

Comparison of Early Outcomes in Del Nido Cardioplegia Versus Conventional Cardioplegia in Term of Myocardial Protection in Patients with A Preserved Left Ventricular Function Undergoing Coronary Artery Bypass Grafting (CABG)

SYED SARDAR RAHIM¹, AHMAD KAMRAN KHAN², MALIK SALMAN³, FURQAN YAQUB PANNU⁴, BILAL AHMED⁵, SHAHID IQBAL⁶, AMNA SHAFQAT⁷, SHAMILA AFSHAN⁸

¹⁻³SR Cardiac Surgery, Punjab Institute of Cardiology, Lahore

^{4,5}SR, Cardiology Department, Mayo Hospital, Lahore

⁶SR Cardiology, Punjab Institute of Cardiology, Lahore

⁷⁻⁸Biostatistician, Punjab Institute of Cardiology, Lahore

Correspondence to: Dr. Syed Sardar Rahim, Email : dr_sardar.rahim@yahoo.com, Cell No : 0341-5566336

ABSTRACT

Objective: To compare early outcomes in antegrade conventional crystalloid cardioplegia with Del Nido (DN) cardioplegia in term of myocardial protection in patients undergoing CABG.

Methodology: All the patients undergoing Coronary artery bypass grafting surgery were enrolled in this study after informed consent. Preoperative, intra-operative and postoperative variables were entered in the pre-designed proforma and patients were followed to compare early outcomes in Del-Nido versus Conventional Cardioplegia.

Results: The mean age of the patients in Del Nido group was 54.61 ± 9.129 whereas the mean age of the patients in Conventional Cardioplegia group was 53.91 ± 10.39. There were 50(71.43%) males and 20(28.57%) females in Del-Nido group as compare with Conventional group 52(74.29%) males and 18(25.71%) females in this study. The mean cardioplegia volume given to Del Nido and Conventional Cardioplegia group as (1271.43 ± 447.91 vs 2142.86 ± 584.48 (ml/min) with p-value is <0.005 which shows there is a significant difference of Cardioplegia volume given to both groups. The mean cardiopulmonary bypass time (min) in Del Nido group was 116.87 ± 27.25 and in Conventional Cardioplegia group 106.58 ± 29.19 and the p-value of CPB time was significant 0.004. In our data 6(8.5%) patients from Del Nido Cardioplegia Group suffered from AKI whilst in Conventional Cardioplegia Group there were 7(10%) patients who suffered from AKI. Similarly 3(4.29%) patients from Del Nido Group and 2(2.86%) patients from conventional Cardioplegia Group previously suffered from stroke. Arrhythmia is a disorder of heart that affects the rate or rhythm at which the heart beats. Its p-value is significant (0.05) which shows there is a significant difference of this disorder in both groups

Conclusion: There was a significant difference in post-operative complication Arrhythmia in both groups and the need for a lower cardioplegia volume and an uninterrupted procedure are the main advantages of Del Nido (DN) cardioplegia solution, which make it superior from conventional cardioplegia.

Keywords: Coronary artery Bypass grafting surgery, Del Nido Cardioplegia, Conventional Cardioplegia, CKMB, Troponin I.

INTRODUCTION

The main aim of heart surgery should have best anatomic outcomes and to restrain post-operative injury. There should be two goals to achieve these aims which are bloodless intra-operative field to permit surgeons to localize and identify the surgical lesion and achieve the myocardial protection to avoid myocardial injuries in the every intra-operative and post-operative period to get advantages of cardiac surgery. Cardiomyocyte injuries due to insufficient cardiomyocyte protection may lead to low cardiac output syndrome which may increase cost effectiveness. To reduce these complications have visualize toward a more perfect state of myocardial protection techniques and management.

