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ORIGINAL ARTICLE

Correlation of Post-Operative Outcomes in patients undergoing CABG Receiving Antegradecardioplegia alone Versus Combined Antegrade Plus Retrograde Cardioplegia: A Prospective Review

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ABSTRACT

Aim: To compare the mean ejection fraction and cardiac enzymes level in patients with Ischemic heart disease undergoing elective coronary artery bypass graft surgery (CABG) having antegrade blood cardioplegia versus antegrade plus retrograde Cardioplegia.
Study design: Randomized Controlled Trial
Place and duration: This study was performed from 7th February, 2020 to 7th August, 2020 at the Cardiac Surgery Department, PIC, Jail Road, Lahore.
Methodology: After receiving informed consent, all patients undergoing CABG were enrolled in this study. In order to compare the mean ejection fraction and cardiac enzyme levels between patients who had antegrade blood cardioplegia and those who had antegrade plus retrograde cardioplegia, preoperative, intraoperative, and postoperative characteristics were recorded into the predesigned proforma.
Results: The total number of patients 72 was enrolled in this study who were divided into two groups. There were 36(50%) patients of who have given Cardioplegia through antegrade route while CABG and 36(50%) patients who have given Cardioplegia through antegrade plus retrograde route while CABG in this study. According to Table 1, the mean age of the patients in Group A was 51.86±9.35 years, whereas the mean ages of the participants in Group B 52.92±7.70 years. There were 26(72%) male and 10(28%) females in Group A and 30(83%) male and 6(17%) females in Group B. The mean BMI in Group A was 25.65±5.18 and 25.02±3.97 in Group B. There were 35(97%) hypertensive and 1(3%) non hypertensive patients in Group A and B respectively. Similarly, there were 33(92%) diabetic and 3(8%) non diabetic patients in Group A and 28 (78%) diabetic and 8(22%) non diabetic patients were in Group B. There were 26(72%) smokers and 10(28%) non- smokers in Group A and 24 (67%) smokers and 12(33%) non-smokers in this Group B.
Practical Implication: The comparison of CKMB(IU/L) levels in Antegrade route group and antegrade plus retrograde group baseline and after 48 hours shows insignificant p-values of 0.17 and 0.12 respectively which shows that there is no significant difference in CKMB levels regarding these two routes chosen for giving Cardioplegia to patients undergoing coronary artery bypass grafting.
Conclusion: Although both required additional surgical manoeuvres, however, the antegrade and antegrade plus retrograde cardioplegia approaches were equally effective and safe. Prior research demonstrated that multiple infusions offer superior protection to either antegrade or retrograde cardioplegia alone.
Keywords: Coronary artery Bypass grafting surgery, Antegrade route, Retrograde Route, Antegrade plus Retrograde route.

INTRODUCTION

Patients with symptomatic multi-vessel coronary artery disease are most frequently treated with CABG because it is better than medical management. However, CABG remains a surgical challenge in patients with impaired LV function and aberrant cardiac enzymes[1,2]. Cardioplegia treatment for myocardial protection enhances post-operative heart performance and reduces myocardial damage from ischemia. It also enhances cardiac performance and hastens myocardium function recovery in patients with coronary artery disease and improves post-operative ejection fraction[3,4].

The two methods that are most frequently used are: path that combines an antegrade with a retrograde. The antegrade approach involves injecting a cardioplegic solution into the aortic root while keeping the aorta cross-clamped. To safeguard the myocardium during cardiac surgeries, this is the most popular way to administer cardioplegia. Cardioplegia solution is administered retrogradely by entering the right atrium through the coronary sinus orifice. In high-risk individuals, ante-grade and retrograde cardioplegia is known to produce improved cardiac enzyme and LV function findings[5-8].

In comparison to retrograde cardioplegia treatment alone, antegradecardioplegia leads in improved cooling of the right ventricle in experimental experiments. Antegradecardioplegia alone results in an optimal/even administration of cardioplegia to all areas of the myocardium in the absence of coronary artery disease[8,9]. In contrast, antegradecardioplegia alone causes between distributions in patients with coronary artery disease. Cardioplegic solution can be administered both antegrade and retrogradely to solve this issue. This combined approach is beneficial for complicated operations needing lengthy periods of cross clamp time because it allows for the occasional administration of retrograde cardioplegia without interfering with the surgical procedure[8,10,11].

