بسم الله الرحمن الرحيم

∞∞∞

تم رفع هذه الرسالة بواسطة / مني مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

Comparison between Percutaneous Coronary Intervention versus Coronary Artery Bypass Graft with Mitral Valve Replacement in Patients with Single Vessel and Mitral Valve Disease

Thesis

Submitted by
Taher Mohamed Eid AbdelMoneim
MSc Cardiothoracic Surgery

In partial fulfillment of MD Degree
in Cardiothoracic Surgery

Supervisors

Prof. Dr/ Walaa Ahmed Saber
Professor of Cardiothoracic Surgery
Faculty of Medicine - Ain Shams University

Prof. Dr/ Osama Abbas Abdelhamid
Professor of Cardiothoracic Surgery
Faculty of Medicine - Ain Shams University

Dr/ Moustafa Gamal ELBarbary
Lecturer of Cardiothoracic Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2022

Acknowledgement

“At first, I thank God; the most gracious and merciful”

I would like to express my deep gratitude to Professor **Dr. Walaa Ahmed Saber**, Professor of Cardiothoracic Surgery, Faculty of Medicine, Ain shams University, for his continuous guidance, his great support during the preparation of this work. His advices were the corner stone in building up of this study. There are no words that can sustain my gratitude to him.

I am also thankful to **Dr. Osama Abbas Abdelhamid**, Professor of cardiothoracic Surgery, Ain shams University, for his brotherly support and continued encouragement over the past months. His influence on this work has been truly inspirational.

Last but by no means least; I’d like to thank **Dr. Moustafa Gamal ELBarbary**, lecturer of cardiothoracic surgery, Faculty of Medicine, Ain shams University for his illuminating discussion and continuous support.

A final thank you goes out to my family, friends, and colleagues who have always supported me; sharing the good times and the most difficult of them as well.

Abstract

Introduction: Combined coronary artery mitral valve disease is a major cause of morbidity and mortality in the adult patient population. Traditional treatment involves combined mitral valve and CABG surgery using a median sternotomy. However, this combined surgical approach confers a higher risk when compared with isolated MV surgery, the risks of such a combined surgical procedure may outweigh the benefits. Thus, the concept of parsing the total risk of a single major procedure to the lesser individual and summed risks of 2 smaller procedures—percutaneous coronary intervention (PCI) plus the mitral valve operation—has been applied in clinical practice and reported by various groups.

Methods: The study was a prospective comparative review of 80 patients with combined single coronary artery (requiring revascularization in non-LAD territory) and rheumatic MV disease, divided into two groups; Group I consisting of 40 patients who underwent staged PCI, and mitral valve replacement 3 months later, and Group II consisting of 40 patients who underwent combined CABG (using saphenous venous graft) and mitral valve replacement. The study centers were Cardiothoracic Surgery Department of Ain Shams University Hospitals, and National Heart Institute (NHI). PCI was done at Cardiology Department of Ain Shams University Hospitals, and National Heart Institute (NHI). The collected data was revised, coded, tabulated and introduced to a PC using statistical package for social Science (SPSS 15.0.1 for windows; SPSS Inc, Chicago, IL, 2001). The outcomes of interest are total cardiopulmonary bypass time, total cross-clamp time, the need for inotropic support, ECG changes in the form of ischemia or arrhythmias, bleeding, cerebrovascular accidents, renal failure, respiratory complications, duration of mechanical ventilation, duration of ICU stay, wound infection, duration of hospital stay, 30-day mortality, major cardiac events or CCU admission within first year, and the need for reoperation for myocardial infarction or ischemia within first year.

