IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 3 Ser.1 (March. 2020), PP 49-54
www.iosrjournals.org

The Comparison of Diltiazem and Metoprolol in Acute Management of Atrial Fibrillation with Fast Ventricular Rate in Patients Undergoing Non-Cardiac Thoracic Surgery

Dr. ArtiSinha
Registrar, Dept of Anaesthesia, Indraprastha Apollo Hospital, New Delhi
Corresponding Author: Dr.ArtiSinha

Abstract
Background: *Atrial fibrillation is the most common cardiac rhythm disturbance in clinical practice. Postoperative AF is reported in up to 45% of cardiac surgeries, up to 30% of non-cardiac thoracic surgeries, and up to 8% of other major surgeries. It usually appears in the first 5 postoperative days, and is associated with longer hospital stays and increased mortality*
Objective: *The aim of this study was to compare diltiazem and metoprolol in acute management of Atrial fibrillation (AF) with Fast ventricular rate (FVR) in Patients undergoing Non-cardiac thoracic Surgery.*
Methods*: After IEC approval, a prospective, randomized, double blinded study was conducted on 261 ASA I and II adult patients underwent non cardiac thoracic surgery admitted in Surgical Intensive Care unit. 60 Patients developed Atrial Fibrillation with Fast ventricular rate were randomly divided into two groups of 30 patients in each group: Group D and Group M.Patients of Group D received diltiazem and Group M received metoprolol according to protocol.*
.Results: *Sixty patients participated in the study. Demographic characteristics and operative data were similar in both groups.Both the study drugs were equally effective in controlling AF with FVR.The adverse events were also comparable in both groups[p>0.005].*
Conclusions: *In conclusion, for the acute management of AF with FVR in postoperative non cardiac thoracic patients intravenous diltiazem achieved similar rate control at 30 minutesand 60 minutes with no difference in adverse events when compared to intravenous metoprolol. While this study is limited due to its size, available data is scarce and further studies are warranted in this specific population to validate safety and efficacy in the acute setting.*
Key words:*Non-cardiothoracic Surgery, Diltiazem, Metoprolol, Atrial fibrillation (AF) with Fast ventricular rate (FVR)*

Date of Submission: 19-02-2020 Date of Acceptance: 03-03-2020

I. Introduction

Atrial fibrillation is the most common cardiac rhythm disturbance in clinical practice. It can be paroxysmal (resolves spontaneously), recurrent (2 or more episodes), persistent (present for at least 7 days), or permanent (present for at least one year).[1,2] Most patients with AF are elderly (median age 75 years) and have underlying cardiac disease. About 25% of patients are less than 60 years of age and have no underlying cardiac disease[1]: a condition known as lone atrial fibrillation.

Postoperative AF is reported in up to 45% of cardiac surgeries, up to 30% of non-cardiac thoracic surgeries, and up to 8% of other major surgeries[3]. It usually appears in the first 5 postoperative days[4], and is associated with longer hospital stays and increased mortality.[3,4] Several predisposing factors have been implicated, including heightened adrenergic activity, magnesium depletion, and oxidant stress. Prophylaxis with β-blockers and magnesium is currently popular[3,5], and there is evidence that the antioxidant N-acetylcysteine (a glutathione surrogate) provides effective prophylaxis following cardiac surgery[5]. Most cases of postoperative AF resolve within a few months.Several recent studies have shown, however, that Post operative AF is associated with an increased risk of in-hospital morbidity and mortality, and an increased long-term risk of ischemic stroke.[6,7]

Diltiazem is a calcium channel blocker that achieves satisfactory rate reduction in up to 90% of cases of uncomplicated AF [8]. The acute response to diltiazem shows better response amiodarone and digoxin after the first hour of therapy. Adverse effects of diltiazem include hypotension and cardiac depression. Although diltiazem has negative inotropic effects, it has been used safely in patients with moderate to severe heart failure.

