



CORONARY ARTERY BYPASS GRAFTING WITH OR WITHOUT CORONARY ENDARTERECTOMY – SHORT TERM OUTCOMES

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Author's Contribution

Jl: Conducted the study and wrote the article. MB: Helped in review the article. AS: Re-arranged data and corrected article. BM and AM: Helped in data collection.

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ABSTRACT:

BACKGROUND: The surgical options for diffuse coronary artery disease (CAD) are still controversial especially, in patients with advanced atherosclerotic disease. Coronary endarterectomy (CE) adjuvant to coronary artery bypass graft (CABG) has a successful role in the recovery of these patients, however, postoperative and long term outcome and complications restrict its usage when compared with CABG alone. This study was designed to compare peri and postoperative outcome of patients undergoing CABG with CE and CABG alone.

MATERIAL AND METHODS: In this observational study retrospective data collection was done from September 2010 to 2018. A total of 200 patients who underwent CABG were included and divided into two groups: group A patients underwent CABG and group B patients underwent CABG with coronary endarterectomy. Patients were managed by a single surgeon at various public and private healthcare settings. Adult patients of both genders were studied. Patients with history of previous bypass grafting were excluded. The study outcomes were postoperative morbidity such as myocardial infarction (MI), re-exploration and mortality.

RESULTS: Age and gender of patients were comparable among both groups with male dominance. Postoperative MI, re-exploration, respiratory failure, stroke, mediastinitis were found slightly greater in the CABG with CE group. Two (2.0%) patients died in CABG group and 3 (3.0%) in CABG with CE group. Hospital stay was significantly longer in CABG with CE group (7.8 versus 7.0 days; p-value, 0.008). Similarly, the stay in intensive care was also significantly longer in CABG + CE group (3.5 versus 2.4 days; p-value; 0.001).

CONCLUSION: Coronary endarterectomy may be a feasible method for adequate and complete revascularization of complex and diffuse coronary artery disease in patients undergoing CABG.

KEYWORDS: Cardiac diseases, coronary endarterectomy, coronary artery bypass grafting, outcomes

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INTRODUCTION:

Coronary endarterectomy (CE) is a useful but still controversial technique regarding its long term outcome.^{1,2} Serious cardiac patients with multi-vessel, diffuse and complex CAD with left ventricular dysfunction are more commonly treated with CABG.²

However, approximately 25% of patients with complex and diffuse disease cannot be successfully and safely grafted, and are thus considered inoperable.³ In addition, elderly patients with multiple co-morbidities, having undergone previous percutaneous coronary interventions (PCIs), increasingly present with severe and diffuse atherosclerotic disease, which also confer a high operative risk and poor postoperative outcomes.³ In experienced hands, CE has been performed with good results.

Coronary endarterectomy may be a procedure which can change the inoperable and ungraftable disease to an operable and graftable one. Many surgeons are still reluctant to use coronary EA primarily because of increased mortality and myocardial infarction rate postoperatively compared with CABG alone. This technique is likely to be more needed in the future as we see more diabetic patients with diffuse disease and previous multi vessel stenting.^{4,5}

Comparative studies evaluating CE versus CABG have been criticized for their non-randomized nature and inherent selection bias. As such, endarterectomy patients tend to have more complex and diffuse disease patterns compared with those undergoing CABG.^{5, 6, 7}

Despite several studies defining the role of coronary endarterectomies there is still continued uncertainty regarding its potential.^{8,9} The purpose of this study was to compare the use of CABG with CE and conventional CABG. The primary aim was to evaluate the effect of CE on the frequency of peri- and postoperative MI and early mortality. The secondary outcome was the impact of CE on major morbidities, length of stay and overall vessel patency.

MATERIAL AND METHODS:

In this observational study, retrospective data collection was done from September 2010 to 2018. A total of 200 patients who underwent coronary artery bypass surgery were enrolled in this study and divided into two groups: group A underwent routine CABG and group B underwent CABG with CE. This is a single surgeon study conducted at different institutions with analyzing

data of Coronary artery Bypass Graft surgery cases retrospectively. Only the first 30 days postoperative outcome was evaluated. The medical records of all patients between ages 18 to 80 years who underwent CABG (coronary artery bypass grafting) at Pakistan Institute of Medical Sciences Islamabad, Bilal Hospital, Rawalpindi and Quaid-e-Azam International Hospital, Rawalpindi and Rawalpindi Institute of Cardiology were reviewed. All patients were assessed preoperatively by using Euro Score for standardizing the risk and expected outcome. Inclusion criteria for the patients were elective coronary artery bypass grafting with age over 18 years, provision of informed consent for CABG was mandatory for elective cases.

The exclusion criteria was based on the features like any associated heart surgery, emergency surgery, cardiogenic shock, preoperative intra-aortic balloon pump, recent MI within last one month, a history of supra-ventricular tachycardia, atrial fibrillation, renal, respiratory impairment, previous stroke, transient ischemic attacks and coagulopathy.

