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Perioperative Predictors of Conducting System Disorder after Open Heart Surgery that may Indicate for Permanent Pacemaker Implantation

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Abstract

Background: Cardiac conduction abnormalities have been observed following heart surgery. Although transient bradyarrhythmias resolve within a few days of surgery, persistent conduction disturbances necessitating permanent pacemaker implantation (PPI) occur in a significant number of patients undergoing traditional heart surgery.

Aim of Study: To investigate perioperative predictors of conducting system disorder after open heart surgery, indications and prevalence for permanent pacemaker implantation after open heart surgery.

Patients and Methods: The present retrospective study was conducted on 134 adult patients who underwent various surgeries (open-heart surgery; all CABG operations, CABG and valve operations, valve only operations and other operations including modified Bentall's procedure, excision of atrial myxomas, personalized external aortic root. All redo and emergency operations at Ain Shams University Hospital, Cardiothoracic Surgery Department (cardiothoracic Academy) during 6 months While patients with congenital heart disease (or post congenital heart surgery), patients who already had a PPM or implantable cardioverter defibrillator (ICD) and patients with an indication for PPM were excluded from the study.

Results: We found that 30 patients (22%) had arrhythmia (off bypass rhythm), these arrhythmias were LBBB in one patient (1%), RBBB in 4 patients (5%), AF in 14 patients (10%) and complete heart block with external transient pacemaker inserted in 11 patients (8%). While with extended ICU follow up (Morbidity) we found that PPM in our study were all post valve replacement, 4 patients with a PPM implanted postoperatively underwent aortic valve replacement either as a stand-alone procedure or in conjunction with other cardiac surgical procedures for pathology like HOCM, Aortic root abscess, Aortic ANNURYSIM and sever calcific aortic stenoses. That may be related to the extra surgery itself or the time consumed to do so in the AVR surgeries, two of them were mitral valve replacement both with Sorin metallic valve and one patient after discharge from hospital through regular follow-up with no mortality.

Conclusion: With close monitoring during an extended ICU stay, patients with complete heart block were paced with an external transient pacemaker in 8% of cases. The incidence of severe postoperative bradyarrhythmia requiring permanent pacemaker insertion was found to be 5% and varies by type of surgery, with valve replacement being the most common due to conduction system trauma.

Key Words: *Perioperative predictors – Conducting system disorder – Open heart surgery – Permanent pacemaker implantation.*

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Introduction

POST-OPERATIVE conduction disorders are a major source of morbidity and mortality after cardiac surgery. The incidence of severe postoperative bradyarrhythmia after cardiac surgery requiring permanent pacing varies with type of surgery and ranges between 0.8% to 24% **[1]**.

Although the prevalence and predictors for postoperative permanent pacemaker (PPM) implantation following cardiac surgery have been well described **[2]**, little is known about long term pacing requirements in this population. A proportion of patients receiving permanent pacemakers for postoperative bradyarrhythmia have been observed to spontaneously recover native conduction, obviating the continued need for pacing **[3,4,5]**.

Despite this observation, the optimal timing for PPM implantation in the postoperative setting has not been clearly defined, due in part to a poor understanding of the natural history of postoperative conduction disturbances. Optimizing timing and patient selection for insertion of PPM in the postoperative setting might lead to fewer inappropriate device implantations in patients without the need for long-term pacing, thereby reducing the risk of adverse events and substantial financial burden associated with a PPM **[6]**.

Aim of the work was to investigate perioperative predictors of conducting system disorder after open heart surgery, indications and prevalence for permanent pacemaker implantation after open heart surgery.

Patients and Methods

This retrospective cohort study was carried out on 134 adult patients at Ain Shams University Hospital, Cardiothoracic Surgery Department (cardiothoracic Academy) for 6 months from January till June 2021 and follow-up for another 6 months from July till December 2021.

The study included adult patients who underwent open-heart surgery; all CABG operations, CABG and valve operations, valve only operations and other operations including modified Bentall's procedure, excision of atrial myxomas, personalized external aortic root. All redo and emergency operations) and their demographic, clinical, preoperative, operative, and early postoperative data were obtained from the cardiac surgery database at Ain Shams University Hospital, Cardiothoracic Surgery Department (cardiothoracic Academy).

