

Research Article

Study of Cardiac Rhythm Disorders in Post-Operative Period Following Cardiac Surgery in Cotonou: Incidence and Associated Factors

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Abstract

Introduction: The occurrence of cardiac rhythm disorders (CRDs) is a frequent and often serious complication following cardiac surgery. The aim of this study was to investigate the incidence, nature, and potential risk factors associated with new-onset postoperative CRDs following cardiac surgical procedures. **Material and Method:** This was a prospective, descriptive, and analytical study conducted at the Cardiology Unit of the CNHU-HKM in Cotonou over a 31-month period, spanning from March 2021 to September 2023. We included, via exhaustive enrolment, all consecutive patients of all ages and both sexes who underwent cardiac surgery during the study period. Patients with pre-existing CRDs were excluded. The primary variables studied were the incidence of CRDs diagnosed during the first 30 postoperative days and the identification of associated demographic, clinical, and surgical risk factors. **Results:** A total of one hundred and two patients were included. The mean age was 38 ± 14.39 years, with age extremes ranging from 12 to 66 years. The sex ratio was 0.92. The overall incidence of new postoperative CRDs, monitored until postoperative day 30, was 37.2% (38 cases). The most frequently observed CRDs were atrial fibrillation (42.1% of all CRDs, 16 cases) and atrial flutter (23.7%, 9 cases). Less common rhythm disturbances included junctional tachycardia (13.2%, 5 cases), sustained ventricular tachycardia (13.2%, 5 cases), and atrial tachycardia (7.9%, 3 cases). Factors found to be significantly associated with the occurrence of CRDs were age greater than 50 years ($p=0.001$) and tricuspid plasty ($p=0.035$). **Conclusion:** Postoperative cardiac rhythm disorders are frequent complications after cardiac surgery in our setting, with atrial fibrillation being the predominant type. These findings emphasize the need for rigorous monitoring in older patients and those undergoing complex valve repairs. Future studies, based on a larger sample size, are recommended to validate these findings and identify further associated factors to improve prevention strategies.

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Keywords

Post-Operative Cardiac Rhythm Disorder, Cardiac Surgery, Cotonou

1. Introduction

Cardiac rhythm disorders (CRDs) are frequently seen in the post-operative period after cardiac surgery, with varying delays in onset [1]. Among these arrhythmias, atrial fibrillation is the most frequently encountered [2]. The frequency of occurrence varies according to the type of surgery and patient characteristics [3]. Because of its complications, it adversely affects patients in terms of morbidity and length of hospital stay [4]. Ventricular tachycardias represent an immediate vital risk for the patient. In sub-Saharan Africa, few countries have cardiac surgery, which is why data presenting the frequency and evolution of arrhythmias in post-operative cardiac surgery are scarce. In Benin, where this activity has become a reality, it seems important to determine the frequency of post-operative arrhythmias and to describe their evolution over time, in order to improve their management.

2. Materials and Methods

This was a prospective, descriptive, analytical study performed at the cardiology department of the national teaching hospital (CNHU-HKM) in Cotonou from March 2021 to September 2023. Patients of all ages and both sexes who underwent cardiac surgery during the study period were included by an exhaustive enrolment process. Day 0 (D0) being the day of surgery, the period from D0 to D30 was considered as the short-term post-operative period. CRTs were investigated during the long-term post-operative period of 12 months. The dependent variable was the presence of at least one new CRT during the long-term post-operative period. These CRDs included atrial fibrillation (AF), atrial flutter, atrial tachycardia, junctional tachycardia, ventricular tachycardia and ven-

tricular fibrillation. CRDs diagnosed on surface electrocardiogram were included. New cases included patients with no known CRD prior to surgery. The evolution profile was specified at D30 and the end of 12th post-operative months. Other variables studied were sociodemographic data, Euroscore II, indications of cardiac surgery, surgical procedure, immediate post-extracorporeal circulation (EC), heart rate, other postoperative complications, and postoperative treatment. Pre-operative clinical, electrocardiographic and biological data, as well as data collected up to the end of the 12th month post-operatively, were collected by direct observation, medical records and by performing electrocardiograms. The data collected were entered on the KoboToolbox platform, then analyzed using SPSS2 software. Quantitative variables were presented as mean $\pm$ standard deviation for symmetrical distributions, and as median with interquartile range for asymmetrical distributions. Proportion comparisons were made, and associations between variables were sought using Pearson's Chi2 test or Fisher's test with a significance threshold of 5%.

3. Results

One hundred and two patients were included, aged 38 ± 14.39 years with extremes of 12 and 66 years. The sex ratio was 0.92. Patients aged between 40 and 60 were the most numerous, accounting for 44.1% of the sample. Mitral valve surgery was performed in 66.6% of cases. Extracorporeal circulation (EC) was used in 97.1% of cases, and for a duration of more than one hour in 74.7% of cases (Table 1).

