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Department of Anesthesia,
Lady Reading Hospital Peshawar

Address for correspondence:
Sayed Shah Hassanain
Department of Anesthesia,
Lady Reading Hospital Peshawar

E-mail:
dctrshah7@gmail.com

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COMPARISON OF AMIODARONE VERSUS MAGNESIUM SULPHATE IN PREVENTION OF POST OPERATIVE ARRHYTHMIAS IN OPEN HEART SURGERY: A RANDOMIZED CONTROLLED TRIAL AT LADY READING HOSPITAL PESHAWAR

Amjid Ali, Muhammad Haseeb Moin Ud Din, Sayed Shah Hassanain✉, Muhammad Izaz, Muhammad Aftab Ahmad

ABSTRACT

Objective: To compare the frequency of postoperative arrhythmias with amiodarone versus magnesium sulphate in patients undergoing open heart surgery

Methodology: This randomized Controlled trial was done at Department of Anesthesia Lady Reading Hospital, Peshawar. Eighty patients of age 40-70 years, either gender undergoing open heart surgery under general anesthesia were enrolled via Non-probability, consecutive sampling technique. Then they were divided in two groups by using lottery method. In group A, patients were given loading dose of amiodarone 5mg/Kg and in group B, patients were given 2g of MgSO₄ in 100ml of isotonic 0.9% solution intravenously. After surgery, patients were followed-up there for 3 days. Patients were monitored through ECG monitor for postoperative arrhythmias.

Results: The mean age of patients was 49.93±7.38 years in amiodarone group while 51.45±7.31 years in MgSO₄ group. There were 26 (65%) males and 14 (35%) females in group A while 15 males (37.5%) and 25 females (62.5%) in group B. Postoperative arrhythmias were observed in 10 (25%) cases with amiodarone while in 16 (40%) cases with MgSO₄, although the difference was insignificant ($p>0.05$).

Conclusion: The frequency of postoperative arrhythmias is reduced with using amiodarone than MgSO₄.

Keywords: Postoperative Arrhythmias; Amiodarone; Magnesium Sulphate; Open Heart Surgery; Bypass Surgery

INTRODUCTION

One of the well-known complications of cardiac surgery which is also a major cause of morbidity, lengthy stay in hospital and financial issues are Arrhythmias. Both tachyarrhythmias and bradyarrhythmias can occur after surgery but limited knowledge is available about its occurrence, major and minor risk factors and management of such complication.¹ Most of the time it arrhythmias after surgery are with limited consequences and can be for limited time but sometime it can lead to devastating consequences such as heart failure, stroke, renal failure and even mortality.² It is reported that this complication is related to upto 41% in patients after Coronary artery bypass surgery, upto 50% in patients after valve surgery and more than 20% in patients undergoing heart transplantation.³ It is proved to be the cause of increase hospital stay which comes with its own disadvantages including economical issues. Numerous studies along with clinical and experimental investigations are conducted on patho-

physiological factors causing arrhythmias after surgery which show that more than one factors are involved in this phenomena.⁴

Many of the medications have been used to prevent postoperative arrhythmias. Since sympathetic activation is essential in the pathogenesis of arrhythmias after surgery, using beta-blockers such as propranolol, metoprolol, and atenolol is a good option for prophylaxis.⁵ The use of intravenous magnesium sulphate before surgery also reduces the risk of post-operative arrhythmias. Use of amiodarone before surgery is also documented to reduce the risk of post-operative arrhythmias.^{6,7} Amiodarone belongs to the class III anti-arrhythmic agent which is used to treat ventricular arrhythmias, supraventricular arrhythmias and dysrhythmias associated with acute ischemic injury to the heart. Risk of arrhythmias is decreased when it is used oral or intravenously before CABG for 3 to 5 days.⁸

Rationale of this study is to compare the postop-

erative arrhythmias with amiodarone versus MgSO₄ in patients undergoing open heart surgery. Literature showed that amiodarone is more effective in preventing postoperative arrhythmias than MgSO₄ in open heart surgeries. But controversial evidences have been noticed in literature. Moreover, no local data was found which could help us in administration of amiodarone instead of MgSO₄ before surgery to avoid postoperative arrhythmias. So we wanted to conduct this study in local setting to get evidence and implement the results of this study in future and we can implement the use of amiodarone in patients before open heart surgery to avert postoperative arrhythmias. So this study is hypothesized that there is a difference in frequency of postoperative arrhythmias with amiodarone versus MgSO₄ in open heart surgery patients. With the objective of comparing the frequency of postoperative arrhythmias with amiodarone versus magnesium sulphate in patients undergoing open heart surgery.

