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Case Series

Outcome of combined coronary artery bypass grafting and aortic valve replacement; a case series

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ABSTRACT

Introduction: Co-presentation with both coronary and valve diseases is increasing as the age of the individuals referred for coronary artery intervention rises. The study aims to report a single center experience in combined coronary artery bypass grafting and aortic valve replacement (CABG-AVR).
Methods: This is a retrospective study from January 2014 till January 2019 in a single center. Inclusion criteria included those patients that underwent combined coronary and aortic valve procedure in a single operation. The data were collected from the hospital registry. All patients underwent preoperative coronary angiography, transthoracic echocardiography (TTE), Doppler study was performed for those patients with previous stroke and peripheral vascular diseases. The cases were followed up for a mean duration of 2 years.
Result: The study included 62 patients, 38 of them were males, the mean age was 57 years. Prosthetic mechanical valves were inserted in all of the cases, left internal mammary artery (LIMA) was harvested in all the cases, 24 patients (38.7%) had single graft, 26 cases (41.9%) two grafts, and 12 (19.3) had three grafts. The mean cross clamp time was 148.9 min and mean cardiopulmonary bypass (CPB) time was 187 min. The overall mortality rate was 6.4% (4 patients).
Conclusion: With maximum myocardial protection and minimum cross clamp and CPB time and meticulous technique, the outcome of combined CABG-AVR is comparable with isolated CABG or isolated AVR.

1. Introduction

Co-presentation with both coronary and valve diseases is increasing as the age of patients referred for coronary artery bypass grafting (CABG) surgery rises. If aortic stenosis (AS) is severe or the patient is symptomatic, single-stage aortic valve replacement and CABG should be carried out [1]. For patients with combined valvular and coronary artery diseases (CAD), AVR-CABG is an acceptable surgical intervention. Even though there are some contradictory conclusions in the literature, most authors approve that performing CABG with AVR marginally increases long-term survival, even in the high-risk population [2]. Calcified AS is often associated with coronary artery diseases and coronary grafting is an obligatory task during the AVR procedure [3]. The most common operation joined to the correction of aortic valve pathology is CABG [3,4]. Despite the increasing risk, AVR-CABG is the third most recurrently accomplished technique behind isolated CABG and AVR [4]. This study tries to expose a single-center experience in the surgical treatment of aortic valve pathology combined with CABG surgery.

2. Patients and methods

2.1. Registration

The study registry has been provided in line with the declaration of Helsinki—"Every research study involving human subjects must

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be registered in a publicly accessible database before recruitment of the first subject". The research was registered in the Chinese Clinical Trial Registry. ChiCTR190021262 is the registration number.

2.2. Study setting and design

This is a retrospective study conducted from January 2014 till January 2019 in a single center with an academic setting. Approval has been taken from the Ethical committee of Kscien organization for scientific research. The study has been arranged in line with the PROCESS criteria [5].

2.3. Participants

Inclusion criteria included those cases that underwent combined coronary and aortic intervention. The data were collected from the hospital registry. Exclusion criteria were prior sternotomy, active endocarditis, at least moderate aortic insufficiency, and associated major procedures except for CABG (such as mitral valve repair).

2.4. Preoperative preparation

All patients underwent preoperative coronary angiography, transthoracic echocardiography (TTE), Doppler study was performed for the patients with previous stroke and peripheral vascular diseases. CAD is defined by the presence of stenosis greater than 50% in at least one epicardial artery. All patients underwent a questionnaire regarding the overall health status compared with the time before the operation, current quality of life, the use of anticoagulants; re-hospitalization and specific complications.