Patients were evaluated with the aid of daily progress parameters. Daily ECG was done to monitor any event postoperative MI or Ischemia, specifically, in cases of endarterectomies, how inotropic support was weaned off, early mobilization, respiratory efforts, wound healing, frequency of arrhythmias, renal function and return of bowel habit. Chest radiography was performed as routine on day 1 before surgery and on the 2nd, 3rd, 4th, 5th and 7th postoperative days. Later on all the patients were followed up in outdoor clinic first weekly then after two weeks and monthly basis. Parameters of clinical improvement in quality of life were freedom from symptoms, sternal dehiscence and mediastinal drainage of any kind were recorded till 30th day postoperatively.

Data was entered and analyzed in SPSS software (version 21.0). The continuous numerical variables like age, hospital stay, and operative time were measured as mean and standard deviation. The categorical variables like gender, clinical features and mortality were measured as frequency and percentages. Student's t-test was applied to compare means between the two study groups whereas chi square test was used to compare frequency of different clinical and per operative and post operative findings between the study groups. A p-value of < 0.05 was considered statistically significant.

RESULTS:

In this observational study which was analyzed

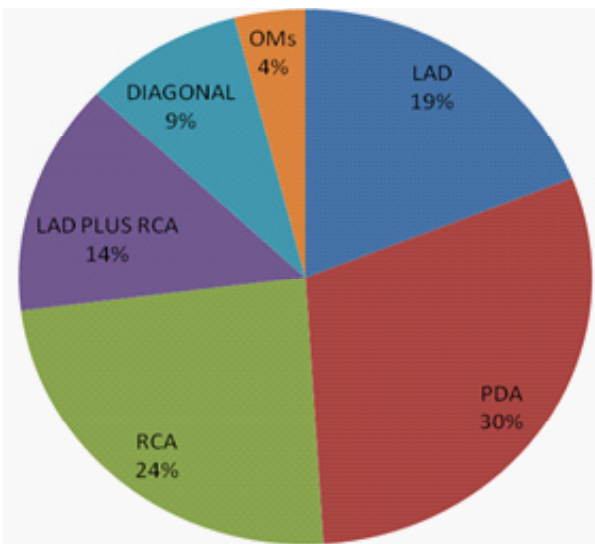


Figure 1: Common endarterectomies performed in the study.

by collecting retrospective data. in which two interventions i.e. CABG alone and CABG + CE were compared in terms of intra and postoperative findings. 100 patients were present in both groups A & B each. Age was comparable between the two groups in group A, there were 65 male and 35 females with a mean age of 54.5 ± 11.2 years whereas in group B, there were 80 males and 20 females, with a mean age of 53.4 ± 10.3 years. Females were slightly dominant in CABG alone group (35% versus 20%). Unstable angina was found more prevalent in CABG + CE group than CABG alone (41% versus 28%). The chronic diseases like hypertension, diabetes mellitus, dyslipidemia and congestive heart failure, peripheral arterial disease, renal failure and COPD were

Table 1: Distribution of Demographic and Clinical characteristics in the two groups

	CABG group (n=100)	CABG + CE group (n=100)
Age (years)	52.4 ± 13.4	53.3 ± 11.8
Female patients	35 (35.0%)	20 (20.0%)
Unstable angina	28 (28.0%)	41 (41.0%)
Prior myocardial infarction	2 (2.0%)	5 (5.0%)
CCS class 3 or 4	11 (11.0%)	16 (16.0%)
Ejection fraction (%)	40 ± 10.5	40 ± 14.3
Left main disease	20 (20.0%)	13 (13.0%)
Triple-vessel disease	79 (79.0%)	82 (82.0%)
History of PCI	28 (28.0%)	35 (35.0%)
Congestive heart failure	6 (6.0%)	11 (11.0%)
Hypertension	38 (38.0%)	34 (34.0%)
Diabetes mellitus	60 (60.0%)	58 (58.0%)
Dyslipidemia	8 (8.0%)	11 (11.0%)
Smoking history	23 (23.0%)	19 (19.0%)
Cerebrovascular disease	18 (18.0%)	16 (16.0%)
Peripheral arterial disease	2 (2.0%)	4 (4.0%)
Renal failure	9 (9.0%)	7 (7.0%)
COPD	7 (7.0%)	9 (9.0%)
Preoperative use of IABP	4 (4.0%)	5 (5.0%)
Previous cardiac operation	0 (0.0%)	0 (0.0%)