Table 1. Distribution of 102 patients undergoing cardiac surgery at the National Teaching Hospital (CNHU-HKM) in Cotonou, according to their general characteristics.

		Headcount	Percentage (%)
Sex (n=102)	Female	53	52
	Male	49	48
Age ranges (n=102)	≤ 20	14	13,7
	]20, 40]	40	39,2
	]40, 60]	45	44,1

		Headcount	Percentage (%)
EUROSCORE II (n=102)	> 60	03	02,9
	< 4	61	59,8
	[4-8]	41	40,2
	> 8	00	00
Type of procedure performed	Tricuspid plasty	61	59,8
	Mitral valve surgery	68	66,6
	Aortic valve surgery	33	32,3
	Double mitral and aortic surgery	17	16,6
	Double mitral and tricuspid surgery	40	39,2
	Mitral, aortic and tricuspid surgery	10	09,8
Use of extracorporeal circulation (n=102)	No	03	02,9
	Yes	99	97,1
Duration of extracorporeal circulation (minutes, n=99)	≤ 90	45	45,5
	> 90	54	54,5
Mode of resumption of cardiac activity in the immediate post-EC period	Sinus rhythm	75	73,5
	Arrhythmia	27	26,5
Number of valves operated (n=80)	One	39	48,7
	Two or more	41	51,3

EC: extracorporeal circulation, CNHU-HKM: National Teaching Hospital Hubert Koutoukou Maga.

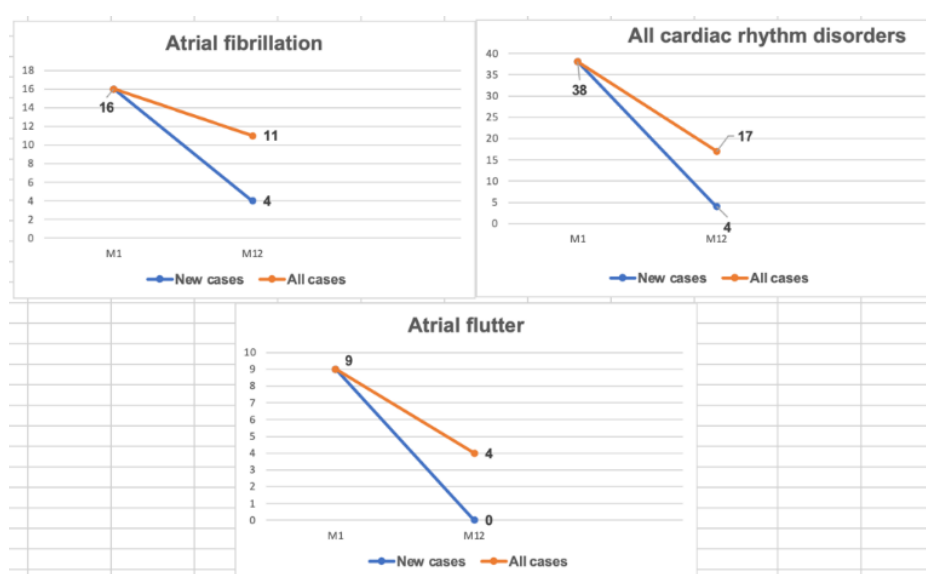


Figure 1. Presentation of cases of cardiac rhythm disorders in postoperative of cardiac surgery and their evolution in a sample of 102 patients (Cotonou, 2023). M1: end of first month after surgery, M12: end of 12th month.

In the short-term post-operative period, 46 patients presented with a CRD including 38 new cases representing 37.2%. These included 16 cases of AF (42.1%), 9 cases of atrial flutter (23.7%), 5 cases of junctional tachycardia (13.2%), 5 cases of sustained ventricular tachycardia (13.2%) and 3 cases of atrial tachycardia (7.9%).

The evolution of these CRDs was studied. In the short term, 22 cases (21.6%) abated after a mean duration of 14.05 ± 7.84 days. The incidence of short-term AF was 15.7% (16 cases). Six cases (5.9%) were reduced in the short term after a duration

of 23.3 ± 5.5 days. At the end of the 12th month, 4 new cases (3.9%) were observed. This evolution is illustrated in Figure 1.

CRDs were managed with betablockers in 12 cases (31.5%), amiodarone in 5 cases (13.2%) and electrical cardioversion in 2 cases (5.3%). In 24 cases (63.1%), no antiarrhythmic therapy was used.

Factors associated with the occurrence of postoperative CRDs were investigated. Advanced age over 50, a Euroscore of less than 4 and tricuspid plasty were associated with the occurrence of postoperative CRDs.