While patients with congenital heart disease (or post congenital heart surgery), patients who already had a PPM or implantable cardioverter defibrillator (ICD) and patients with an indication for PPM were excluded from the study.

Ethical considerations:

The study was performed after ethical committee approval.

Study procedures:

Data collection was done retrospectively of 134 patients who underwent open heart surgery with conduction disorders which were identified by reviewing the patients' electrocardiograms at baseline, postoperatively, before hospital discharge and at follow-up for 6 months. All tracings were analysed to record the presence of first-, second or third-degree AV block, right bundle branch block (RBBB), left bundle branch block (LBBB), and arrhythmias.

Surgical technique:

All operations were performed under standard cardiopulmonary bypass with a perfusion rate of 2.2 to 2.4L/min/m^2 and a mean arterial pressure of 70 to 75mmHg. A systemic hypothermia of 28 to 30°C and haematocrit level of 20 to 26% was provided during perfusion. Myocardial protection was provided by antegrade hyperkalemic cardioplegia through aortic root.

Postoperative follow-up:

Patients were followed in the intensive care unit with electrocardiographic, central venous pressure, and arterial monitorization. Temporary epicardial pacemaker support was provided for all patients with rhythm problems developed during weaning from cardiopulmonary bypass. Postoperative indication for PPI was the development of complete AV block after the operation and its persistence more than 10 days.

Results

We retrospectively studied 134 patients, the mean age for the entire group was (50 ± 12) years, with a range of 19 to 73 years. Mean ages for the PPI and non paced groups were (40 ± 12) years and (50 ± 12) years, respectively (p 0.056). The male/female ratio was 93:40 (2.2:1). Although a slight female (relative) predominance (1:1) was seen in the PPI group, it was not significantly different from the gender ratio of patients who were not paced. To sum up, there were no significant differences in gender, hypertension, diabetes mellitus, BMI between the two groups.

Preoperative predictors:

We found no relation between preoperative medications (e.g., beta-blockers, calcium channel blockers, digoxin, and anti-arrhythmic medications) and the requirement of PPM in our patients.

In our study the most frequent preoperative rhythm disturbances were chronic or intermittent AF in 22 patients (17%), left bundle branch block in 4 (3%), right bundle branch block in 3 (2.2%), and Asymptomatic sinus brady in 3 (2.2%).

Operative predictors:

We found that of all valve surgeries in general, combined Aortic valve with supra coronary conduit or other surgeries had a higher risk of requiring PPM, but with multivariate analysis, these did not emerge as independent risk factors.

In our CABG was performed in 57 (43%) cases, aortic valve replacement in 23 (17%), mitral valve replacement in 31(23%), and CABG with Valve in 5 (4%). Other operations like BENTALL, SAM (8%).

PPM in our study were all post valve replacement, 4 patients with a PPM implanted postoperatively underwent aortic valve replacement either as a stand-alone procedure or in conjunction with other cardiac surgical procedures for pathology like HOCM (myomectomy done + AVR with 23”

SJ), Aortic root abscess (excision was done + AVR with 23" Sorin), Aortic ANNURYSIM (supracoronary conduit was done + AVR with 21 "SJ) and sever calcific aortic stenoses (decalcification + AVR with 21" SJ). That may be related to the extra surgery itself or the time consumed to do so in the AVR surgeries.

Two of them were Mitral valve replacement (one Emergency Redo MVR for stuck valve, the other one was elective MVR) both with Sorin metallic valve (29"-27" respectively).

In our study the mean of bypass time is (1 10 ±41) and cross clamp time is (70 ±31) in all patients, while the mean for bypass time in PPM is (97 ±40), and cross clamp time is (64 ±25) (*p*-value 0.56, 0.74 respectively).

Prolonged cardiopulmonary bypass time and cross-clamp time have been found in this study NOT associated with postoperative PPM requirement

As for post operative (off bypass rhythm) it was found to be very significant (*p*-value 0.05).

