

Early Postoperative Arrhythmias after Paediatric Cardiac Surgery

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Abstract

Pediatric arrhythmias represent around 55.1 per 100,000 patients assessed in pediatric crisis divisions. Patients with intrinsic coronary illness are at deep rooted hazard for the advancement of arrhythmias. The point of this investigation is to assess the rate and kinds of early postoperative arrhythmias after pediatric cardiovascular medical procedure. Strategies: The current investigation included 227 pediatric patients with intrinsic heart maladies made arrangements for careful repair. All patients will be exposed to Demographic information, Complete cardiovascular conclusion, Preoperative treatment, Operative system, Post-usable boundaries (electrolyte levels, oxygen immersion, blood pH, serum calcium, sodium, and potassium levels), and Electrocardiogram (ECG), Echocardiography (ECHO). Results: there was slight female power in which female patients represented 52.9% of the complete accomplice, yet rate of arrhythmia was higher in male patients. the examination between the arrhythmic and non-arrhythmic gathering of patients uncovered a measurably critical distinction as respect of sexual orientation, with higher danger of arrhythmia in male patients. There was a marginal relationship between more youthful age at activity and arrhythmia too ($p = 0.055$). In like manner, the examination between the arrhythmic and non-arrhythmic gathering of patients uncovered a measurably critical distinction as respect of BSA, with lower BSA in arrhythmia gathering. End: Lower age, male sexual orientation, lower body weight, longer ACC time, longer mechanical ventilation, longer ICU remain, electrolyte irregularities, and biventricular physiology all are hazard factors for postoperative arrhythmias. Thus, specialists must consider these components preoperatively to have the option to recognize in danger populace and plan the postoperative consideration as needs be.

Keywords: Postoperative, Arrhythmias, Paediatric, Cardiac, Surgery.

1. Introduction

Inborn coronary illness (CHD) is the commonest birth deformity around the world, influencing a large number of infants consistently. CHD is normally characterized as a basic anomaly of the heart as well as extraordinary vessels that is available upon entering the world. Albeit around 20% of CHD rate can be credited to hereditary conditions, teratogen introduction or maternal diabetes, there stays considerable vulnerability with respect to chance variables for the staying 80% of cases. Surely, the birth predominance of CHD over the world isn't yet precisely settled, conceivably clouding contrasts in natural or potentially hereditary danger factors for CHD between districts that might have general wellbeing consequences [1]. The announced occurrence of intrinsic cardiovascular deformities differs between 0.47 to 1.17% of live births, yet 0.6% to 0.8% of live births is viewed as commonplace. Intrinsic heart absconds are more normal than notable inborn peculiarities, for example, inherent pyloric stenosis, congenital fissure, Down condition and innate separation of the hip [1]. The careful reason for all intrinsic cardiovascular imperfections isn't known. Most of the deformities can be clarified by multifactorial legacy speculation which expresses that an inclined baby, when presented to a given ecological trigger to which the embryo is touchy during the basic time of heart morphogenesis will build up the infection. This hereditary and natural connection is well on the way to be pathogenetic component of intrinsic heart deserts. Counts dependent on this speculation foresee the recurrence of event of the malady in first degree family members to be square base of its recurrence in the populace; this fits the

innate coronary illness figures [2]. Pediatric arrhythmias represent around 55.1 per 100,000 patients assessed in pediatric crisis offices. Sinus tachycardia is by a wide margin the most regularly announced arrhythmia, trailed by supraventricular tachycardia (SVT) which speaks to about 13%, and bradycardia representing about 6% of all cases [3]. Postoperative arrhythmias are normal and haPP.en in 7.5% up to 48% of postoperative pediatric heart patients. [4] They may haPP.en intraoperatively because of direct injury or control to the heart conduction framework or during the early postoperative period because of nearby tissue edema and irritation in the myocardium contiguous conduction framework. Extra contributing components are arrhythmogenic impacts of medications utilized generally during postoperative consideration and electrolyte unsettling influences experienced after cardiovascular medical procedure [5]. Tachyarrhythmia is generally experienced after pediatric heart medical procedure. By and large, it tends to be grouped by their source into restricted QRS complex (≤ 0.09 s) or wide QRS complex tachycardia (> 0.09 s) [6]. In specific, junctional ecto-pic tachycardia (JET) stays an infamous arrhythmia that draws out emergency unit remain and a few times prompts mortality. A few reports have taken a gander at the occurrence, hazard variables, and the executives of these arrhythmias. Nonetheless, the wide range of intrinsic heart ailments and shifting careful ways to deal with oversee them make unlimited oPP.ortunities for the sort and standpoint of these arrhythmias [4]. The point of this examination is to assess the occurrence and kinds of early postoperative arrhythmias after pediatric cardiovascular medical procedure.