Another study evaluated that there is no significant preference among antegrade vs. antegrade/retrograde approach to CKMB (50.74±40.24 vs. 49.43±27.11) and postoperative EF was decreased in both groups as (42.40±7.85 vs. 40.88±8.65)[10]. Additional study established that theeffect of CKMB in aetrograde cardioplegia group was almost as that of antegrade+retrograde cardioplegia group. (2.22% vs. 2.38%)[12.13].

The rationale of the study is to compare the clinical outcome of patients undergoing elective coronary artery bypass graft surgery (CABG) having antegrade blood cardioplegia vs. antegrade plus retrograde cardioplegia. There is variability in the international results regarding improved cardiac enzymes and LV function by using combine and alone cardioplegia techniques. Moreover, no local study has been conducted up till now. This study will generate results for our population and will help in the

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decision making and remodeling the invasive treatment in the term of impaired LV function and cardiac enzymes.

MATERIAL AND METHODS

Randomized Controlled Trial study was performed. After IRB permission, this study was performed from 7th February, 2020 to 7th August, 2020 at the Cardiac Surgery Department, PIC, Jail Road, Lahore. A total of 72 patients were enrolled in this study after taking informed consent. These patients were divided into two groups. There were 36(50%) patients of who have given Cardioplegia through antegrade route while CABG and 36(50%) patients who have given Cardioplegia through antegrade plus retrograde route while CABG in this study.

Inclusion Criteria:

- All patients having coronary artery disease (IHD), undergoing elective CABG.
- Both gender with age range 20-70 years.

Exclusion Criteria:

- Patients undergoing coronary artery bypass grafting with valve replacement surgery.
- Patients having previous Myocardial Infraction.
- Patients with pre-operative renal failure (serum creatinine level ≥1.5 mg/dL).
- Patients with on-going arrhythmia (in 12 lead ECG P wave will be absent and rhythm irregular and pacemaker dependent).

Data collection procedure: A total of 72 cases 36 in each group undergoing elective coronary artery disease were enrolled in the study. Written informed consent was obtained from all the patients. The data of the patients was collected in a well-designed proforma. Demographic, clinical characteristics and outcomes were recorded. All operations were done in same institute. Standard bypass technique was used with membrane oxygenator and roller pump, while using hypothermia and hemo-dilution. CK-MB was achieved with the administration of cardioplegia.

Statistical Analysis: Data was analyzed using SPSS Version 20.0 for Window. Mean and standard deviation was given for quantitative variables (i.e. age, height, weight, EF). Frequencies, percentages were given for qualitative variables like (Gender). Student t test was used to compare means. All P values≤0.05 were considered statistically significant. All tests applied were two tailed.

RESULTS

According to Table 1, the mean age of the patients in Group A was 51.86±9.35 years, whereas the mean ages of the participants in Group B 52.92±7.70 years. There were 26(72%) male and 10(28%) females in Group A and 30(83%) male and 6(17%) females in Group B. The mean BMI in Group A was 25.65±5.18 and 25.02±3.97 in Group B. There were 35(97%) hypertensive and 1(3%) non hypertensive patients in Group A and B respectively. Similarly, there were 33(92%) diabetic and 3(8%) non diabetic patients in Group A and 28(78%) diabetic and 8(22%) non diabetic patients were in Group B. There were 26(72%) smokers and 10(28%) non- smokers in Group A and 24(67%) smokers and 12(33%) non-smokers in this Group B.

Table -1: Frequency distribution of demographics and risk factors

Age	**Group A**		**Group B**	
Mean ± SD	51.86 ± 9.35		52.92 ± 7.70	
	Male	**Female**	**Male**	**Female**
Gender	26 (72%)	10 (28%)	30 (83%)	6 (17%)
BMI	25.65 ± 5.18		25.02 ± 3.97	
Hypertension	**Yes**	**No**	**Yes**	**No**
	35 (97%)	1 (3%)	35 (97%)	1 (3%)
Diabetes	33(92%)	3 (8%)	28 (78%)	8 (22%)
Smoking Status	26 (72%)	10 (28%)	24 (67%)	12 (33%)

Table 2 shows that the comparison of CKMB(IU/L) levels in Antegrade route group and antegrade plus retrograde group baseline and after 48 hours shows insignificant p-values of 0.17 and 0.12 respectively which shows that there is no significant difference in CKMB levels regarding these two routes chosen for giving Cardioplegia to patients undergoing coronary artery bypass grafting.