Out of 134 patients in this study, there were 102 patient (76%) get off bypass with Normal sinus rhythm (*some of them after DC and/or Anti-Arrhythmogenic drugs like cordarone).

30 patients (22%) had arrhythmia (off bypass rhythm) not responding to medications, these arrhthmia were: LBBB one patient (1%), RBBB 4 patients (5%), AF 14 patients (10%) and Complete heart block paced with external transient pace maker 11 patients (8%) with close monitoring during extended ICU stay.

Table (1): Significance of preoperative predictors in PPM and Non PPM.

	Total patients		PPM		Non PPM		*p*-value
Age:							
Mean	50± 12		40± 12		50± 12		0.056
Gender:							
Males	93	69%	3	2%	90	67%	0.616
Females	40	31%	3	2%	37	29%	
Smoking:							
Smoker	62	46%	2	1.40%	60	45%	0.43
Exsmoker	25	19%			25	19%	
Not smoker	46	34%	4	3%	42	31%	
HTN:							
Yes	82	62%	3	2%	79	60%	0.34
No	52	38%	3	2%	49	36%	
Diabetic:							
Diabetic	42	31%	1		41	31%	0.13
Not diab	92	69%	5	4%	87	65%	
BMI:							
<20	2	5%			2	5%	0.07
20-25	38	28%	1	1%	37	27%	
25-30	51	38%	3	2%	48	36%	
>30	43	32%	2	1.40%	41	31%	

Table (2): Significance of rate control medications in PPM and Non PPM.

	Total patients		PPM		Non PPM		*p*-value	
Preoperative medications:								
Concor	33	25%			33	25%		
Lanoxin	5	4%			5	4%		
Concor & Lanoxin	5	4%	2	1.4%	3	4%		
Cordarone	2	1.40%			2	1%		0.25
Preoperative significant ECG:								
Paroxysmal AF	2	3%			2	3%	0.11	
Asymptomatic Sinus Brady	3	3%			3	3%	0.73	
LBBB	4	3%			4	3%	0.73	
RBBB	3	3%			3	3%	0.69	
AF	20	15%	2	1.40%	18	14%	0.39	
NSR	102	75%	4	3%	98	72%	0.78	0.24

Table (3): Type of operation and off bypass rhythm in PPM and Non PPM.

	Total patients		PPM		Non PPM		*p*-value	
Procedure type:								
AVR	23	17%	4 (1 sorin, 3 SJ)	3%	19	14%	0.116	
MVR	31	23%	2SORIN	1.40%	29	22%	0.06	
AVR & MVR	7	5%			7	5%	0.85	
CABG	57	43%			57	43%	0.763	
CABG & Valve	5	4%			5	4%	0.65	
Other op (bentall, SAM)	11	8%			11	8%	0.38	0.6
CCT in mins:								
Mean	70±31		64±25		70±31			0.74
Total Bypass time in mins:								
Mean	110±41		97±40		110±41			0.56
Off bypass rhythm:								
NSR:								
Total	102	76%	1	1%	101	75%		
DC then NSR	18	13%			18	13%		
DC and cordarne then NSR	6	4.50%			6	5%	0.84	
Arrthsmia:								
LBBB	1	1%	5	4%	1	1%	0	
RBBB	4	5%			4	5%	0.84	
AF	14	10%			14	10%	0	
CHB, paced	11	8%			6	4%	0.34	0.05

Table (4): Arrhythmia during ICU in PPM and non PPM.

	Total patients		PPM		Non PPM			*p*-value
Arrhythmia during ICU:								
LBBB	8	6%			8	6%	0.17	
RBBB	14	10%			14	10%	0.16	
Rapid AF	36	27%	1	1%	35	26%	0.65	
CHB:								
- Total	10	7%	5	4%	5	3%		
- AF then CHB	5	3.50%			5	4%	0.53	
2nd degree HB	4	3%			4	3%	0.53	
SA node dysfunction	1	1%			1	1%	0.39	0.09
Ventilation in hours	15±14		13±1		15±14			0.68
ICU stay	3.8±3.6		17±8		3.8±3.6			.001

All patients that inserted PPM before hospital discharge were 5 (4%) had A CHB since getting off bypass, (but not all patients with CHB after bypass needed PPM).