β-blockers achieve successful rate control in acute AF [9], and they are the preferred agents for rate control when AF is associated with hyperadrenergic states (such as acute MI and post-cardiac surgery)[1]. Two β-

blockers with proven efficacy in AF are esmolol and metoprolol. Both are cardioselective agents that preferentially block β-1 receptors in the heart. Esmolol is more attractive than metoprolol because it is an ultra short-acting drug (with a serum half-life of 9 minutes), which allows rapid dose titration to the desired effect.[10]

Atrial fibrillation with fast ventricular rate is frequently defined as heart rate (HR) ≥ 120 beats per minute (bpm). The 2014 American Heart Association, American College of Cardiology, and Heart Rhythm Society Guideline for the Management of Patients With Atrial Fibrillation recommends intravenous non-dihydropyridine calcium channel blockers or beta-blockers for acute HR control in hemodynamically stable patients presenting with AF without HF.[11]

The present study was done to Compare of Diltiazem and metoprolol in acute management of Atrial fibrillation with Fast ventricular rate in Patients undergoing Non-cardiac Non-thoracic Surgery.

II. Materials And Methods

Ethical statement: The study was approved by the Institutional Ethics Committee, District Hospital 10, BiplabiHarenGhoshSarani, Howrah:1 West Bengal, India. Written consent was obtained after informing the participants about the nature, scope and risks related to the study.

Methods: This study was conducted at ,District Hospital 10, BiplabiHarenGhoshSarani, Howrah:1 West Bengal, India.BetweenApril 2018 and September 2019. Two hundred Sixty one consenting adult patients were included in this double blind, randomized, controlled study. The sampling type was randomized cluster sampling.

Inclusion criteria

Patients of either sex,
ASA I and II physical status,
Between 18 and 60 years of age,
Patient underwent Non-cardiac thoracic Surgery.
Patient admitted to surgical intensive care unit (SICU) for post operative care

Exclusion criteria

Patient or patient`s attendant refusal,
Known allergy to diltiazem and metoprolol
ASA III / IV patients,
History of significant systemic illness,
Patient was on any kind of antiarrhythmic agent

Intervention plan: On arrival in SICU, routine monitoring in the form of ECG, NIBP, SPO_2 and respiration were instituted and baseline values were noted. Infusion of plasmalyte was started. Oxygen through face mask was administered @ 4L/min to all the patients.

By use of computer generated random numbers, patients were allocated to one of two groups;

- Gr D: Patients allocated to group D, received diltiazem0.25 mg/kg IV over 2 min, If heart rate > 90 bpm after 15 min, give second bolus of 0.35 mg/kg.
- Gr M: 2.5 – 5 mg IV over 2 min, and repeat every 5 –10 min if needed to a total of 3 doses.

All study drugs were diluted with normal saline and make it 10 ml.

Outcome:

Primary outcome: The primary outcome was successful rate control (HR < 100 bpm or a HR reduction ≥ 20%) within 30 min from administration of the first dose of intravenousmetoprolol or intravenousdiltiazem.

Secondary outcome: incidence of hypotension (SBP < 90 mm Hg), bradycardia (HR < 60 bpm), and conversion to normal sinus rhythm within 30 min.

Blinding: The study drugs were prepared by an independent intensivist not involved in the study. The intensivistadministering the study drugs and observing the patient was blinded to the treatment group. Neither the patient nor the attending intensivist who also collected the data was aware of the group allocation.

Statistical methods

Power analysis

PASS version 11 software was used for calculation of sample size, with results of prior study [8]. With power of study 80% and alpha error 5%, the sample size came to 24 for each group. Considering drop outs, 30 patients in each group were recruited.

Statistical software: The data was compiled and subjected to statistical analysis using Statistical Package for Social Sciences [SPSS Inc, Version 20.0.Chicago, IL, USA)

Statistical tests: Statistical tests employed were Student's t-testfor age, weight, onset and duration of motor and sensory blocks and haemodynamic parameters. Gender and ASA grade data were subjected to Chi-square test. Data is presented as mean±SD. P-value < 0.05 was considered to indicate statistical significance.