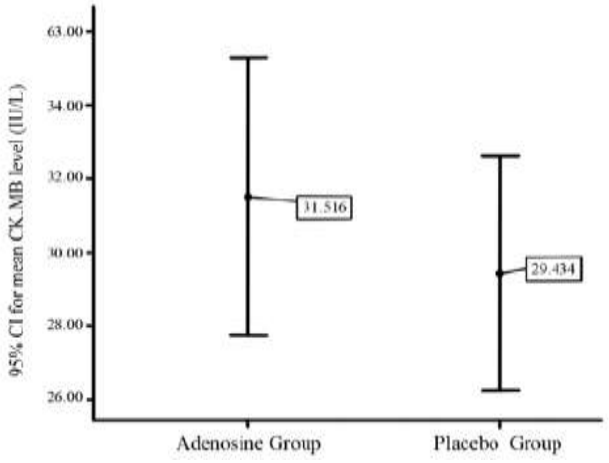
Table 2: Comparison of CKMB levels in both Routes baseline and after 48 hours.

Study Groups	**CKMB (IU/L) Baseline Mean ± S.D**	**CKMB (IU/L) After 48 Hours Mean ± S.D**	**P-Value**
Group A	48.89 ± 16.01	41.14 ± 10.36	0.17
Group B	20.69 ± 3.49	19.28 ± 4.08	0.12

Table 3: Demographic Data

	Control group ($n=72$)	Remote IPC group ($n=77$)	P-value
Age (years)	53.5 ± 8.76	54.59 ± 7.75	0.416
Males	62	67	0.872
Smoking	32	30	0.497
Diabetes	35	42	0.469
Hypertension	45	50	0.757
Dyslipidemia	46	53	0.523
Obesity	10	9	0.687
Family history	20	16	0.319
Baseline laboratory values			
CK-MB (U/l)	13.33 ± 4.58	14.89 ± 12.05	0.304
Tn T (ng/ml)	0±0	0±0	1.000
CRP (mg/dl)	13.33 ± 4.58	14.89 ± 12.05	0.304
Pre-procedural medications			
Statins	53 (74)	55 (71)	0.766
GP IIb/IIIa inhibitors	12 (17)	22 (29)	0.084

Figure 1: 95% of means of two groups



DISCUSSION

Previous studies showed that surgeons mostly preferred antegrade route of cardioplegia delivery. Although there are many benefits of antegrade route despite it has many limitations of myocardial protections. Myocardial areas distal to complete stenosis are poorly protected by antegradeCardioplegia[8,12,14].

Numerous investigations have found that retrograde distribution of the cardioplegic solution results in better maintenance of the myocardial energy reserve than antegrade delivery in the presence of stenosis[12]. Retrograde cardioplegia provides more uniform distribution of cardioplegic solution[15,16].

Important methods for safeguarding the heart during cardiac surgeries include anterograde and retrograde cardioplegia. It is anticipated that combining the two cardioplegic approaches may result in a more effective cardiac protective strategy based on the advantages and disadvantages of each technique. It has not been explicitly stated that simultaneous antegrade/retrograde cardioplegia enhances myocardial perfusion, despite numerous

research indicating that antegrade/retrograde cardioplegia offers superior cardiac protection to either antegrade or retrograde cardioplegia[18].

We enrolled 72 patients in this current study 50% were allocated in antegrade group and 50% were allocated in antegrade plus retrograde group. The mean age of the cases was 52.38±8.64 years with lower and extremes of ages being 26 and 70 years. Similarly in a previous study the mean age of the patients in antegrade group was 57±10 and in antegrade plus retrograde group was 50±11. The p-value was not significant 0.077[15,18].

The comparison of CKMB(IU/L) levels in Antegrade route group and antegrade plus retrograde group baseline and after 48 hours shows insignificant p-values of 0.17 and 0.12 respectively which shows that there is no significant difference in CKMB levels regarding these two routes chosen for giving Cardioplegia to patients undergoing coronary artery bypass grafting. Similar results were founded in a previous study where post-operative CKMB values in group A (Antegrade) were 39.93±25.48 and in group B (Antegrade plus retrograde) were 47.35±27.11 with insignificant p-value (0.778). These results support our study[22]. In a second trial, there was no difference found in the postoperative release of CK-MB in the first 48 hours between the two groups (p=0.86)[19,20,21,22,23].

CONCLUSION

Although both required additional surgical manoeuvres, however, the antegrade and antegrade plus retrograde cardioplegia approaches were equally effective and safe. Prior research demonstrated that multiple infusions offer superior protection to either antegrade or retrograde cardioplegia alone.

Conflict of interest: Nothing to declare

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