Postoperative predictors:

Postoperative conduction disturbances and high-grade AV block were found to increase risk of PPM postoperatively. Most of our patients who required PPM had postoperative complete heart block (CHB).

As for post operative (ICU arrhythmias) it was found to be very not significant (*p*-value 0.09).

76 patients (56%) had arrhythmia during ICU mostly responded to electrolyte correction and, like LBBB 8 pt (6%), RBBB 14 patients (10%), AF 36 patients (27%), SA node dysfunction in 1 patient (1%), 2nd degree heart block 7 patients, (10%) and Complete heart block 10 patients (7%).

All patients that inserted PPM before hospital discharge were 5 (4%) had A CHB since getting off bypass still had it during ICU and put on Transient Pace maker by epicardial leads for follow-up but still they were in CHB and decision was made for PPM. The mean time from surgery to PPM implantation was 17±8 days.

Indications for PPM implantation were complete AV block in 5 patients (4%), slow AF in 1 (1%). There were no early complications related to PPM implantation in the studied population.

Mean Ventilation hours in ICU for all patients were (15±14), in PPM patients (13±1) with a p-value (0.68) non-significant.

Mean for ICU stay were 3.8±3.6 days, and in PPM were 17±8 in days which was found to be a significant with p-value (0.009) as any patient with complete heart block stay at least 3 weeks for the transient causes to be resolved before PPM implantation.

Additionally, implantation of the pacemaker early after cardiac surgery is recommended for conduction system disorders which are unlikely to recover. Placing epicardial PPM leads in identified at-risk patients during the surgery, especially with valve intervention, may also be helpful, which already been done at our center.

As for post discharge follow-up, just one case reported for PPM after hospital discharge, readmitted with moderate to severe pericardial effusion with arrhythmia mostly slow AF, CHB.

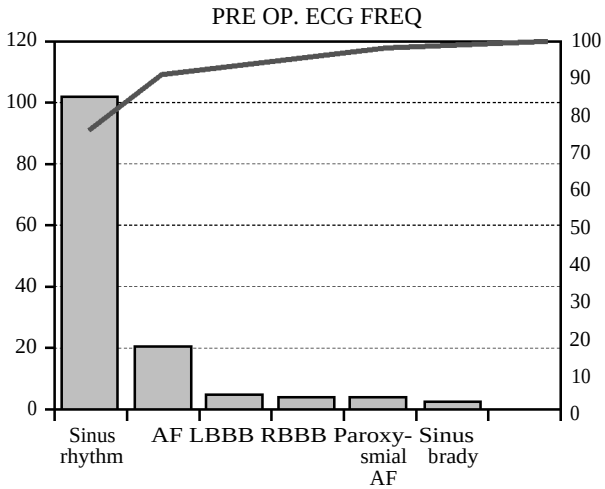
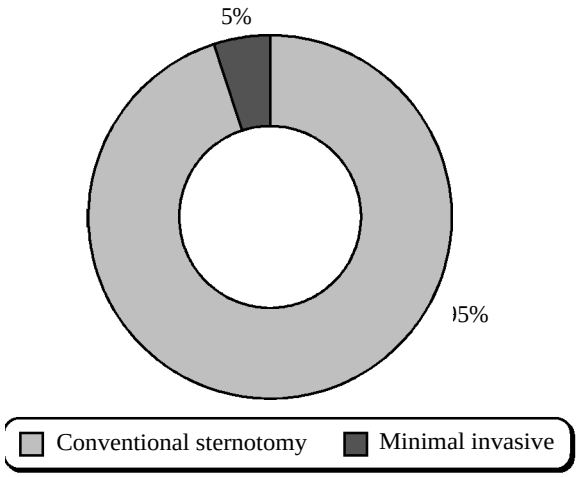


Fig. (1): Frequency of pre-operative Rhythm.