The objective of cardiomyocyte protection during cardiac surgery is to keep maintain the better function of cardiomyocyte whilst give intraoperative bloodless field and hyperkalemia diastolic arrest to make the operation easy. According to Bigelow have achieved myocardial protection through Cardioplegia solution to reduce cardiomyocyte demand of O₂ and avoid myocardial injuries. Moreover, Melrose demonstrated that the use of hyperkalemia diastolic arrest is achieved by hyperkalemia solution administration allowing heart surgeries to be on arrested heart. So, these two myocardial protection techniques have been the goal during heart surgeries with better intra and post-operative outcomes.⁽¹⁻³⁾

It is mentioned in many papers that when Del Nido Cardioplegia was given to the patient during surgery for diastolic hyperkalaemia arrest those patients were averting to spontaneous defibrillation as compared to conventional cardioplegia group, however less than 10 percent patients needed electrical cardioversion in Del Nido cardioplegia group, which is harmful to myocytes.⁽⁴⁾ When the intracellular calcium load is less in the cardioplegia solution it will make prompt hyperkalemic diastolic cardiac arrest which can preclude cardiomyocytes injuries, ventricular arrhythmia due to ischemic reperfusion injuries. Del Nido was been produced to preclude pre-mature myocytes; Del

Nido Cardioplegia have many other components which consists magnesium and lidocaine, which reduce Ca²⁺ storage in cardiomyocytes to inhibit reperfusion injury due to ischemia later to revascularization.⁽⁵⁾ Because of these early benefits and one dose of Cardioplegia has been exclusively used in congenital heart surgery with better outcome.⁽⁶⁾ Whereas DNP not that famous in adult heart surgeries now.⁽⁷⁾

The benefit rendered by single dose cardioplegia strategy is to avoid interruption in the flow of surgery, and particularly, a considerable reduction in the cross clamp time. Del Nido is an extracellular cardioplegic answer to these grounds and has been used effectively in paediatric and congenital heart surgery. The succeeding conclusion of its use stimulating the outcomes has revealed by modern studies. The benefits to use the Del Nido is to give sufficient time to surgeon of arrested heart without manipulation of aorta by cross clamping, so it reduces risk of thromboembolism, decrease cross clamp and CPB timing and all surgery timing. Many other researches compared it with conventional cardioplegia and the potential domain of concern with its use in adult cardiac surgery.

MATERIALS AND METHODS

The study was conducted in Cardiac surgery Department, Punjab Institute of Cardiology, Lahore Pakistan dedicated to cardiac patients only Lottery methods is used to assigning patients in two groups. Sample size was consisted of a total of 140 post-op cardiac surgery patients.

Inclusion criteria: Both adult male and female patients undergoing Coronary Artery Bypass Surgery were selected. Patients with preserved LV ejection fraction >45. Collected data was analyzed through SPSS version 25. Continuous variables i.e., age, ejection fraction, CPB time, aortic cross clamp time were presented as mean ± SD. Categorical variables i.e., gender and postoperative complication (Arrhythmia, stroke and MI were expressed as frequencies and percentages. Chi square test was

used to compare the postoperative complications between both groups. P-value ≤0.05 will be considered statistically significant.

RESULTS

The mean age of the patients in Del Nido group was 54.61 ± 9.129 whereas the mean age of the patients in Conventional Cardioplegia group was 53.91 ± 10.39. There were 50(71.43%) males and 20(28.57%) females in Del-Nido group as compare with Conventional group 52(74.29%) males and 18(25.71%) females in this study.

The mean cardioplegia volume given to Del Nido group is 1271.43 ± 447.91 (ml/min) and the mean cardioplegia volume given to Conventional Cardioplegia was 2142.86 ± 584.48 (ml/min) with p-value is <0.005 which shows there is a significant difference of Cardioplegia volume given to both groups. The mean cardiopulmonary bypass time (min) in Del Nido group was 116.87 ± 27.25 and in Conventional Cardioplegia group 106.58 ± 29.19 and the p-value of CPB time was significant 0.004. (Table-2)

In our data 33(47%) patients from Del Nido Cardioplegia Group suffered from MI whilst in Conventional Cardioplegia Group there were 19(27%) patients who suffered from MI p-value=0.002 which is significant. Similarly 3(4.29%) patients from Del Nido Group and 2(2.86%) patients from conventional Cardioplegia Group previously suffered from stroke with insignificant p-value=0.649. Arrhythmia is a disorder of heart that affects the rate or rhythm at which the heart beats. Its p-value is significant (0.05) which shows there is a significant difference of this disorder in both groups (Table-2)

Table-1: Descriptive Statistic of Demographical Data

Characteristics	Del-Nido Cardioplegia (n-70)	Conventional Cardioplegia (n-70)	P-Value
Age	54.61 ± 9.129	53.91 ± 10.39	0.234
Gender	Male 50(71.43%)	52(74.29%)	0.491
	Female 20(28.57%)	18(25.71%)	
Cardioplegia Volume (ml)	1271.43± 447.91	2142.86± 584.48	<0.005
CPB time (min)	116.87 ± 27.25	106.58 ± 29.19	0.004
Aortic-Cross Clamp Time (min)	66.04 ± 22.12	51.64 ± 18.05	0.95

