



DEL NIDO CARDIOPLEGIA IN ADULT CARDIAC SURGERY

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ABSTRACT In the early 1990s del Nido cardioplegia was developed by Pedro del Nido, Hung Cao-Danh, Eric Sommers and Akihiko Ohkado at the university of Pittsburgh for pediatric and infant cardiac surgeries. Its use in adult cardiac surgeries is expanding now. In Our institution cardiac surgeries such as mitral valve replacement, aortic valve replacement, double valve replacement, repair of congenital cardiac defects and CABG are being routinely performed .This study deals with usefulness of del Nido cardioplegia in adult cardiac surgery

KEYWORDS : cardioplegia, del Nido,

Introduction

Cardioplegic solutions are the means by which the ischemic myocardium is protected from cell death. This is achieved by immediate and sustained electromechanical quiescence, rapid and sustained homogenous myocardial cooling, maintenance of therapeutic activities in effective concentration and periodic washout of metabolic inhibitors Del Nido cardioplegia requires less frequent dosing and has potential benefits in adult cardiac surgery and minimally invasive valve surgery which includes decreased workflow interruption, shorter aortic cross clamp and bypass times and has better myocardial protection

Aims and objectives

- To assess the usefulness of del Nido cardioplegia in adult cardiac surgeries
- To evaluate the aortic cross clamp time and total bypass time
- To evaluate whether use of del Nido cardioplegia will reduce the need for defibrillation
- To assess the myocardial protection with use of del Nido cardioplegia.

Material and methods

This prospective study was undertaken in the Department of cardiothoracic surgery, Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai.

Adult patients undergoing cardiac surgery using del Nido cardioplegia during the study period was studied for the usefulness of Del Nido cardioplegia

Inclusion Criteria

All patients undergoing cardiac surgery using del Nido cardioplegia during the study period in the age group of 15 – 60 years

Exclusion criteria

- Age more than 60 years

In patients more than 60 years there will be coexistence of other confounding factors such as co morbid conditions which would affect the outcome of surgery

- Coronary artery disease

In patients with coronary artery disease, previous injury to the myocardium due to ischemia can alter the outcome of surgery

- Poor LV function
- Patients with poor left ventricular function will have lower myocardial reserve
- Hepatic or renal failure

Methodology

The preoperative and postoperative details of the patients enrolled for the study were collected personally by the investigator
The following parameters were taken into consideration during the study

- Name , age and sex of the patient
- Cardiopulmonary bypass time
- Number of del Nido Cardioplegic dosages administered during surgery
- Assessment of total aortic cross clamp time
- Requirement of DC shock – whether required or not
- Postoperative duration in ICU
- Postoperative ECHO – done after 5th postoperative day
- Mortality – cause was evaluated with respect to technical reasons or postoperative low cardiac output which was assessed in terms of myocardial protection.

Results

In this study dealing with “del Nido cardioplegia in adult cardiac surgery”,

the details which were observed during the course of the study are summated and given below.

Table 1 - Age

Age in years	Number of Patients
Less than 20	5
20 – 40	27
40 – 60	27
Total	59

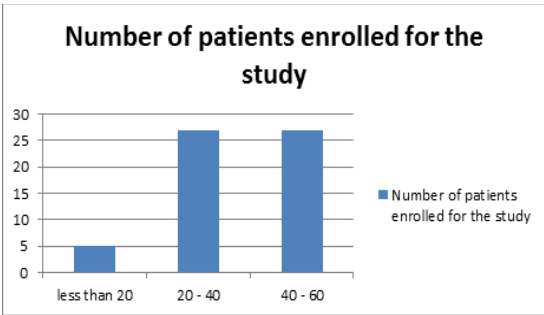
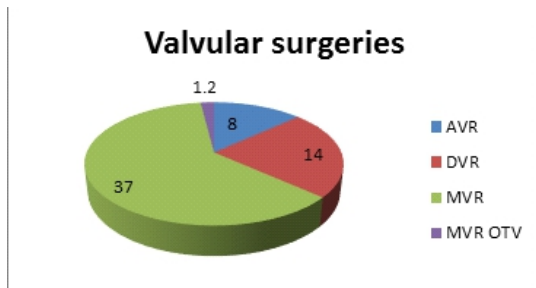
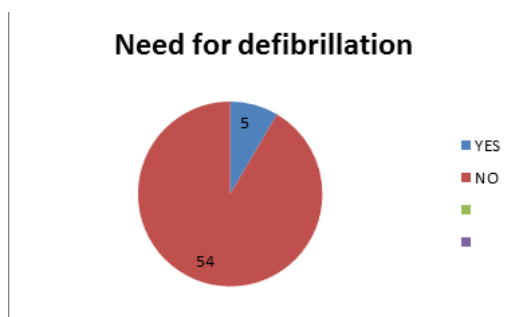