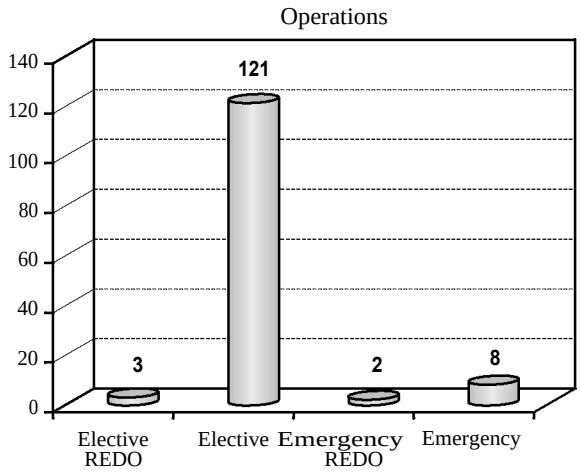
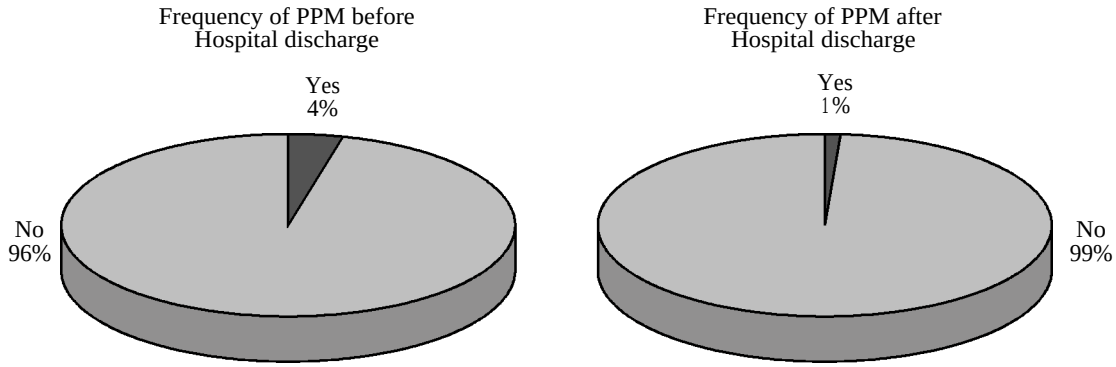


Fig. (2): Percentage of conventional vs minimal invasive.



Fg. (3): Frequency of PPM before and after hospital discharge.

Discussion

Post-operative conduction disorders are a major source of morbidity and mortality after cardiac surgery. The incidence of severe postoperative bradyarrhythmia after cardiac surgery requiring permanent pacing varies with type of surgery and ranges between 0.8% to 24% [1].

One study found that; age is a significant risk factor; the elderly population is significantly in need of PPM after cardiac surgery with mean ages of 66-70 years in patients with PPM vs. 60.2-67.9 years in patients without PPM. The female sex (p=0.01) is another preoperative risk factor that increases the chances of PPM [7].

In our study, there was no difference in gender between the PPM and the non-PPM groups, unlike some previous studies which showed female gender as a predictor for PPM implantation (p 0.616). Most likely as the mean age for the entire group was (50±12) years. (unlike other studies).

Also, in another study by Al-Ghamdi et al., there was no difference in gender between the PPM and the non-PPM groups, unlike some previous studies which showed female gender as a predictor for PPM implantation. Age above 75 years at the time of surgery was reported previously as a risk factor for requiring a PPM, but this was not the case in our patients [8].

In their Univariate analysis of demographic variables and preoperative comorbidities of patients Kho et al., that found female gender, RHD and pulmonary hypertension are considered significant risk factors for postoperative PPM dependency. While RHD is a well-recognized cause for arrhythmias, to our knowledge, this is the first study to find an association between RHD and an increased need for PPM post-cardiac surgery [9].