III. Result

Two hundred Sixty one patients were assessed for eligibility. Sixty patients were developed Atrial fibrillation (AF) with Fast ventricular rate (FVR) during postoperative course in SICUand they were enrolled and randomized into either of the two groups; 30 each in the intervention and the comparator groups. Finally, 27 patients in Group D and 26 patients in Group M were analyzed, the rest being excluded due to mortality [Figure 1]

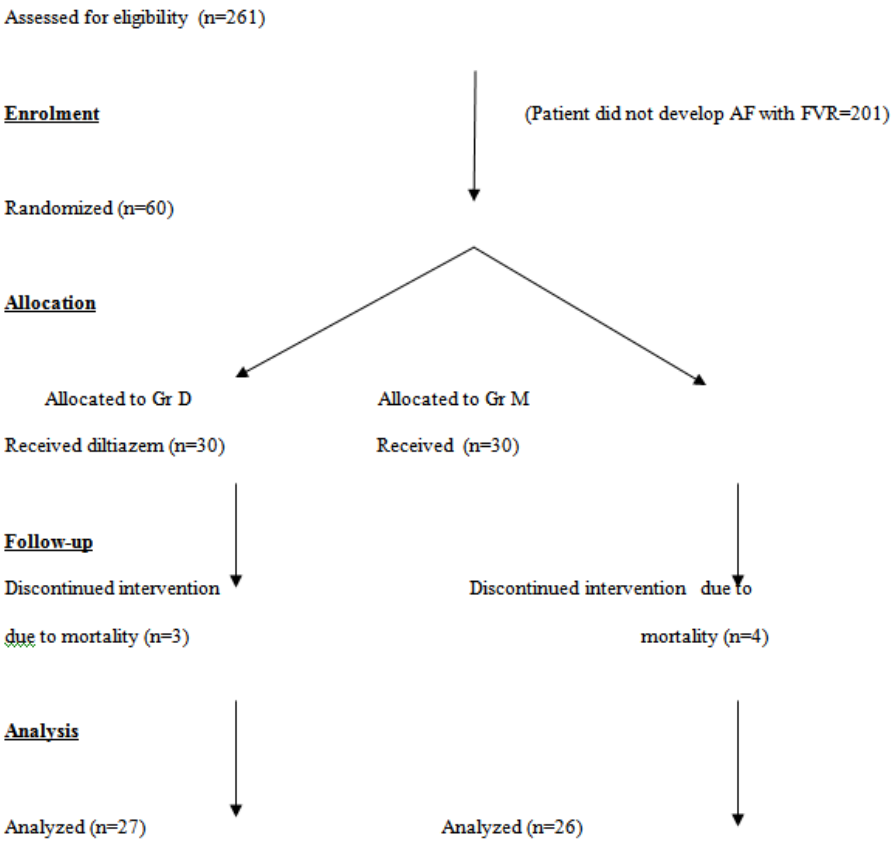


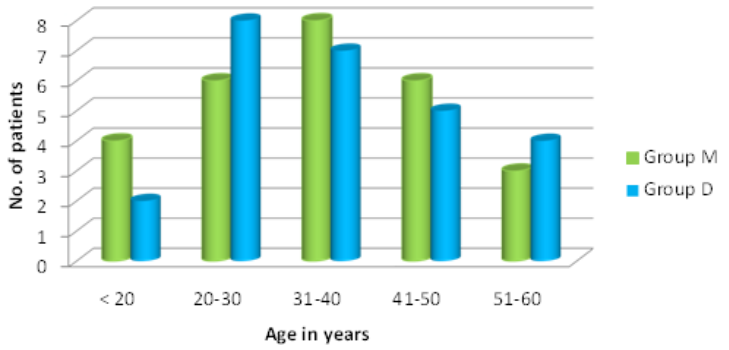
Figure 1. CONSORT flow diagram of study participants

There was no statistically significant difference between the patients in the two groups with respect to age, gender, body weight and ASA physical status [Table 1]. There were 13 male patients in group A whereas group B comprised of 14 males. Eight patients belonged to ASA II status in group M and 6 in group D.