Table 2 - Valvular Heart surgeries performed using del Nido cardioplegia

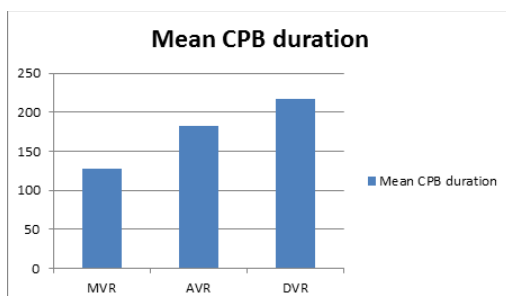
Valvular Heart surgeries	Number performed
AVR	8
DVR	14
MVR	37
MVR OTV	1

**Need for defibrillation**

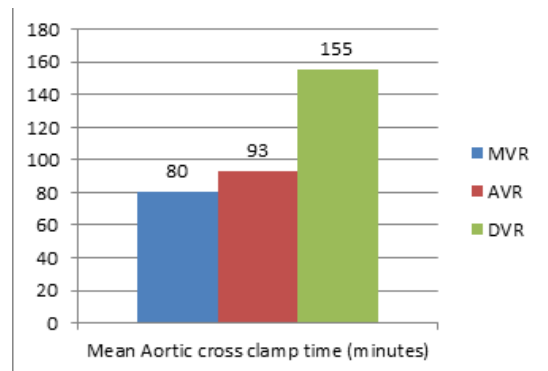
Out of the 59 valvular surgeries performed using del Nido cardioplegia, the need for defibrillation was found only in 5 cases. Amongst the 5 cases, 4 were aortic valve replacement and 1 was double valve replacement.

**Table 3 - Cardioplegia bypasses duration while using del Nido cardioplegia**

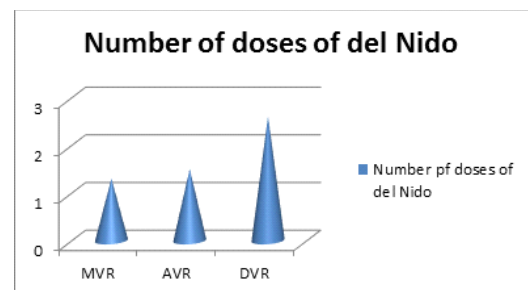
Valvular Heart Surgery	Mean CPB duration(minutes)
MVR	128
AVR	182
DVR	217

**Table 4 - Aortic Cross clamp time**

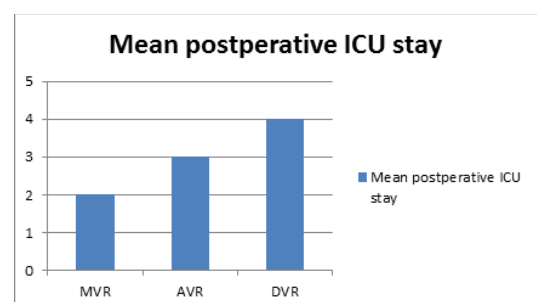
Valvular surgery	Mean Aortic Cross clamp time (minutes)
MVR	80
AVR	93
DVR	155

**Table 5 - Number of doses of del Nido cardioplegia during valvular cardiac surgeries**

Valvular surgeries	Average number of doses of del Nido
MVR	1.3
AVR	1.5
DVR	2.61

**Table 6 - Mean Postoperative ICU stays**

Valvular surgery	Mean Postoperative ICU stay (DAYS)
MVR	2
AVR	3
DVR	4

**Post operative ECG**

Postoperative ECG did not show any evidence of perioperative ischemic insult such as development of Q wave or any other significant changes consistent with the development of cardiac ischemia