The use of rate lowering cardiac medications (e.g., beta-blockers, calcium channel blockers, digoxin, and anti-arrhythmic medications) is one of the suggested mechanisms contributing to conduction system damage postoperatively. Some studies showed that preoperative use of antiarrhythmic medications, like digoxin, calcium channel blockers, and amiodarone, increased the risk for PPM postoperatively, but we found no relation between preoperative medications and the requirement of PPM in our patients. Also Preoperative non-sinus rhythm or AF were found to be risk factors in some previous studies but not in our study.

In a study by Al-Ghamdi et al., the presence of conduction system disease preoperatively, right bundle branch block (RBBB) or LBBB, LBBB alone, RBBB alone, first-degree AV block or left anterior fascicular block (LAFB) was found to be a predictor for requiring PPM postoperatively. In our patients, LBBB was found to be a significant predictor. Preoperative non-sinus rhythm or AF were risk factors in some previous studies but not in our series [8].

A previous study by Merin et al. found that;The presence of preoperative rhythm and conduction abnormalities such as left bundle branch block (LBBB), bifascicular blocks, and first and second-degree heart block is associated with increased risk of PPM postoperatively (25%, p<0.0001; 4%, p=0.017; 15%, p=0.005; 1%, p=0.08, respectively). AV block in the postoperative period is associated with numerous preoperative factors including, but not limited to, being 60 years old and older, female sex, chronic kidney disease, having atrial fibrillation, and perioperative acute myocardial infarction; all of these may indirectly increase the risk for pacemaker implantation through severe AV block onset [10].

The percentage of PPM postoperatively is more common in valve surgeries especially aortic, mitral and tricuspid valve surgeries mostly due to Mechanical trauma to the conduction system. PPM in our study were all post valve replacement, 4 patients with a PPM implanted postoperatively underwent aortic valve replacement either as a stand-alone procedure or in conjunction with other cardiac surgical That may be related to the extra surgery itself or the time consumed to do so in the AVR surgeries. Two of them were Mitral valve replacement.

Al-Ghamdi and colleagues found that mechanical trauma to the conduction system arising secondary to valve operation, or other surgeries close to the AV node, is another risk factor for AV node conduction disorder. The need for PPM postoperatively is more common in valve surgeries especially aortic, mitral and tricuspid valve surgeries. We found that of all valve surgeries in general, mitral valve and tricuspid valve surgeries had a higher risk of requiring PPM, but with multivariate analysis, these did not emerge as independent risk factors [8].

Also, Kho et al. found that the requirement for PPM insertion is more frequent after valve surgery than most other cardiac procedures. This may be due to the close proximity of the valves to the

conduction system of the heart. Our study found the incidence of PPM implantation after any MV- and TV-related procedures to be higher than other valvular interventions. When the mitral and tricuspid valves are operated on simultaneously, the risk of PPM implantation significantly increases. The septal cusp of the tricuspid valve forms one of the borders of the triangle of Koch, which contains the atrioventricular node and its penetrating bundle. As the bundle passes through the apex of the triangle directly into the left ventricular outflow tract, it has close anatomical relations to the tricuspid and mitral valves, placing it at risk during valve surgery [9].

A previous study by Harky et al., showed that presence of aortic valve diseases, stenosis, or regurgitation has been reported to be a significant contributing factor in increasing the rate of PPM postoperatively; this is particularly relevant when there is aortic annular calcification ($p<0.001$). The risk of permanent pacing varies with the type of surgery performed; Merin et al., found aortic valve replacement (AVR) surgery ($p<0.0001$) to be an independent risk factor that led to more people needing PPM than CABG, TV repair, and mitral valve replacement (MVR) [7].

Jouan et al., [11] found that 14.5% of patients who underwent isolated mitral valve surgery developed high-grade cardiac conduction disorders lasting longer than 3 days postoperatively. When concomitant tricuspid valve ring annuloplasty was carried out, the occurrence increased to 41.2%. While their study did not evaluate the PPM implantation rates post-surgery, another study quoted a PPM implantation rate post-tricuspid valve procedure of 21 % Our PPM rate post-isolated AVR of 1.03% was found to be relatively lower than that reported in other studies. The aortic valve is the most common valve to be operated on due to its predisposition to developing calcification with ageing. The calcification of the valve leaflets and its surrounding annulus affects the nearby atrioventricular node and bundle of His. Surgical manipulation during AVR operations can lead to further mechanical trauma to the conduction system, generating new conduction defects or exacerbating pre-existing ones [9].