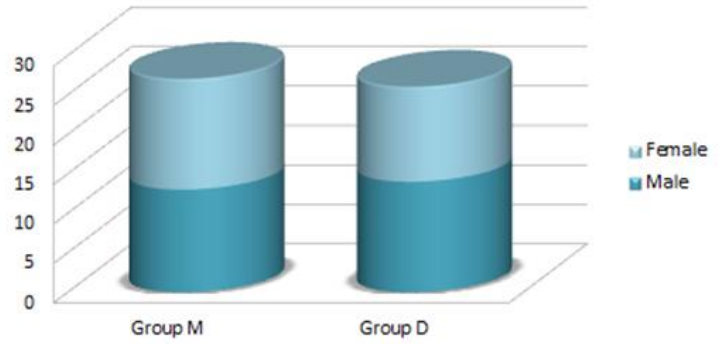
Table 1. Demographic characteristics

	Group M (n=27)	Group D (n=26)	
	Mean±SD	Mean±SD	p-value
Age (Years)	42.3±13.6	37.8±12.3	0.201
Gender (M/F)	13 / 14	14 / 12	0.678
Weight (Kg)	57.7±7.0	59.8±8.4	0.347
ASA grade (I/II)	19 / 8	20 / 6	0.589

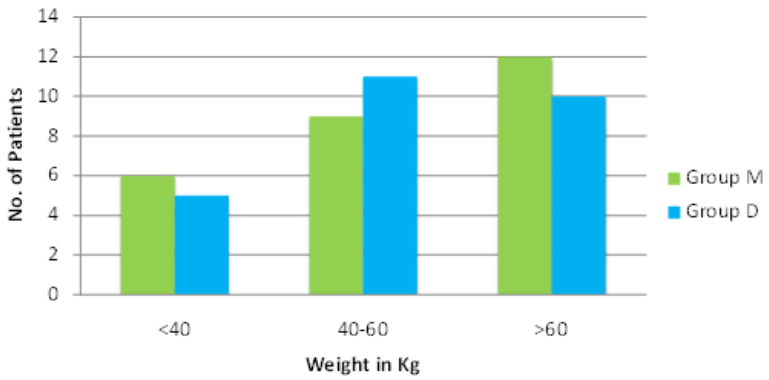
Graph 1. Age Distribution



Graph 2. Sex Distribution



Graph 3. Weight Distribution



Graph 4. ASA physical status

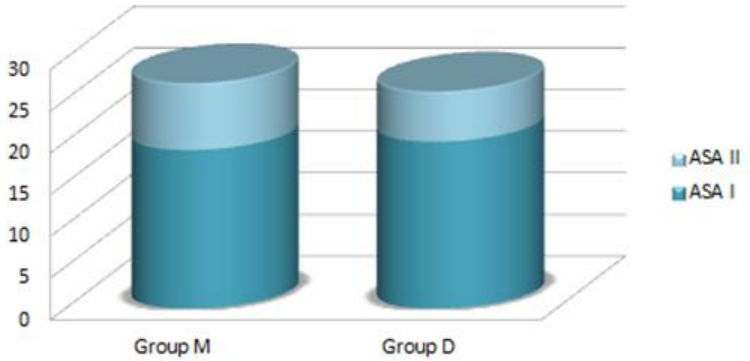
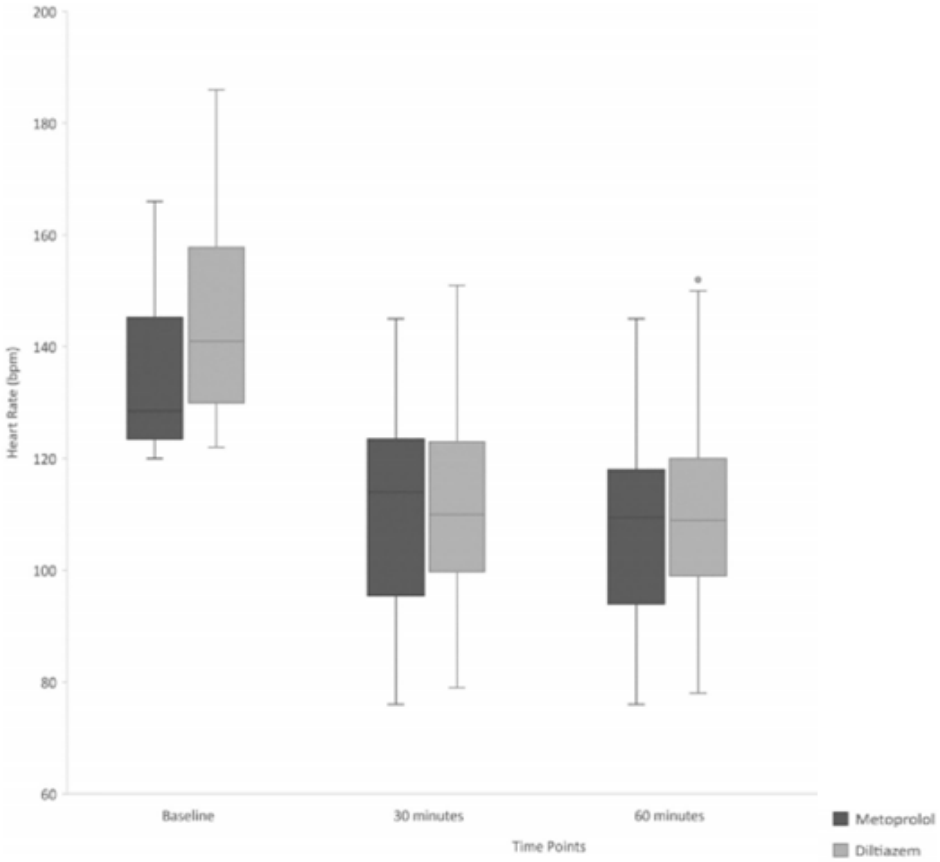