2. Patients and methods

This investigation was carried on 100 patient from postoperative cardiovascular pediatric Intensive Care Unit (PICU) Bahtem Insurance Hospital and other private PICUs during a period from October 2018 to April 2019. Endorsement of the investigation convention by the Ethical Scientific Committee of Benha University will be gotten, with an educated clinical assent will be acquired from all guardians of included patients.

2.1 Inclusion criteria

Patients with congenital heart disease below the age of 18 years under going cardiac surgery.

2.2 Exclusion Criteria

Patients operated on without Cardiopulmonary bypass (CPB) and those having arrhythmias preoperatively .

2.3 All patients will be subjected to the following

- Demographic data
- Complete cardiac diagnosis
- Preoperative treatment
- Operative procedure
- Intraoperative parameters (CPB time, aortic crossclamp time, total surgery time)
- Post-operative parameters (electrolyte levels,

oxygen saturation, blood pH, serum calcium, sodium, and potassium levels, and doses of inotropic agents required).

- Electrocardiogram (ECG), Echocardiography (ECHO).

2.4 Statistical analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corporation). Comparisons of variables between clinically infected and normal contralateral sides were performed using the t test. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Qualitative data were described using number and percent. The Shapiro-Wilk test was used to verify the normality of distribution for non-parametric ones. The accepted level of significance in this work was stated at 0.05 (Probability value [P-value] <0.05 was considered significant).

3. Results

There was slight female predominance in which female patients accounted for 52.9% of the total cohort, but incidence of arrhythmia was higher in male patients . The median age of the patients was 20.0 (8.0-32.0) months Table (1).

Table (1) Incidence of arrhythmia in relation to gender and age.

Outcome	Arrhythmia (no = 47)	No Arrhythmia (no = 180)	Statistical test	P value
Gender No (%)				
Male	29(61.7)	78(43.3)	X ² = 5.05	0.025*
Female	18(38.3)	102(56.7)		
Age Median (IQR)	14(5-24)	22.0(8.0-32.0)	MW= 1.35	0.18
<1M	2(4.3)	18(10.0)		
1M-	20(42.6)	42(23.3)	FET= 8.75	0.055
1Y-	19(40.4)	102(56.7)		
6Y-	5(10.6)	12(6.7)		
≥12Y	1(2.1)	6(3.3)		

In the present study, we found that the incidence of post-surgical repair arrhythmia was 20.7% among children with CHD. The most common types of arrhythmia were arteriovenous block (38.3%), junctional ectopic tachycardia (34%), and premature ventricular contractions (12.8%).

With regard to management of patients included in our cohort, 57.5% of the patients required temporary pacemakers and nearly 10% required permanent pacemakers. Amiodarone was administrated in 34% of the patients and 21.3% had electrolyte replacement. DC was needed in 3.4% of the patients.

In the present study, the comparison between the arrhythmic and non-arrhythmic group of patients revealed a statistically significant difference as regard of gender, with higher risk of arrhythmia in male patients. There was a borderline association between

younger age at operation and arrhythmia as well (p =0.055).

In the present study, the comparison between the arrhythmic and non-arrhythmic group of patients revealed a statistically significant difference as regard of BSA, with lower BSA in arrhythmia group Fig (1).

In this report, the comparison between the arrhythmic and non-arrhythmic group of patients revealed no statistically significant difference as regard of CPB. On the contrary, there was statistically significant difference as regard of aorta cross-clamp (ACC) time. The association between higher occurrence rate of arrhythmias and longer ACC time might just reflect increasing complexity of the surgery Fig (2).

