Myocardial preservation using antegrade versus combined antegrade and retrograde cardioplegia in patients suffering from left main coronary artery disease undergoing coronary artery bypass grafting (CABG).

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Acknowledgement

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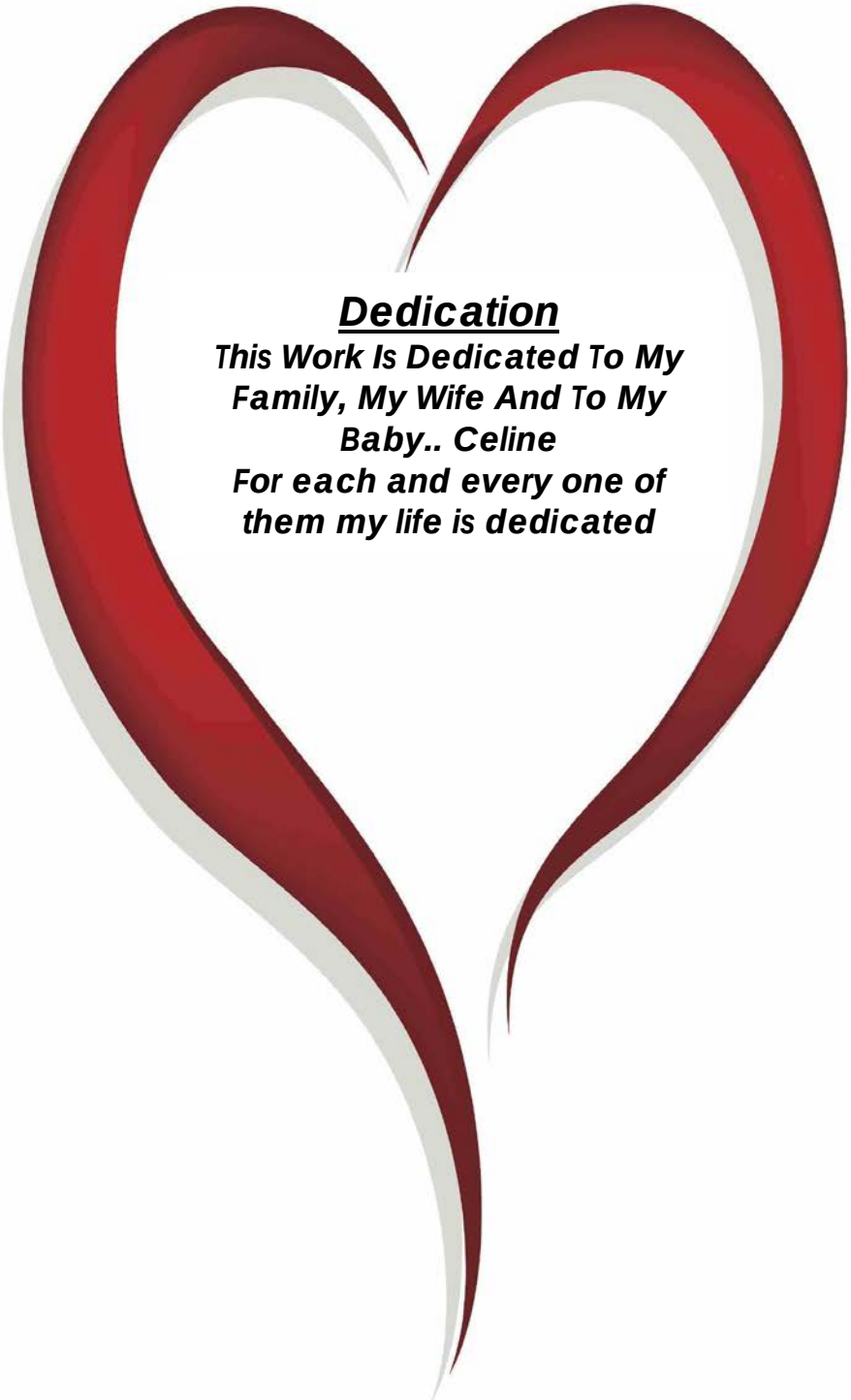

Dedication

This Work Is Dedicated To My Family, My Wife And To My Baby.. Celine

For each and every one of them my life is dedicated

ABSTRACT

Background: The optimal route to delivery cardioplegia solution in patients with ischemic heart disease undergoing CABG surgery is still debatable.

Objective: The objective of this study is to find out the optimum route to deliver cardioplegia in patients with left main coronary artery stenotic disease (whether left main stem or left main equivalent) undergoing CABG surgery.