Prolonged cardiopulmonary bypass time and cross-clamp time have been found in this study, unlike in previous studies, NOT associated with postoperative PPM requirement. As for post operative (off bypass rhythm) it was found to be significant (p-value 0.05).

Al-Ghamdi revealed found that prolonged cardiopulmonary bypass time and cross-clamp time have been found in this study as well as in previous studies to be associated with postoperative PPM requirement. Cold blood cardioplegia was also found to be a risk factor in previous studies, but not in our current study. About 35% of PPM patients in this study were undergoing redo surgery. Reoperation was found in this study to be a significant risk as it was in previous studies [8].

All patients that inserted PPM before hospital discharge were 5 (4%) had A CHB since getting off bypass, (but not all patients with CHB after bypass needed PPM). So, we found that Postoperative conduction disturbances and high-grade AV block were found to increase risk of PPM postoperatively. Most of our patients who required PPM had postoperative complete heart block (CHB).

Harky et al., revealed that postoperative complete heart block was common, occurring in 18 patients (18%). In the majority of cases this was a transient phenomenon. Six patients (6%) required PPM before discharge, and a further 3 patients (3%) required late PPM (median follow-up, 4.2 years; time of late PPM not specified). The investigators were unable to demonstrate any predictive clinical or operative variables for the early development of postoperative complete AV block [7].

As for post operative (ICU arrhythmias) it was found to be very not significant (p-value 0.09). 76 patients (56%) had arrhythmia during ICU mostly responded to electrolyte correction and, like LBBB 8 patients (6%), RBBB 14 patients (10%), AF 36 patients (27%), SA node dysfunction in 1 patient (1%), 2nd degree heart block 7 patients, (10%) and Complete heart block 10 patients (7%).

One study found that; postoperative conduction disturbances occurred in 192 patients, symptomatic sinus bradycardia in 30 patients (8%), atrial fibrillation with slow ventricular response (AF) in 17 patients (4.5%), first-degree atrioventricular block (AVB) in 24 patients (6.4%), second degree AVB in 1 patient (0.3%), third-degree AVB in 26 patients (7%), new RBBB in 86 patients (23%), and new LBBB in 8 patients (2.1%) [12].

All patients that inserted PPM before hospital discharge were 5 (4%) had A CHB since getting off bypass still had it during ICU and put on Transient Pace maker by epicardial leads for follow-up but still they were in CHB and decision was made for PPM. The mean time from surgery to PPM implantation was 17 ± 8 days.

Mean ventilation hours in ICU for all patients were (15 ± 14), in PPM patients (13 ± 1) with a *p*-value 0.68) non-significant. Mean for ICU stay were 3.8±3.6 days, and in PPM were 17 ±8 in days which was found to be a significant with p value (0.009) as any patient with complete heart block stay at least 3 weeks for the transient causes to be resolved before PPM implantation.

Al-Ghamdi et al., found that the timing of pacemaker implantation ranged from 7 to 73 days after surgery, with a mean of 17.65 ± 14 and median of 13.5 days. The delay in implantation in two patients was due to prolonged stay in the intensive care unit (ICU) and active infection **[8]**.

Additionally, implantation of the pacemaker early after cardiac surgery is recommended for conduction system disorders which are unlikely to recover. Placing epicardial PPM leads in identified at-risk patients during the surgery, especially with valve intervention, may also be helpful, which already been done at our center.

One study found that two patients were discharged with junctional rhythm because they did not initially accept PPM implantation. Later on, when they presented for follow-up with no improvement in their rhythm, these patients did undergo PPM implantation **[8]**.