Table-2: Comparison of MI, Stroke and Arrhythmia Between Del Nido and Conventional Cardioplegia

Characteristics	Del-Nido Cardioplegia (n-70)	Conventional Cardioplegia (n-70)	P-Value
AKI	Yes 6(8.5%)	7(10%)	0.612
	No 64(91.5%)	63(90%)	
Stroke	Yes 3(4.29%)	2(2.86%)	0.649
	No 67(95.71%)	68(97.14%)	
Arrhythmia	Yes 14(20%)	24(34.29%)	0.05
	No 56(80%)	46(65.71%)	

DISCUSSION

In this study 140 patients undergoing CABG were studied. Patients were divided in two groups: 70(50%) patients were given Del Nido Cardioplegia and 70(50%) patients were given conventional Cardioplegia. Demographic findings showed the mean age of the patients in Del Nido Cardioplegia group was 54.61 ± 9.129 whereas the mean age of the patients in Conventional Cardioplegia group was 53.91 ± 10.39. There were 50(71.43%) males and 20(28.57%) females in Del-Nido group as compare with Conventional group 52(74.29%) males and 18(25.71%) females in this study. In a study by conducted by Aycan et al (2018), they found that the mean age in Del Nido and blood Cardioplegia was 69.53 ± 6.73 and 67.63 ± 5.56 respectively.⁽⁶⁾

The mean cardioplegia volume given to Del Nido group is 1271.43 ± 447.91ml and compared with Conventional Cardioplegia was 2142.86 ± 584.48ml. There p-value is <0.005 which shows there is a significant difference of cardioplegia volume given to both groups. The same result was found in a study by Kavala et al, (2018) they compared DNC with conventional BC and showed significantly lower cardioplegia volume in DNC group (DNC = 884.33±156.8 mL, P=0.001,BC = 1130.00±194.1 mL and) .⁽⁸⁾ Same results were found in another study done by Pourmoghadam,

et al (2017) they revealed their findings , that the volume of cardioplegia doses was significantly higher in non-Del Nido group (p-value<0.001).⁽⁹⁾ This result can be demonstrated with our study.

The mean cardiopulmonary bypass time (min) in Del Nido group was 106.58 ± 29.19 and in conventional cardioplegia group 116.87 ± 27.25 whilst the mean aortic clamp time (min) in Del Nido group was 66.04 ± 22.12 and in Conventional Cardioplegia was 51.64 ± 18.05. In another study by (Haci et al 2018) aortic cross-clamp time and cardiopulmonary bypass times were lesser in Del Nido Cardioplegia group versus conventional blood cardioplegia (43.7 ± 8.6 min, 54.3 ± 9.7 min and 67.9 ± 11.5min, 77.2 ± 14.1 min) respectively.⁽¹¹⁾

Arrhythmia is a disorder of heart that affects the rate or rhythm at which the heart beats. Its p-value is significant (0.05) which shows there is a significant difference of this disorder in both groups. Stroke is one of the most severe complications after CABG surgery. Its p-value is insignificant (0.649) which shows that there is no significant difference of this complication in both groups. Similar results were found in another study by Haci et al (2018) which showed insignificant p-value (0.076).⁽¹¹⁾ In another study conducted by Kavala & Saygin (2018) the comparison of stroke in Del-Nido and blood Cardioplegia also showed highly insignificant p-value (1.00), which demonstrated that there is no statistically significant difference in both groups.⁽⁸⁾ These results supported our study.

CONCLUSION

The clinical and laboratory outcomes in patients undergoing coronary artery bypass grafting using Del Nido Cardioplegia and conventional Cardioplegia are quite satisfactory. There was a significant difference in post-operative complication Arrhythmia in both groups and the need for a lower cardioplegia volume and an uninterrupted procedure are the main advantages of Del Nido cardioplegia solution, which make it superior from conventional cardioplegia. It is not possible to make a general conclusion based solely on these results future studies on cardiomyocyte at the molecular level, will give more explanatory results on the future use of cardioplegic techniques. Our conclusions are supportive for more future researches.

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