In our report, there was statistically significant difference between the arrhythmic and non-arrhythmic

group as regard of postoperative serum potassium and magnesium levels, being lower in arrhythmic patients. There was statistically significant difference between

the arrhythmic and non-arrhythmic group as regard of ventricular physiology, with higher risk of arrhythmic in patients with double ventricular physiology.

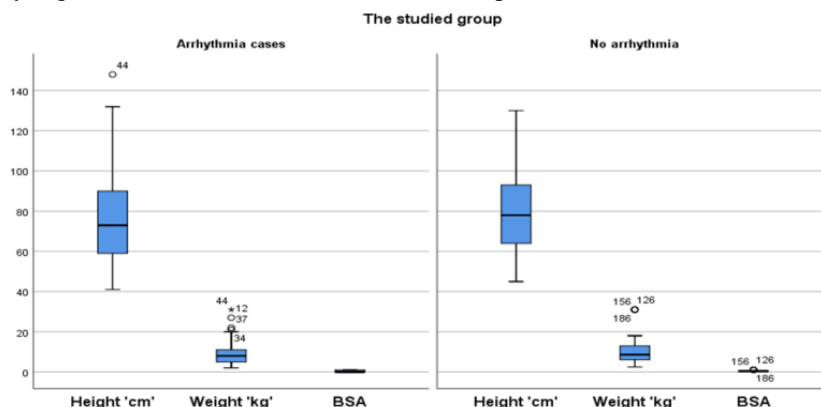


Fig (1) Incidence of arrhythmia in relation to anthropometric measurements.

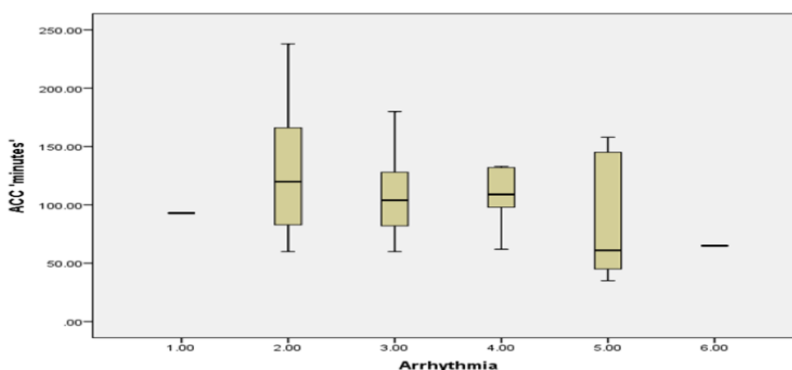


Fig (2) Relation between incidence of specific types of arrhythmia and ACC

Table (2) Incidence of arrhythmia and its relation to electrolytes , temperature and type of repair.

Outcome	Arrhythmia (47)	No (180)	Statistical test	P value
HCO3	24.0(22.0-26.0)	24.5(23.0-25.0)	MW=0.33	0.74
Median (IQR)				
Lactate level	2.0(1.0-2.0)	2.0(1.3-2.3)	MW=0.71	0.48
Median (IQR)				
K	3.0(3.0-3.94)	3.5(3.4-3.7)	MW=2.95	0.003**
Median (IQR)				
Mg	2.0(2.0-2.0)	2.0(1.8-2.0)	MW=3.98	<0.001**
Median (IQR)				
Temp	36.0(35.0-36.0)	36.0(35.5-36.5)	MW=1.26	0.21
Median (IQR)				
Ventricle physiology				
Single	3(6.4)	0(0.0)	FET= 7.26	0.008**
Double	44(93.6)	180(100)		

4. Discussion

In the current examination, there was slight female power in which female patients represented 52.9% of the absolute associate, however rate of arrhythmia was higher in male patients . The middle age of the patients was 20.0 (8.0-32.0) months . In accordance with our

discoveries, Diogenes et al., [7] played out a meta-examination of CHD pervasiveness, isolated by sex. Three web indexes were utilized, and 578 articles were evaluated. Twelve articles were incorporated. Quantitative examination indicated a higher predominance of CHD, especially atrioventricular

septal deformities (AVSD), in female patients. On the opposite, Atwa et al., [8] assessed the impact of sex on the result of CHDs in kids. 312 patients with CHDs matured under 12 years were remembered for this examination. Most of patients were guys. In the current investigation, we found that the rate of post-operative arrhythmia was 20.7% among youngsters with CHD. The most widely recognized kinds of arrhythmia were arteriovenous square (38.3%), junctional ectopic tachycardia (34%), and untimely ventricular compressions (12.8%).