Patient and Methods: A randomized controlled study on 100 patients with left main stem or left main equivalent coronary artery disease undergoing CABG. Patients were divided into two groups; (group A, used antegrade cardioplegia n = 50) and (group AR, used combined antegrade / retrograde cardioplegia n = 50) both groups were administered the same type of cardioplegia. Cardiac troponin T and CKMB activity were measured in all patients 24 and 48 hours respectively after surgery. Aortic cross-clamp time, total bypass time, recovery rhythm and the need for defibrillation shocks whether in the O.R or I.C.U were all recorded. In addition to ECG monitoring and use of inotropic support intraoperative and in the ICU.

Results: The Troponin T and CKMB levels of group A were higher than those of group AR for the 24 and 48 hour measurements. These differences were statistically significant at all measurements (P=0.001).

Regarding recovery with fibrillation after removal of aortic cross clamp and the need for D.C shock; in Group A (24%) while in Group AR (8%) which is higher in group A (P= 0.001).

There was a higher incidence of significant use of intra-operative inotropic support in group A (27%) compared to (10%) in group AR with significant statistical difference between both groups (P=0.001).

There was higher incidence of postoperative ECG changes in group A (35%) than in group AR(19%) These differences were statistically significant between both groups (P=0.001).

The average cross clamp time and bypass times were higher in group AR (83.58mins, 113.38mins) than in group A (71.32mins, 101.92mins) with significant statistical difference between both groups (P= 0.009, P=0.043).

Conclusion: Although both routes of cardioplegia deliveries allowed for excellent clinical results, cardiac enzymes, initial reperfusion rhythm, use of intra-operative inotropic support and post operative ECG changes, were able to confirm better myocardial preservation in combined antegrade/retrograde delivery of cardioplegia.

Key Words: Antegrade, Retrograde, Cardioplegia, left main, CABG.

CONTENTS

List of Abbreviations

A	Antegrade cardioplegia
ADP	Adenosine diphosphate
AIV	Anterior interventricular artery
AMP	Adenosine monophosphate
AR	Antegrade-retrograde cardioplegia
ATP	Adenosine triphosphate
A-V NODE	Atrioventricular node
BDM	2-3-butanamide
BR-HTK	Bretschneider- Histidine-Tryptophane-Alpha ketoglutarate
CA	Coronary artery
Ca^{++}	Calcium ions
CABG	Coronary artery bypass grafting
CAD	Coronary artery disease
CICR	Calcium induced calcium release
cNOS	Constitutive nitric oxide
CoA	Coenzyme A
COPD	Chronic obstructive pulmonary disease
CPB	Cardiopulmonary bypass
cTn_1	Cardiac troponin I
Diag	Diagonal artery
ECC	Excitation contraction coupling
EDRF	Endothelial derived relaxing factor
EF	Ejection fraction
EM	Resting membrane potential
FAD	Flavin adenine dinucleotide
GCV	Great cardiac vein
GDP	Guanosine diphosphate
GIK	Glucose –insulin- potassium
GTP	Guanosine triphosphate
ICa,L	L- type calcium channel
ICU	Intensive care unit
IHD	Ischeamic heart disease
INa	Fast sodium channel
K^+	Potassium ions
LAD	Left anterior descending artery
LCX	Left circumflex artery
LMB	Left marginal branches
LMT	Left main trunk

MCV	Middle cardiac vein
MI	Myocardial infarction
mm	millimole
MVO	Myocardial oxygen consumption
NADH	Nicotinamide adenine dinucleotide hydrogen
NO	nitric oxide
PDA	Posterior descending artery
Pi	Inorganic Phosphate
RCA	Right coronary artery
RMA	Right marginal artery
RYR	Ryanodine receptors
SR	Sarcoplasmic reticulum
St H-1	St Thomas hospital number one
St H-2	St Thomas hospital number two
TCA	Tricarboxylic acid cycle

List of Tables

List of Figures

Introduction

The word cardioplegia combines the roots "cardio" meaning the heart, and "plegia" meaning paralysis. Technically this means arresting or stopping the heart in order for surgical procedures to be done in a still and bloodless field. However, in practice, the word cardioplegia refers to the solution used to arrest and protect the ischemic myocardium from cell death until the surgical procedure has been done. **(1)**

This is achieved by reducing myocardial metabolism through reduction of cardiac work load which is aided by the use of hypothermia. **(2)**

The optimal delivery of cardioplegic solution to induce and maintain cardiac asystole is fundamental for myocardial preservation during cardiac surgery. The most common procedure to achieve this is via infusing cold cardioplegic solution into the coronary circulation. This protects the myocardium from damage during the period of ischemia. **(3)**

There are many cardioplegic solutions of varying additives. The only vital additive in most solutions is potassium chloride in a 20-35 mmol/L concentration range. Other additives such as mannitol, sodium bicarbonate, xylocaine, et cetera, are of secondary importance. **(4)**