2.5. Operative intervention

Ordinary cardiac operation monitoring was used. The procedure was performed through a complete median sternotomy. Before the institution of CPB, the grafts were harvested. LIMA was harvested in the pedicle fashion. The saphenous vein was harvested in the standard fashion. After heparin administration, CPB was instituted followed by the aortic cross clamping, normohermia for patients with borderline renal function, mild hypothermia (32 C) for the rest. Blood cardioplegia was used, induced by antegade and maintained by retrograde fashion, hot shot was given in most cases. Venting the left ventricle through superior pulmonary vein was performed. Distal anastomoses were done first followed by transverse aortotomy. The leaflets were removed and meticulous decalcification was done. Separated suture technique was practiced to insert the aortic prosthesis. Sutures 2/0 with pledged in most cases in the aortic face and in the other ventricular face were used. The heart was de-aired and the aortic clamp removed after the closure of the aorta. The heart revived spontaneously in most cases, few cases needed direct current (DC) shock. Proximal anastomoses were performed, at the end of the operation the cannulas were removed and protamine was given. Mediastinal and pleural drains were placed before chest closure.

2.6. Who performed the procedures

A specialized team composing of two specialists, senior house officers and nurses operated on the patients.

2.7. Post-intervention considerations

Intravenous antibiotics (Ceftriaxone 1 g × 2, Ampiclox 1 g x 4), analgesic (paracetol bottle 1 × 3) during the hospital stay, while they were prescribed oral antibiotics (Ciprofloxacin 500 mg x 2) and analgesic (paracetol tablet 500 mg, 1 × 4) at least for the seven days at home. Follow-up of patients in long-term is obtained through clinical visits and telephone interviews with patients and/or their family.

2.8. Statistical analysis

The data were registered into the excel sheet, later, they were shifted to Statistical Package for the Social Sciences (SPSS) software, version 22 after coding. Descriptive analysis was calculated and analytical tests were used for the comparison if indicated.

3. Result

The study included 62 patients, 38 of them were males, the mean age was 57 years. They were elective cases, pre-operative angiography showed more than 50% stenosis of coronary arteries (Table 1).

Prosthetic mechanical valves were used in all of cases, LIMA was harvested in all cases, 24 patients (38.7%) had single graft, 26 cases (41.9%) two grafts, 12 (19.3) three grafts. Mean cross clamp time was 148.9 min and mean CPB was 187 min, The overall mortality rate was 6.4% (4 patients), one of them could not be weaned from the bypass, the second one was CVA that required prolonged respiratory support, the third one was cardiac tamponade, and the last one was multi-organ failure (Table 2).

4. Discussion

CABG and Aortic valve operations occupy an important part in cardiac surgery in different cardiac centers all over the world. Concomitant correction of aortic valve pathologies with CABG increases the difficulty of the operation and influences early and late outcomes. The leading indication for coronary intervention is to alleviate symptoms like angina not responding to other types of management. Surgical intervention decreases the rate of life threatening events (death, myocardial infarction, angina recurrence) more than other forms of treatment modalities [2,6]. When indicated, a single session, concomitant CABG with valve surgery is comparatively harmless with satisfactory early outcomes and complications. CABG when combined with double valve replacement, increases the risk of postoperative morbidities and mortality [2].

Regarding this study, the mortality rate was 6.4%, this is compatible with international studies, The 4th European Association for Cardiothoracic Surgery Adult Cardiac Surgery 2010 database reported that overall mortality for isolated valve surgery is

Table 1
Pre-operative variables.

Pre-operative variables	Number	Percentage
Male	38	61.2%
Female	24	38.7%
Diabetes Mellitus	22	35.4%
COPD	8	12.9%
Asthma	2	3.2%
Peripheral vascular disease	2	3.2%
Stroke	2	3.2%
Hypertension	28	45.1%
Dyslipidemia	16	25.8%
Aortic pathology		
Aortic stenosis	32	51.6%
Aortic regurgitation	30	48.3%
Previous PCI	2	3.2%
Ejection fraction (mean)	61.95	

Table 2
Post-operative hospital morbidity and mortality.