Pathophysiologic reasons for early postoperative arrhythmias are different, including direct careful wounds like myocardial cut, consequences of cannulation, stitches near the conduction framework, and intense changes of the intracardiac pressure brought about by volume and weight over-burden [9]. In accordance with our discoveries, Rekawek et al., [10] tentatively examined in 402 back to back patients matured 1 day to 18 years (mean 29.5 months) who went through activity among January and December 2005 for CHD. Arrhythmias happened in 57 of 402 patients (14.2%). Notwithstanding, the circulation of arrhythmia types was unique in relation to our investigation; the most well-known sorts of arrhythmia were junctional ectopic tachycardia (21), supraventricular tachycardia (15), and arteriovenous square (6). Moreover, Delaney et al., [11] meant to decide the occurrence and danger factors related with the improvement of arrhythmias following medical procedure in a pediatric populace. Information were gathered in a forthcoming observational arrangement from pediatric patients going through cardiovascular medical procedure between September 2000 and May 2003. Arrhythmias happened in 28 of the 189 patients selected (15%) incorporating 16 with junctional ectopic tachycardia, 7 with complete atrioventricular square, 4 with ventricular tachycardia, and 1 with re-participant supraventricular tachycardia. Pfammatter et al., [12] surveyed the event, clinical course, need of treatment, and result of early postoperative cardiovascular arrhythmias after open-heart medical procedure in a forthcoming report. 310 successive pediatric patients going through cardiovascular medical procedure on cardiopulmonary detour were read for the event of heart arrhythmias during the entire perioperative clinic remain. Of 310 patients examined, 83 (27%) had postoperative arrhythmias. In any case, it ought to be noticed that different reports exhibited sequential occurrence of post-operative arrhythmia than our outcomes. For instance, [4] directed an imminent report proposed to decide the occurrence, hazard components, and the board conventions for early postoperative arrhythmias after pediatric cardiovascular medical procedure. Of 220 successive pediatric patients going through heart medical procedure from September 2013 to July 2014, 15 (7.5%) patients created arrhythmia, the most widely recognized was junctional ectopic tachycardia (n = 7, 46.6%) trailed by supraventricular tachycardia (n = 5, 33.3%). Yildirim et al., [13] included 580 youngsters in