Results: The median aortic cross-clamp and cardiopulmonary bypass times were 44 and 62 minutes for Group I, vs 60.5 and 82 minutes for Group II, that difference between groups is statistically significant. 8 patients (20%) in Group I needed inotropic support vs 12 patients (30%) in Group II, which is not statistically significant. No patients in both groups did need any mechanical support in the form of intra-aortic balloon pump (IABP). None of the patients in both groups had

intraoperative ECG changes in the form of ischemia or arrhythmias. The median intensive care unit (ICU) length of stay (hours) and hospital length of stay (days) were 39 hours and 5.5 days for Group I, vs 56.5 hours and 8.5 days for Group II, that difference between groups is statistically significant. The median blood loss (ml) postoperatively was 925 (range 650-1200) in group I vs 1075 (range 900-1400) in group II, which is statistically significant. However, the rate of re-exploration for bleeding did not differ significantly between both groups, with 1 case only (2.5%) in group I vs 2 cases (5%) in group II, and no postoperative delayed cardiac tamponade noted in any of the two groups. The post-operative complications for groups I and II included 0 (0%) vs 3 (7.5%) prolonged mechanical ventilation (>24 h), 0 (0%) vs 1 (2.5%) respiratory complications, 0 (0%) vs 2 (5%) wound infection, 0 (0%) vs 1 (2.5%) cerebrovascular accidents, 2 (5%) vs 1 (2.5%) acute kidney injury, respectively. There is no statistically significant difference between both groups regarding these previous post-operative complications. None of the patients in both groups died within the first 30 days after surgery. None of the patients in both groups had major cardiac events or CCU admission. Postoperative routine trans-thoracic echo (TTE) follow up upon discharge, after 3 months, 6 months, & 1 year were done for all patients in both groups. Regional wall motion abnormalities were noted in 15 patients (37.5%) of group I vs 17 patients (42.5%) of group II, who all undergone stress ECG, of whom 9 patients (22.5%) in group I vs 11 patients (27.5%) in group II showed positive results, and qualified for diagnostic coronary angiography, which confirmed the need for reoperation for myocardial ischemia/infarction within the first year of follow up post-operatively in 4 patients (10%) of group I vs 8 patients (20%) of group II. All these follow up outcomes showed no significant difference between both groups.

Conclusion: a staged approach of PCI followed by MVR is an alternative to the conventional combined CABG and MVR, can be performed safely in some patients with single coronary artery and MV disease, and is associated with good short and follow-up outcomes. Nevertheless, important questions remain, including the optimal timing of the individual procedures, and the optimal antiplatelet therapy after PCI. With ongoing advances in stent technology, procedural techniques, and anticoagulation strategies, as well as the accumulation of long-term outcomes data, hybrid approaches to concomitant coronary artery and mitral valve disease will likely become increasingly common. Tailoring the approach to individual patient pathology and comorbidities is feasible and offers potentially better treatment paradigms.

Table of Contents

Page No.

List of Tables

List of Figures

List of Abbreviations

ACC	American College of Cardiology
ACS	Acute coronary syndrome
ADP	Adenosine diphosphate
AF	Atrial fibrillation
AHA	American Heart Association
AMI	Acute myocardial infarction
AMI	Acute mesenteric ischemia
AV	Atrioventricular
BMI	Body Mass Index
CABG	Coronary artery bypass graft
CAD	Coronary artery disease
CCU	Cardiac Care Unit
COPD	Chronic obstructive pulmonary disease
CPB	Cardiopulmonary bypass
DES	Drug-eluting stents
EACTS	European Association for Cardio-Thoracic Surgery
ECG	Electrocardiogram
EF	Ejection Fraction
ESC	European Society of Cardiology
GP	Glycoprotein
GSV	Great saphenous vein
IABP	Intra-aortic balloon pump

ICU	Intensive Care Unit
IMA	Internal mammary artery
INR	International normalized ratio
IQR	Interquartile range
LA	Left atrium
LAD	Left anterior descending artery
LM	Left main
LV	Left ventricle
MIMVS	Minimally invasive mitral valve surgery
MIVS	Minimally invasive valve surgery
MR	Mitral regurge
MS	Mitral stenosis
MV	Mitral valve
MVD	Mitral valve disease
N	Number
NSTEMI	Non ST segment Elevation Myocardial Infarction
PAP	Pulmonary artery pressure
PARs	Protease-activated receptors
PCI	Percutaneous coronary intervention
PMBC	Percutaneous mitral balloon commissurotomy
RBCs	Red blood cells
SB	Side branch
SD	Standard deviation
STEMI	ST segment Elevation Myocardial Infarction
STS	Society of Thoracic Surgeons