Variable	Number	Percentage
ICU stay	48 h	–
Mortality	4	6.4%
Pericardial effusion	3	4.8%
Pleural effusion	6	9.6%
Deep sternal wound infection	2	3.2%
Heart block	3	3.2%
Respiratory complication	4	6.4%
Arrhythmia	2	3.2%
Re exploration	1	1.6%
Renal impairment	6	9.6%
CVA	2	3.2%
GIT bleeding	3	4.8%
Hospital stay	5–7days	

3.7% while for CABG combined with valve procedures it increases to 6.2% [7]. Wijns W and colleagues reported a 4. 3% mortality rate of aortic valve surgery, ranging from 1 to 8%, while in combined surgery mortality ranges from 2 to 10% [8]. The overall operative mortality in R. Gunay et al. study was 10% while Ahmed OF et al. reported a 14% mortality rate [2,9]. Operative mortality ranging from 5.5% to 7.5% for AVR-CABG procedures over the last 10 years [10]. Over the last ten years, the Society of Thoracic Surgeons National Cardiac Database has described a fair even though continuously higher operative mortality rate in patients undergoing AVR with CABG (4.5%) versus isolated AVR (3%) [11].

About 9.6% of patients developed symptomatic pleural effusion (PE) in the first month after surgery that required re-admission and intervention. Approximately 10% of patients post-CABG develop PE that occupies more than one-four of the hemithorax. Most CABG related PEs are left sided [12]. Anticoagulants (unfractionated heparin, low-molecular-weight heparin, and warfarin), clopidogrel, anti-arrhythmic agents, and diuretic agents have also been associated with PE development, which may be partly due to the underlying conditions for which such medications are prescribed. In this study, all the patients were taking acetylsalicylic acid both preoperatively and postoperatively [13]. Four (5.6%) and 5 (5.9%) patients were using clopidogrel in the pleural effusion group and non-pleural effusion group, respectively (P-value less than 0.000). In the current era, because of the increased complexity of the procedures and extensive anticoagulation and, the incidence of PE might be higher [14]. In this study there are a lot of causes that can be blamed for the pleural effusion, long surgery, CPB, use antiplatelet and anticoagulation, routine use of LIMA.

In this study, there was 4.8% pericardial effusion that necessitated re-admission. Pericardial effusion was commonly associated with PE; this also has been confirmed by Ikäheimo and colleagues [15]. As with PE, Logically, there should be an association between anticoagulation and the occurrence of pericardial effusion. However, in the literature this relationship is hardly reported apart for large effusion [16]. Malouf and associates compared the occurrence of postoperative pericardial effusions in cases with and without systemic anticoagulation, the study denied the relationship for a small and moderate amount of effusion while confirmed for huge effusion [17]. A study investigated the potential risk factors for prolonged pericardial effusion and reported that the risk factors for prolonged pericardial effusion were sex, age at repair, body weight, duration of bypass, low oxygen saturation before the operation, wound infection after operation, time for endotracheal intubation, duration of stay in hospital, and Nakata index [18].

In the current data, 4.8% of patients developed upper gastrointestinal bleeding that needed transfusion, the incidence of gastrointestinal complications is variably reported in the literature, ranging from 0.3% to 5.5% with an average incidence of approximately 1.2% [19]. Peptic ulcer disease (PUD) and bleeding from the upper gastrointestinal tract is a rare serious postoperative complication (0.35–0.9%) with significant morbidity [21]. In this study it was mostly due to antiplatelet and anticoagulant drugs as well as stress ulcer due to this type of surgery.

There are several limitations to this study. These include the retrospective nature of this study, poor compliance of patients, single-center experience and lastly small sample size.

5. Conclusion

With maximum myocardial protection and minimum cross clamp and CPB time, perfect and meticulous technique, the outcome of combined CABG-AVR is comparable with isolated CABG or isolated AVR.

Ethical approval

Kscien's ethical approval was taken.

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Author contribution

Okba F. Ahmed: Substantial contribution to the concept and design, data collection, literature review and writing of the manuscript.

Saoud Y Al-Neaimy: data collection, literature review and writing of the manuscript.

Fahmi H. Kakamad, Rawezh Q.S, Shvan H.M: substantial contribution to the concept and design, drafting the manuscript. Final approval of the manuscript.

Abdulwahid M. Salih: substantial contribution to the concept and design and Final approval of the manuscript.

Guarantor

Fahmi Hussein Kakamad.

Research registration number

The research was registered in Chinese Clinical Trial Registry. The registration number was ChiCTR1900021262.

Declaration of Competing Interest

None to be declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijso.2019.11.004.

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