the pediatric cardiovascular emergency unit had gone through heart medical procedure between May 2001 and December 2002. 51 of the patients (8.8%, mean age 1.7+/- 2.3 years) created arrhythmias. 21 (41.1%) had supraventricular tachycardia, 12 (23.5%) had junctional ectopic tachycardia, 10 (19.6%) had total atrioventricular square, 3 (5.8%) had ventricular arrhythmias, and 5 (9.8%) had atrial fibrillation and atrioventricular separation. Jain et al., [14] expected to contemplate the frequency of postoperative cardiovascular arrhythmias in kids going through heart medical procedure and to assess the danger variables and result of these patients. This review observational examination was directed in the cardiovascular emergency unit included kids <18 years old. 500 and 36 youngsters were incorporated, and the pervasiveness of arrhythmia was 14.4% (n = 77). The most well-known arrhythmia was finished heart block (n = 28; 5.2%), trailed by junctional ectopic tachycardia (JET) (n = 25; 4.7%), junctional get away from cadence (n = 13; 2.4%), supraventricular tachycardia (SVT) (n = 8; 1.5%), and ventricular tachycardia (VT) (n = 3; 0.6%). While Abdel Gawad et al., [15] played out a cross-sectional examination included 30 postoperative patients, with age extend four as long as 144 months. They were chosen from those admitted to the Cardiology Unit in the Pediatric branch of Ain Shams University clinics, in the wake of going through CPB medical procedure for rectification of intrinsic heart abandons. Arrhythmia was archived in 15 out of 30 patients (half). Grosse-Wortmann et al., [16] detailed pinnacle commonness of arrhythmias 79.1%, which was higher than all other announced investigations. Once more, the specific reason for such contrast might be ascribed to various epidemiological attributes, diverse example sizes, and varieties in the definition and conclusion of postoperative arrhythmia. Another clarification of this distinction might be the utilization of Holter observing, which may mirror a more delicate technique for recognition, particularly of extrasystoles, rather than bedside checking. Concerning the board calculation of patients remembered for our associate, 57.5% of the patients required transitory pacemakers and almost 10% required perpetual pacemakers. Amiodarone was administrated in 34% of the patients and 21.3% had electrolyte substitution. DC was required in 3.4% of the patients. In accordance with these discoveries, Chaiyarak et al., [17] planned to decide the frequency, hazard variables and result of early postoperative arrhythmias in pediatric patients with innate coronary illness. An aggregate of 191 pediatric patients went through cardiovascular medical procedure. 45 cases (23.5%) grew early post-employable cardiovascular arrhythmias for example junctional ectopic tachycardia 18 cases (40%), heart block 7 cases (15.6%), supraventricular tachycardia 2 cases (4.4%). 39 cases were treated with meds, 7 cases with transitory pacing, and 1 case with electrical cardioversion. Pfammatter et al., [12] reported that, of the 83 youngsters with arrhythmias, 53 (64%) required

explicit antiarrhythmic treatment. The utilization of antiarrhythmic drugs was required in just 7 of these patients. Just a single patient (1.2% of patients with arrhythmias) kicked the bucket from arrhythmia. Jain et al., [14] reported that cardiovascular pacing was required in all CHB; 8 (28.6%) required a perpetual pacemaker. Six (24%) patients with JET reacted to customary measures; 19 (76.0%) patients required amiodarone and 5 (20%) expected cooling to 34°C or cardiovascular pacing. Brief cardiovascular pacing was required in 9 (69.2%) instances of junctional get away from mood. Seven (87.5%) occasions of SVT reacted to adenosine and 1 (12.5%) required cardioversion. Two (66.7%) of VT reacted to cardioversion while 1 (33.3%) was stubborn. In the current investigation, the correlation between the arrhythmic and non-arrhythmic gathering of patients uncovered a measurably critical contrast as respect of sexual orientation, with higher danger of arrhythmia in male patients. There was a marginal relationship between more youthful age at activity and arrhythmia also ($p = 0.055$). In accordance with our discoveries, Yildirim et al., [13] announced that there were patterns towards higher rate of post-fix arrhythmia in male and more youthful patients. Similarly, Delaney et al., [11] reported a measurably huge contrast between the mean qualities for the arrhythmic and non-arrhythmic gatherings about age at activity. Essentially, Abdel Gawad et al., [15] appeared, with respect to the examination between the arrhythmic and non-arrhythmic gathering of patients, a measurably critical distinction as respect age at activity. Jain et al., [14] reported a measurably critical contrast between the mean qualities for the arrhythmic and non-arrhythmic gatherings about age at activity. In the current examination, the correlation between the arrhythmic and non-arrhythmic gathering of patients uncovered a factually noteworthy distinction as respect of BSA, with lower BSA in arrhythmia gathering. So also, Abdel Gawad et al., [15] appeared, in regards to the examination between the arrhythmic and non-arrhythmic gathering of patients, a measurably critical distinction as respect weight, with lower weight in arrhythmia patients.

5. Conclusion

Early postoperative arrhythmias following medical procedure for intrinsic coronary illness are moderately incessant in kids: half. Junctional ectopic tachycardia and inborn heart block were basic kinds of arrhythmias. Lower age, male sexual orientation, lower body weight, longer ACC time, longer mechanical ventilation, longer ICU remain, electrolyte irregularities, and biventricular physiology all are hazard factors for postoperative arrhythmias. Consequently, specialists must consider these elements preoperatively to have the option to recognize in danger populace and plan the postoperative consideration as needs be. Further examinations with thorough plan, enormous example size and multiregional collaboration are required.

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