As for post discharge follow-up, Just one case reported for PPM after hospital discharge, readmitted with moderate to severe pericardial effusion with arrhythmia mostly slow AF, CHB.

Conclusion:

Post-operative conduction system disorders are a major source of morbidity and mortality after cardiac surgery. In our study patients with complete heart block paced with external transient pace maker was 8% with close monitoring during extended ICU stay we found that the incidence of severe postoperative bradyarrhythmia after cardiac surgery requiring permanent pace maker insertion is 5% and varies with type of surgery, more common with valve replacement mostly due to trauma to the conduction system. So we recommend preoperative assessment for risk of requiring PPM postoperatively to counsel patients about this risk and early PPM implantation in high-risk patients who are dependent on temporary pacemaker after surgery.

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العوامل التى تؤدى إلى إضطراب الضفيرة الكهربية للقلب بعد عمليات القلب المفتوح مما قد يحتاج إلى تركيب منظم دائم لضربات القلب

الخلفية : لوحظ وجود تشوهات فى التوصيل القلبى بعد جراحة القلب. على الرغم من أن اضطراب النظم البطئ العابر يحل نفسه فى الأيام الأولى بعد الجراحة، إلا أن اضطرابات التوصيل المستمرة التى تتطلب زرع منظم ضربات القلب الدائم تحدث فى عدد كبير من المرضى الذين يخضعون لجراحة القلب التقليدية.

الهدف من الدراسة : التحقيق فى المؤشرات المحيطة بالجراحة لاضطراب الجهاز العصبى بعد جراحة القلب المفتوح، ومؤشرات وانتشار زرع منظم ضربات القلب الدائم بعد جراحة القلب المفتوح.

المرضى وطرق البحث : أجريت الدراسة الحالية على ١٣٤ مريضاً بالغاً خضعوا لعمليات جراحية مختلفة (جراحة القلب المفتوح، جميع عمليات تحويل مسار الشريان التاجى، وعمليات تحويل مسار الشريان التاجى والصمامات، وعمليات الصمام فقط وغيرها من العمليات بما فى ذلك إجراء بنتال المعدل، واستئصال الورم العضلى الأذينى، والجراحة الخارجية الشخصية جذر الأبهر جميع عمليات الإعادة والطوارئ) فى مستشفى جامعة عين شمس قسم جراحة القلب والصدر (أكاديمية القلب والصدر) لمدة ٦ أشهر.

النتائج : وجدنا أن ٣٢ مريضاً (٢٤٪) يعانون من عدم انتظام ضربات القلب، مثل مريض الكتلة الفرعية اليسرى للحزمة (١٪)، كتلة الفرع الأيمن ٤ مرضى (٥٪)، ذبذبة اذينية ١٤ مريضاً (١٠٪) وإحصار القلب الكامل ١١ مريضاً مع متابعة وحدة العناية المركزة، وجدنا أن جهاز تنظيم ضربات القلب الدائم فى دراستنا كان جميعاً عبارة عن استبدال للصمام، وخضع ٤ مرضى مع جهاز تنظين ضربات القلب الدائم بعد الجراحة لاستبدال الصمام الأبهرى إما كإجراء مستقل أو بالتزامن مع إجراءات جراحية قلبية أخرى من أجل أمراض مثل ا عتلال عضلة القلب الضخا مى، وخراج جذر الأبهر، وتضخم الأبهر وتضيق الأبهر التكلسى الحاد. قد يكون ذلك مرتبطاً بالجراحة الإضافية نفسها أو الوقت المستغرق للقيام بذلك فى جراحات استبدال الصمام الأبهرى اثنان منهم كانا استبدال الصمام الميترالى بصمام سورين المعدنى ومريض واحد بعد الخروج من المستشى من خلال المتابعة الطبية.

الخلاصة : كان معدل حدوث بطء ضربات القلب الحاد بعد الجراحة القلبية التى تتطلب إدخال منظم السرعة بشكل دائم ويختلف باختلاف نوع الجراحة، وهو أكثر شيوعاً مع استبدال الصمام فى الغالب بسبب صدمة لنظام التوصيل.