METHODOLOGY

This Randomized Controlled trial was conducted at Anesthesia Department lady reading hospital Peshawar from August 2020 To Dec 2021. Sample size of 80 cases was calculated with 95% confidence level, 8% margin of error and taking expected postoperative arrhythmias 15%³ in patients undergoing open heart surgery. Sampling was done by Non-probability, consecutive sampling.

Patients of age 40-70years, either gender undergoing open heart surgery under general anaesthesia with ASA I & ASA II were included in the study while Patients with heart rate < 55 bpm, second or higher degree heart block, history of supraventricular (including atrial flutter) or ventricular tachyarrhythmia, Cardiogenic shock, permanent pacemaker, patients taking class I or III antiarrhythmic drug or on digoxin, valvular heart

surgery in addition to open heart surgery, abnormal TSH, liver disease or renal derangement were excluded from the study.

A total of 170 patients were assessed by principal author for fulfilment of the selection criteria in the study in operation theatre of Department of Cardiology Lady Reading Hospital, Peshawar. An informed consent was taken from all selected patients. 80 were selected after the fulfilment of inclusion criteria. Demographic information was noted. Then they were divided in two groups by using lottery method in parallel design in ratio 1:1. Lottery was done by an assistant who did not take part in research. In group A, the patients were given amiodarone 5mg/Kg initially after anesthesia and on first day after surgery amiodarone was continued as infusion at the rate of 5µg/Kg/minute.. In group B, patients were given 2g of MgSO₄ in 100ml of isotonic 0.9% solution intravenously over 1 hour at following times: pre-operatively, immediately following the operation, and on postoperative days 1, 2, and 3. Intervention was done by a consultant anaesthetist who did not take part in this research and was instructed by Principal author about the group or drug to be used.

General anesthesia was given and all patients underwent surgery. After surgery, patients were shifted in post-surgical ward and were followed-up there for 3 days. During 3 days, patients were monitored through ECG monitor. If there were persistent arrhythmias (heart rate <60bpm or >100bpm) for >30minutes, postoperative arrhythmias were labelled. All the information was recorded on proforma by one of the researcher who did not know the drug used in each assessed patient.

Data was entered & analysed by using SPSS version 20. Both groups were compared for postoperative arrhythmias by using chi-square test. P-value ≤0.05 was taken as significant. The details are given in the con-

sort diagram (Figure 1).

RESULTS

The mean age of patients was 49.93±7.38 years in amiodarone group while 51.45±7.31 years in MgSO₄ group. There were 26 (65%) males and 14 (35%) females in amiodarone group while there were 15 (37.5%) males and 25 (62.5%) females in MgSO₄ group. The mean BMI of patients was 28.85±3.42kg/m² in amiodarone group and 26.68±3.36kg/m² in MgSO₄ group as seen in table 1.

As it is clear that the most common procedure performed was CABG done in 25 cases, 13(32.5%) received amiodarone and 12(30%) received MgSO₄ followed by ASD where 11(27.5%) patients received Amiodarone and 6(15%) patients received MgSO₄.

After surgery, the mean ejection fraction was noted and patient was followed for arrhythmias which were noted upon occurrence. Postoperative findings are described in Table 2.

The mean ejection fraction was 60.83±4.49% in amiodarone group and 58.70±4.31% in MgSO₄ group. The difference was significant and amiodarone showed better preservation of ejection fraction (p<0.05). Postoperative arrhythmias were observed in 10 (25%) cases with amiodarone while in 16 (40%) cases with MgSO₄, although the difference was insignificant (p>0.05). It is clear that group A where amiodarone was administered to the patients observed less number of postoperative arrhythmias as compared to MgSO₄.