Table 2. Distribution of cases of cardiac rhythm disorders in postoperative of cardiac surgery according to age, extracorporeal circulation data and type of surgical procedure performed (sample of 102 patients, 2023, Cotonou).

		CRDs present	CRDs absent	Odds ratio	p-value
Age (years)	> 50	20	13	1,38-7,78	0,006
	≤ 50	22	47		
Euroscore II	< 4	30	31	1,01-5,41	0,046
	≥ 4	12	29		
Use of extracorporeal circulation	Yes	42	57	-	0,26
	No	00	03		
Duration of extracorporeal circulation	> 90 minutes	26	28	0,74-3,78	0,21
	≤ 90 minutes	16	29		
Tricuspid plasty	Yes	25	23	1,05-5,29	0,035
	No	17	37		
Mitral valve surgery	Yes	27	41	0,36-1,91	0,67
	No	15	19		
Double mitral and aortic surgery	Yes	37	48	0,59-5,71	0,28
	No	5	12		
Number of valves operated	One	18	23	0,46-2,73	0,82
	Two or more	16	23		

CRDs: cardiac rhythm disorders.

4. Discussion

The incidence of CRDs in the short-term post-operative period was 37.2%. Considering the 12-month post-operative period, this incidence rose to 41.1%. This percentage is high compared with the incidence of CRDs in some studies carried out in the sub-region. Diop and al in Senegal found 24% of rhythm disorders following aortic valve surgery in a sample of 25 patients, four times less than the sample used in the present study [5]. In Nigeria, Falase and al observed a frequency of 17.6% in a study of 51 cases, from more diverse surgeries, but

with less than 50% valve surgery [6]. Differences in the way these studies were carried out may account for the differences observed in terms of results.

AF was the most frequently encountered CRT, with a short-term incidence of 15.7% in the entire sample. Numerous studies have confirmed this predominance of AF, although the incidences were not identical. Indeed, Togo et al in Mali and Falase et al in Nigeria observed identical incidences of post-operative AF, i.e. 11.8% [6, 7]. Saxena et al in Australia had an AF incidence of 13.6%, similar to the 15.7% reported in the present study [8]. Conversely, Rostagno et al in Italy found a 29.7% incidence of postoperative atrial fibrillation in a sam-

ple with an average age of 67.4 ± 12 years, twice the average age in Cotonou [9]. It is known that advanced age is the first factor favouring the onset of AF [10].

In the present study, a 46% reduction in AF was observed in the first postoperative month, and among these patients, the reduction was spontaneous in more than half of cases (66.6%). There is little agreement in the literature on the natural history of AF after cardiac surgery. According to Mansoor et al, 80% of patients return to sinus rhythm even in the absence of treatment, and less than 10% of patients who return to sinus rhythm develop a recurrence of AF within six weeks of hospital discharge [11]. Patients should be managed on a case-by-case basis, taking into account reducing inotropes, correcting ionic disturbances, combating hypoxia and lowering intra-atrial pressure [12].

Factors associated with postoperative CRDs included advanced age and tricuspid valve surgery. Age is a known risk factor. Indeed, the risk of developing AF increases by 51% per decade [12]. Other factors have been identified in the literature, such as the indication for surgery, inflammation, hemodynamic stress, ionic disorders, myocardial ischemia and drugs used perioperatively [12]. Tricuspid valve surgery was not found in the literature and may be the subject of future studies involving larger sample sizes.

5. Conclusions

Cardiac rhythm disorders in postoperative of cardiac surgery are common in Cotonou, and are still dominated by atrial fibrillation. Their frequency tends to decrease as early as the first postoperative month, with a high proportion of spontaneous reduction. Advanced age is an associated factor recognized in the literature, and tricuspid plasty has also been identified in the present work. Studies based on larger samples will enable us to identify other associated factors and better prevent these rhythm disorders.

Abbreviations

AF	Atrial Fibrillation
CNHU-HKM	National Teaching Hospital Hubert Koutoukou Maga
CRDs	Cardiac Rythm Disorders
D0	Day 0
D30	Day 30
EC	Extracorporeal Circulation

Author Contributions

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Danielle Makuissu: Writing - review & editing

Romuald Tandjiekpon: Writing - review & editing

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Data Availability Statement

The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography



Djidjoho Jo ã Arnaud Sonou is a cardiology lecturer at the Faculty of Health Sciences of the University of Abomey-Calavi, with the rank of Associate Professor. His areas of interest are cardiac electrophysiology, cardiac pacing, cardiac physiology, hypertensiology and women's cardiovascular health. Dr

Sonou is the current president of the Beninese Society of Cardiology. He has authored and co-authored several research articles related to his areas of interest.

Research Field

Djidjoho Jo ã Arnaud Sonou: Cardiac rhythm and conduction disorders, Cardiac pacing and implantable defibrillators, Heart failure, Acute coronary syndrome, High blood pressure.