Table: 2 Outcome			
Characteristics	Group D (n=27)	Group M (n=26)	p- value
30 min			
Successful Rate control	13/14	14/12	0.45
Heart Rate(bpm)	114 [96-124]	110 [100-123]	0.87
Bradycardia	0	0	1
conversion	0	2	1.01
60 min			
Successful Rate control	14/13	13/13	0.27
Heart Rate(bpm)	110[94-118]	109 [92-114]	0.68
MCHR*	30 [10-52]	32 [18-47]	0.68
Inotrope Requirement	0	1	1

*MCHR: Maximum control of Heart rate



Graph 5: Heart rate: baseline, 30 and 60 min post-medication administration

III. Discussion

We evaluated the acute management of AF with FVR in postsurgical patients admitted in SICU. The achievement of successful rate control (HR <100 bpm or a HR reduction ≥ 20%) in patients receiving Intravenous metoprolol versus Intravenous diltiazem did not differ between groups at 30 min and60 min. A difference existed in baseline HR between groups; however, both groups had similar maximum median changes in HR following treatment. Overall, no difference was noted between groups with regards to HF symptoms.. In a recent study, Fromm et al. investigated IV metoprolol versus IV diltiazem for HR control in patients with AF with fVR and reported success (HR of <100 bpm within 30 min) in 46.4% of patients receiving IV metoprolol and 95.8% of patients receiving IV diltiazem ($p < 0.0001$) [11]. However, this study and others evaluating metoprolol and diltiazem, excluded patients with Class IV HF and acute decompensated HF [11-13]. Scheuermeyer et al. reported the frequency of heart failure in their population (9.0% in the calcium channel blocker group and 8.8% in the beta blocker group); however, the study did not differentiate between patients with HF when looking at response rates [13]. A study comparing diltiazem to placebo in patients with AF with

RVR and severe HF found that 97% of those treated with IV diltiazem had a reduction in HR of N20% and no symptoms of HF exacerbation [14]. A second study of patients with decompensated HF compared the use of IV metoprolol and IV diltiazem for control of AF with FVR. Both agents were equally effective at controlling HR with no difference in reports of worsening HF or adverse events [15]. Current literature focuses on the risks associated with nondihydropyridine calcium channel blockers and patients with heart failure, but these effects are with long-term treatment [16]. . Both metoprolol and diltiazem act as negative inotropes acutely but beta-blockers provide long term neurohormonal benefits. [17]

However, the limitations of this study were that the sample size was relatively small and limited to postoperative patients.

IV. Conclusion

In conclusion, for the acute management of AF with FVR in postoperative patients intravenous diltiazem achieved similar rate control at 30 min and 60 min to an inpatient unit with no difference in adverse events when compared to intravenous metoprolol. While this study is limited due to its size, available data is scarce and further studies are warranted in this specific population to validate safety and efficacy in the acute setting.