DISCUSSION

Any Surgery involving chest cavity causes arrhythmias commonly. It should be kept in mind while treating patients with arrhyth-

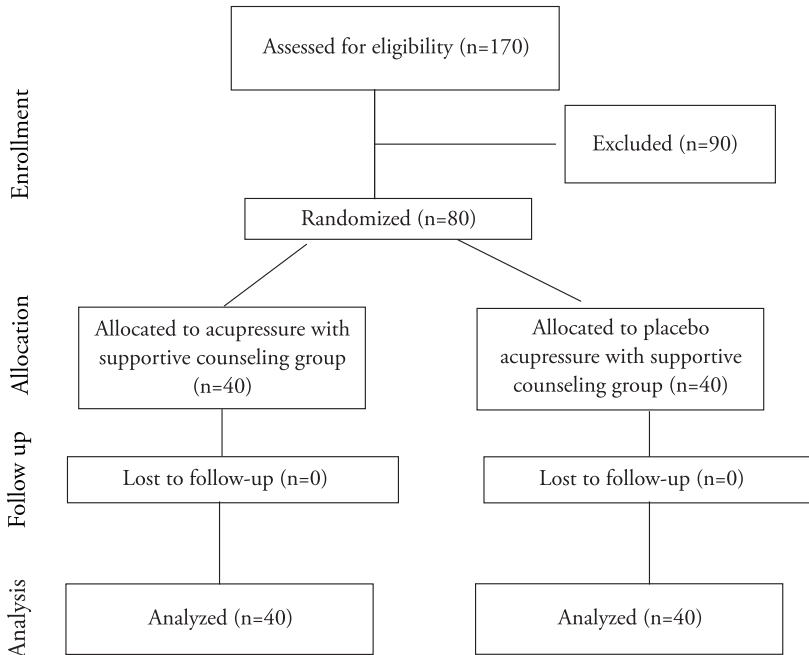


Figure 1: Consort Diagram

Table 1: Demographic features of patients

		Study group	
		Amiodarone	MgSo4
N		40	40
Age (years)		49.93±7.38	51.45±7.31
Gender	Male	26 (65%)	15 (37.5%)
	Female	14 (35%)	25 (62.5%)
BMI (kg/m ²)		28.85±3.42	26.68±3.36
Diagnosis	Atrial Septal Defect	11 (27.5%)	6 (15%)
	Aortic Valve Replacement	1 (2.5%)	8 (20%)
	Atrioventricular Septal Defect	1 (2.5%)	2 (5%)
	Coronary Artery Bypass Graft	13 (32.5%)	12 (30%)
	Degenerative Valve Disease	0 (0%)	1 (2.5%)
	Mitral Regurgitation	1 (2.5%)	0 (0%)
	Mitral Valve Replacement	1 (2.5%)	1 (2.5%)
	Mitral Valve Stenosis	3 (7.5%)	2 (5%)
	Left Main Stem Coronary Artery Disease	2 (5%)	0 (0%)
	Triple Vessel Disease	0 (0%)	1 (2.5%)
Ventricular Septal Defect	7 (17.5%)	7 (17.5%)	

Table 2: Postoperative findings of patients

	Study group		P-value
	Amiodarone	MgSo4	
Ejection fraction	60.83±4.49	58.70±4.31	0.034
Postoperative arrhythmias	10 (25%)	16 (40%)	0.152

mias after surgery that not only arrhythmias should be managed but all the treatable and reversible causes of arrhythmias should also be managed.⁹ There is substantial improvement in surgical and anaesthetic practices and safety has been improved a lot during recent years but the risk of arrhythmias after surgery has not been changed. The tachyarrhythmias after surgery include atrial flutter, atrial fibrillation, ventricular and supraventricular tachycardia.¹⁰

Level of magnesium is very crucial in patients undergoing cardiac surgery. Decreased level of magnesium in such patients is because of low food intake or drugs causing excretion of magnesium such as diuretics, cardiac glycosides and using albumin. The use of cardiopulmonary pump also causes the magnesium level to drop.¹¹ To prevent Atrial arrhythmias after cardiac surgery, certain drugs like digoxin, sotalol, steroids, amiodarone and beta blockers are used. Up to 10% patients after cardiac surgery may still develop atrial fibrillation despite using these drugs.¹²

