective, observational study was conducted with 72 patients to know the incidence of arrhythmia post CABG in the early post-operative period and in a follow up of one year. The following observations were noted:

- The most common type of arrhythmia observed was Atrial Fibrillation.
- It was observed that the patients with arrhythmias were significantly older and predominantly male patients ($p<0.05$).
- There was no significant difference between mean E wave and A wave values, mean E/A ratio, mean Deceleration Time (DT) and Isovolumic Relaxation Time (IVRT) values in echocardiography of patients having arrhythmia and of patients not having arrhythmia.
- The incidence of arrhythmias was significantly higher in patients with severe left ventricular dysfunction compared to patients with moderate or mild dysfunction ($p<0.05$).
- There was no significant correlation found in between incidence of arrhythmia and mode of CABG (i.e. On-Pump CABG and Off-Pump CABG). There was no significant relation between cross-clamp time, cardiopulmonary bypass time and the incidence of arrhythmias for on pump group patients.
- There was no statistical difference between incidence of arrhythmias and the number of grafts performed.
- In our study it was observed Atrial Fibrillation (AF) developed most commonly on second post-operative day (POD).
- In our study it was observed that most of the arrhythmias were treated by I.V. Amiodarone followed by β-Blocker and electrolytes correction while DC cardioversion and I.V. Lidocaine were used only in few patients with Ventricular Arrhythmias.
- The study observed postoperative hospital stay was significantly longer in patients with arrhythmia than in those without arrhythmia, however, there was no significant relation between incidence of arrhythmias and mortality.
- It was observed that there was statistically significant decrease in incidence of arrhythmias during follow-up over a period of 1 year. Over time many patients revert back to sinus rhythm.

References

1. Herzog L, Lynch C. Arrhythmias accompanying cardiac surgery. editor. Clinical Cardiac Electrophysiology. 3rd ed. Philadelphia, PA, USA: JB Lippincott. 1994, pp. 231-258.
2. Creswell LL, Schuessler RB, Rosenbloom M et al. Hazards of postoperative atrial arrhythmias. The Annals of Thoracic Surgery. 1993, 56:539-549.
3. Mathew JP, Fontes ML, Tudor IC et al. Investigators of the Ischemia Research and Education Foundation, Multicenter Study of Perioperative Ischemia Research Group. A multicenter risk index for atrial fibrillation after cardiac surgery. JAMA. 2004, 291:1720-1729.
4. Steinbach K, Merl O, Frohner K et al. Hemodynamics during ventricular tachyarrhythmias. American Heart Journal. 1994, 127:1102-1106.
5. Peretto G, Durante A, Limite LR et al. Postoperative arrhythmias after cardiac surgery: Incidence, risk factors, and therapeutic management. Cardiology Research and Practice. 2014, 2014:(615987);1-5.
6. El-Chami MF, Sawaya FJ, Kilgo P et al. Ventricular arrhythmia after cardiac surgery: Incidence, predictors, and outcomes. Journal of the American College ofCardiology. 2012, 60(25):2664-2671.
7. Švagždienė M, Širvinskas E. Changes in serum electrolyte levels and their influence on the incidence of atrial fibrillation after coronary artery bypass grafting surgery. Medicina (Kaunas). 2006, 42(3):208-214.
8. Md. Rezaul Karim, Tawfiq Ahmed, Shahriar Moinuddin, Tariq Ahmed Chowdhury, Moshfequre Rahman Khan et al. atrial fibrillation after coronary artery bypass surgery with or without cardiopulmonary bypass. Cardiovasular journal. 2018; 10(2): 171-179.
9. Zaman AG, Archbold RA, Helft G et al. Atrial Fibrillation after Coronary Artery Bypass Surgery A Model for Preoperative Risk Stratification. Circulation. 2000, 101:1403-1408.
10. BohatchJúnior MS, Matkovski PD, José Di Giovanni F et al. Incidence of postoperative atrial fibrillation in patients undergoing on-pump and off-pump coronary artery bypass grafting. Rev Bras Cir Cardiovasc. 2015, vol.30(3):316-324.
11. Ismail MF, El-mahrouk AF, Hamouda TH et al. Factors influencing postoperative atrial fibrillation in patients undergoing on-pump coronary artery bypass grafting, single center experience. Journal of Cardiothoracic Surgery. 2017, volume 12, Article number:40.
12. Auer J, Weber T, Eber B. Atrial fibrillation and risk of postoperative complications. J Am Med Assoc. 2004;292:41–5.
13. Cox JL. A perspective of postoperative atrial fibrillation in cardiac operations. Ann Thorac Surg. 1993;56:405–9.
14. Thorén E, Wernroth M, Christersson C et al. Compared with matched controls, patients with postoperative atrial fibrillation (POAF) have

increased long-term AF after CABG, and POAF is further associated with increased ischemic stroke, heart failure and mortality even after adjustment for AF. Clin Res Cardiol, 2020. https://doi.org/10.1007/s00392-020-0161