SVT	Supraventricular tachycardia
SYNTAX	Synergy Between Percutaneous Coronary Intervention With TAXUS and Cardiac Surgery trial
TTE	Trans-thoracic echo
TXA2	Thromboxane A2
VSMCs	Vascular smooth muscle cells
VT	Ventricular tachycardia
vWF	von Willebrand factor

INTRODUCTION

The concept of the hybrid operation emerged in the mid-1990s as a strategy for coronary revascularization in the setting of acute myocardial infarction (AMI) [1]. In the most common scenario, a patient who presented with an AMI was emergently taken for angioplasty and found to have multivessel disease. The culprit lesion was treated percutaneously, and the remaining coronary disease was treated with a subsequent CABG. Thereafter, staged PCI and CABG, frequently with off-pump or minimally invasive CABG, was developed as a treatment option for elective coronary revascularization [2-5]. Expanding on this concept, it was realized that patients with valvular disease who presented with an AMI could be managed similarly. First described in 2005 by Byrne et al., the hybrid approach was defined as a staged procedure with initial PCI in the cardiac catheterization laboratory followed by open valve surgery during the same admission. With further experience it became apparent this hybrid approach could be extended to elective procedures. This strategy produced excellent outcomes and paved the way for single-stage procedures [6].

As the complexity of patients referred to cardiac surgery increases, integrated hybrid therapy is becoming an increasingly popular treatment option for patients with

cardiovascular disease. This stems from the fact that this therapeutic strategy entails less-extensive surgical trauma and has the capacity to curtail the magnitude of the surgery involved. By doing so, it has the potential to decrease operative risk while not compromising the outcomes. Furthermore, hybrid strategy combines the tools available to the surgeon with those available to the cardiologist to treat any set of lesions [7].

Interest in hybrid procedures, defined for the purpose of this thesis as Mitral valve surgery and percutaneous coronary intervention (PCI), has intensified with improved coronary stent technology, increased collaboration between cardiac surgeons and interventional cardiologists, and the introduction of hybrid operating suites. The complementary goals of minimizing the morbidity of surgical procedures and optimizing resource utilization have driven development of new solutions for concurrent valvular and coronary heart disease [8].

Combined coronary artery mitral valve disease is a major cause of morbidity and mortality in the adult patient population. Traditional treatment involves combined mitral valve and CABG surgery using a median sternotomy. However, this combined surgical approach confers a higher risk when compared with isolated MV surgery [9,10]. Typically, patients are sicker, operative times are longer, and

morbidity and mortality are increased. Moreover, this combined surgical approach may prove to have a prohibitively high risk in some patients. For instance, in patients with mitral valve disease and either acute coronary syndrome, poor conduit quality, or poor target-vessel quality, as well as low ejection fraction, and in patients undergoing reoperative cardiac surgery, the risks of such a combined surgical procedure may outweigh the benefits [11,12]. Thus, the concept of parsing the total risk of a single major procedure to the lesser individual and summed risks of 2 smaller procedures—percutaneous coronary intervention (PCI) plus the mitral valve operation—has been applied in clinical practice and reported by various groups [13,14].

A hybrid approach that combines PCI with Mitral valve surgery is worthy of consideration and has demonstrated excellent early and mid-term outcomes [15,16]. It has been associated with a lower morbidity and shorter hospital length of stay, when compared with conventional CABG and Mitral valve surgery [17,18]. Patients with combined Mitral valve and CAD with acute coronary syndrome are particularly suitable for this approach, where PCI is performed to the “culprit lesion” followed by valve surgery [19].

Hybrid procedures (PCI and Mitral valve surgery) can be performed as a "two-stage" procedure in two different