Recently some studies have shown that MgSO₄ can be used to prevent post-surgical arrhythmias, however its controversial.¹² Shepherd et al. performed a systemic review to compare MgSO₄ and sotalol. Magnesium has many pharmacological and physiological benefits, as it acts as anti-calcium, stabilizer of membrane and facilitates energy transfer.¹³ Prophylactic amiodarone is currently listed as Class II recommendations to prevent arrhythmias after cardiac surgery.¹⁴⁻¹⁶ Few studies are documented that show that amiodarone used before surgery has been

gical atrial arrhythmias, decreased hospital stay and decreased cerebro-vascular events. It did not show any adverse complication.^{15,17-19}

In our study, we observed that the mean ejection fraction after surgery was

60.83±4.49% in amiodarone group and 58.70±4.31% in MgSO₄ group. The difference was significant and amiodarone showed better preservation of ejection fraction (p<0.05). This showed that the amiodarone can help to preserve ejection fraction after surgery and prevent hazardous consequences of reduced ejection fraction and can help to improve the outcome of the cardiac surgery. But for postoperative arrhythmias were observed in 10 (25%) cases with amiodarone while in 16 (40%) cases with MgSO₄. Although the difference was insignificant (p>0.05), but the frequency of postoperative arrhythmias was less with amiodarone.

Another randomized trial, conducted by Treggiari-Venzi, also observed that postoperative arrhythmias were present in 14% patients with amiodarone while in 23% with MgSO₄ in patients undergoing open heart surgery. The difference was insignificant (P>0.05).²⁰ Tiryakioglu et al., conducted a randomized trial and found that postoperative arrhythmias was present in 10.9% patients with amiodarone while in 28.1% with MgSO₄ in patients undergoing open heart surgery. The difference was significant (P<0.05).²¹ Bashir et al., conducted another trial in Pakistan, also found that postoperative arrhythmias was present in 10.8% patients with amiodarone while in 25.8% with MgSO₄ in patients undergoing open heart surgery. The difference was significant (P<0.05).²²

In a study conducted by Atreya et al., with sample size 601, prophylactic oral dose of amiodarone before surgery has shown a significant decrease (more than 13% risk reduction) in occurrence of post-surgical atrial arrhythmias.²³ Study has shown that drugs demonstrating control over β receptors like sotalol and amiodarone are useful in prevention of post surgical arrhythmias. While those demonstrating no control over β receptors are not useful in occurrence of

arrhythmias after surgery. Class II β-blockers are introduced as best prophylactic drug for prevention of atrial arrhythmias after cardiac surgery evidently.²⁴

Another study which is conducted by Zebis et al., showed that post-operative intravenous infusion of amiodarone, 300 mg in 20-minute infusion and followed oral dose of 600 mg Amiodarone significantly decreased the occurrence of atrial fibrillation after surgery.²⁵ In the other study, Zebis et al., reported that IV infusion followed by oral administration of amiodarone has decreased the risk of post-operative atrial fibrillation and decrease the cost of care up to more than 170 Euro per patient.²⁶

Myocardial ischemia and injury, electrolyte imbalance and increased catecholamine level causes the Arrhythmias more likely in the immediate post-operative period. As immediately after cardiac surgery, the cardiac function of the patients is relatively tenuous, arrhythmias are likely to cause hemodynamic compromise.²⁷ A high degree of care and vigilance is required in early post-operative period. Surgical trauma can cause sinus node dysfunction or atrioventricular block which can cause bradycardia. Keeping this in mind, Temporary pacing should be available. Most of the time, bradycardias are transient.²⁸

In a study conducted Triplo University Libia in 2021 it was concluded that either of these two drugs are safe and effective in preventing post-operative arrhythmias after corrective heart surgery for CHD in children.²⁹ This study was conducted in children as compared to our study where our mean study population was adult. Both the results are comparable.

In another study conducted as Armed Forces Institute of Cardiology Pakistan in 2022, when amiodarone and magnesium sulphate were compared in CABG surgery

patients, it was concluded that amiodarone is more effective in preventing arrhythmias in such patients.³⁰ When we compare this study to our study we found our results similar. Amiodarone is found more effective in our study when compared to magnesium sulphate.

CONCLUSION

The frequency of postoperative arrhythmias is less with amiodarone than MgSO₄. The difference between the two drugs is insignificant.

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Author's Contribution

AA conceived the idea, designed the study and collected the data. MI performed data analysis. MHM, SSH and MAA helped in the write up of the manuscript. All authors made substantial intellectual contributions to the study.

Conflict of Interest

Authors declared no conflict of interest

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None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.