Postoperative ECHO

No regional wall motion abnormality was detected in postoperative cases which indicates a good myocardial protection

Mortality

Out of the 59 cases 7 deaths were noted. The cause of death in all the 7 cases was primarily not attributed to use of del Nido cardioplegia

Discussion

In our institution, cardiac surgeries such as Mitral Valve Replacement, Aortic Valve Replacement or Double Valve Replacement, repair of adult congenital cardiac defects and CABG are being routinely performed. Adult valvular cardiac surgeries are done under cardiopulmonary bypass in arrested heart. To arrest the heart different Cardioplegic solutions are being used. St.Thomas Cardioplegic solution is being routinely used by us to produce Cardioplegic arrest. It is a multi-dose cardioplegia which has to be repeated every 20 to 30 minutes during surgery (1, 2). On the other hand, Del Nido cardioplegia provides comparable myocardial protection for longer duration of arrest and hence has advantage of lesser workflow interruptions (1,3). Del Nido contains the following composition

Procaine hydrochloride	13.64mg
Potassium chloride	59.65mg
Magnesium chloride	162.65mg
Sodium metabisulphite	2mg
Disodium edetate	0.1mg
Water for injection	1ml

This cardioplegia has blood to crystalloid in the ratio of 4:1. It is given as cold blood cardioplegia at a temperature between 15 – 20 C. For the past 1 year, del Nido Cardioplegic solution has been is in use for the adult valvular cardiac surgeries as some surgeons prefer it as it has duration longer than multi-dose cardioplegia.

This study, which deals with the usefulness of del Nido cardioplegia in adult cardiac surgery has been conducted in the Department of Cardiothoracic Surgery, Rajiv Gandhi Hospital from March 2015 to March 2016.

Similar study was conducted at the Department of Cardiovascular and Thoracic Surgery of Lokmanya Tilak Municipal Medical College & Sion Hospital. Consecutive patients undergoing elective CABG or DVR surgery were retrospectively studied from January 2015 to January 2016 (6). The aortic cross clamp and bypass times were shorter with Del Nido. Fewer cardioplegia doses were required in the Del Nido group vs. the St.Thomas group, while a single cardioplegia dose was given to 35 Del Nido patients (70%) vs. 0 St.Thomas patients. Postoperative LVEF was better preserved in the Del Nido group. The use of Del Nido leads to shorter cross clamp and CPB times, reduces cardioplegia dosage, and provides potentially better myocardial protection in terms of LVEF preservation, with a safety profile comparable to St.Thomas cardioplegia.

Comparison of del Nido versus Buck berg cardioplegia in adult isolated valve surgery was conducted at Department of Thoracic and Cardiovascular Surgery, Cleveland Clinic, Cleveland, Ohio August 2012 to September 2013(4, 5). Total study population was 394. After aortic valve operations, no hospital deaths occurred, and Troponin T levels were similar, with no statistically significant change in left ventricular ejection fraction. Aortic clamp, bypass, and operating room times were shorter with del Nido solution. After mitral operations, there were no hospital deaths and no statistically significant cardioplegia-specific changes in Troponin T levels or postoperative left ventricular ejection fraction. We found no clear time differences with del Nido solution in mitral cases.

This study couldn't compare effectiveness of del Nido with St.Thomas cardioplegia, as the aim was to conduct a pilot study to assess the feasibility and safety of del Nido cardioplegia in our institution. Similarly, considering the resource limited setting, we weren't able to perform Troponin T levels in all cases like the Cleveland study. However, similar to other studies we found adequate myocardial protection as evidenced by no change regional wall motion abnormalities and LVEF preservation on Echocardiogram.

Limitations of the study

- The sample size is less
- It is not a randomized control study
- The variations in the outcome of the surgery is due to individual variations in the operative techniques, postoperative management etc
- Myocardial protection is assessed in this study with the help of the following
- Need for defibrillation
- Postoperative ICU stay
- Postoperative ECG
- Postoperative ECHO
- The non-availability of enzyme assay such as CK-MB, Troponin T adds to limitation of the study
- Long term follow up is not available.

CONCLUSION

From this study it could be concluded that del Nido cardioplegia could be safely used in adult cardiac surgery since it has the following advantages

- Less frequent dosages needed.
- Less workflow interruptions.
- Smooth recovery from the cardiopulmonary bypass.

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