References

[1]. Roger V, Go AS, Lloyd-Jones D, et al. Heart disease and stroke statistics—2012 update: a report from the American Heart Association. Circulation 2012; 125:e2–e220.

[2]. O'Connor RE, Brady W, Brooks SC, et al. Part 10: Acute coronary syndromes. 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2010; 122(Suppl 3):S787–S817.

[3]. Andersen JL, Adams CD, Antman EM. ACC/AHA 2007 guidelines for the management of patients with unstable angina/non-ST-elevation myocardial infarction: executive summary. Circulation 2007; 116:803–877.

[4]. Jneid H, Anderson JL, Wright RS, et al. 2012 ACCF/AHA focused update of the guideline for the management of patients with unstable angina/non-STelevation myocardial infarction (updating the 2007 guideline and replacing the 2011 focused update). Circulation 2012; 212:1–36.

[5]. Trost JC, Lange RA. Treatment of acute coronary syndrome: Part 1: non STsegment acute coronary syndrome. Crit Care Med 2011; 39:2346–2353.

[6]. Bhave PD, Goldman LE, Vittinghoff E, et al. Incidence, predictors, and outcomes associated with postoperative atrial fibrillation after major noncardiac surgery. American heart journal. 2012;164:918–24.

[7]. Gialdini G, Nearing K, Bhave PD, et al. Perioperative atrial fibrillation and the long-term risk of ischemic stroke. Jama. 2014;312:616–22.

[8]. Guyton AC. The relationship of cardiac output and arterial pressure control. Circulation 1981; 64:1079–1088.

[9]. Goldenberg IF, Lewis WR, Dias VC, et al. Intravenous diltiazem for the treatment of patients with atrial fibrillation or flutter and moderate to severe congestive heart failure. Am J Cardiol 1994; 74:884–889.

[10]. Gray RJ. Managing critically ill patients with esmolol. An ultra-short-acting β-adrenergic blocker. Chest 1988;93:398–404.

[11]. Fromm C, Suau SJ, Cohen V, et al. Diltiazem vs. metoprolol in the management of atrial fibrillation or flutter with rapid ventricular rate in the emergency department. J Emerg Med 2015;49(2):175–82.

[12]. Demircan C, Cikriklar HI, Engindeniz Z, et al. Comparison of the effectiveness of intravenous diltiazem and metoprolol in the management of rapid ventricular rate in atrial fibrillation. Emerg Med J 2005;22(6):411–4 doi:22/6/411

[13]. Scheuermeyer FX, Grafstein E, Stenstrom R, et al. Safety and efficiency of calcium channel blockers versus beta-blockers for rate control in patients with atrial fibrillation and no acute underlying medical illness. AcadEmerg Med 2013;20(3):222–30.

[14]. Goldenberg IF, Lewis WR, Dias VC, Heywood JT, Pedersen WR. Intravenous diltiazem for the treatment of patients with atrial fibrillation or flutter and moderate to severe congestive heart failure. Am J Cardiol 1994;74(9):884–9 doi:0002-9149(94)90580- 0.

[15]. Khatchi F, Nagaband S, Shuster J, Novak E, Joseph S. Treating rapid atrial fibrillation in acute decompensated heart failure: metoprolol and diltiazem are equally safe, yet metoprolol increases conversion to sinus rhythm. J Card Fail 2014;20(8):S41.

[16]. Page 2nd RL, O'Bryant CL, Cheng D, et al. Drugs that may cause or exacerbate heart failure: a scientific statement from the American Heart Association. Circulation 2016;134(6):e32-9.

[17]. Bhatt AS, DeVore AD, DeWald TA, Swedberg K, Mentz RJ. Achieving a maximally tolerated β-blocker dose in heart failure patients: is there room for improvement? J Am CollCardiol 2017;69(20):2542–50.

DrArtiSinha. "The Comparison of Diltiazem and Metoprolol in Acute Management of Atrial Fibrillation with Fast Ventricular Rate in Patients Undergoing Non-Cardiac Thoracic Surgery." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(3), 2020, pp. 49-54.