Table 2: Perioperative details of grafting between the two groups

	CABG group (n=100)	CABG + CE group (n=100)	p-value
Operative data			
LIMA to LAD	92 (92.0%)	86 (86.0%)	0.25
SVG to LAD	8 (8.0%)	14 (14.0%)	
No of vessels diseased			
D1	23 (23.0%)	17 (17.0%)	0.37
D2	13 (13.0%)	11 (11.0%)	0.82
OM1	56 (56.0%)	38 (38.0%)	0.01
OM2	62 (62.0%)	58 (58.0%)	0.85
OM3	69 (69.0%)	71 (71.0%)	0.89
RI	46 (46.0%)	53 (53.0%)	0.39
PDA	78 (78.0%)	82 (82.0%)	0.76
PLV	26 (26.0%)	38 (38.0%)	0.09
RCA	22 (22.0%)	18 (18.0%)	0.48

Table 3: Intraoperative and postoperative findings between the two groups

	CABG group (n=100)	CABG + CE group (n=100)	p-value
Operation time (minutes)	180.0 ± 30.6	189.0 ± 25.6	0.02
CBP time	75.9 ± 15.0	84.5 ± 10.6	0.001
X Clamp time	40.2 ± 11.5	43.0 ± 9.00	0.06
Intubation time (hours)	8.9 ± 2.9	8.11 ± 5.2	0.68
ICU stay (days)	2.4 ± 1.6	3.5 ± 2.4	0.001
Postoperative EF (%)	40.2 ± 11.4	35.9 ± 10.0	0.005
Hospital stay (days)	7.0 ± 2.4	7.8 ± 1.8	0.008
Low output syndromes	2 (2.0%)	7 (7.0%)	0.16
Perioperative myocardial infarction	3 (3.0%)	6 (6.0%)	0.27
IABP	9 (9.0%)	13 (13.0%)	0.49
Re-exploration for Bleeding	3 (3.0%)	5 (5.0%)	0.72
Respiratory failure	4 (4.0%)	3 (3.0%)	1.0
Ventricular arrhythmias	9 (9.0%)	15 (15.0%)	0.27
Atrial Fibrillation	22 (22.0%)	32 (32.0%)	0.15
Stroke	3 (3.0%)	2 (2.0%)	1.0
Mediastinitis	2 (2.0%)	3 (3.0%)	1.0
Operative Mortality	2 (2.0%)	3 (3.0%)	1.0

found equally distributed between the two groups in this study. Further details of clinical presentation can be seen in table 1.

The per operative details of grafting were compared between the two groups. LIMA to LAD was observed in similar proportions in both CABG and CABG + CE groups i.e. (92% versus 86%, respectively). Some variation was noted in terms of OM1 between the two groups (56.0% versus 38.0%; p-value, 0.01) respectively. Similarly, PLV graft was noted in greater proportion of CABG + CE group than CABG alone (38.0% versus 26.0%). Further details of grafting per operative can be seen in table 2.

The most common endarterectomy was performed on PDA (30.0%), followed by RCA (24.0%), LAD (19.0%) and LAD plus RCA done in (14.0%) study cases. (Figure 1)

The intra operative and postoperative findings of patients in the two study groups were compared. The mean operative time was significantly longer in CABG + CE group (189 minutes versus 180 minutes; p-value, 0.02). Similarly, CBP (coronary bypass) time was also longer in CABG + CE group



(84.5 versus 75.9; *p*-value, 0.001). Postoperative EF% was found better in CABG alone group than CABG + CE group (40.2% versus 35.9%; *p*-value, 0.005). The other intra and postoperative complications like MI, re-exploration for bleeding, respiratory failure, stroke, mediastinitis were found greater in CABG + CE group. There were two (2.0%) mortalities in CABG group and 3 (3.0%) in CABG + CE group. The overall hospital stay was longer in CABG + CE group (7.8 versus 7.0 days; *p*-value, 0.008). Similarly, the stay in intensive care was also significantly longer in CABG + CE group (3.5 versus 2.4 days; *p*-value; 0.001). (Further details can be found in table 3).

DISCUSSION:

Cardiovascular disease is a common issue in both developing and developed countries. The multitudes of surgical options for these conditions make it difficult for surgeons to opt an ideal procedure. Some patients are managed conservatively safely and effectively, however, many cardiac conditions and other serious coronary artery disease conditions need surgery which pose a constant challenge for cardiac surgeons.¹⁰ For revascularization, coronary endarterectomy has been used successfully to facilitate CABG procedure. In this study the short term survival of patients was similar in both CABG alone and CABG + endarterectomy groups. Sabzi F and colleagues also reported that OPCAB and OPCAB + CE have similar short and longer term survival after procedure.¹⁰ Many others have also witnessed this trend, it has been noted that completed revascularization improved early and late outcomes after CABG procedure.^{11,12} A meta-analysis by Song Y et al proved that CABG + coronary endarterectomy was associated with decreased long term graft patency than isolated CABG.¹³ Variable findings regarding these interventions have been witnessed, one earlier report assessed coronary artery bypass grafting and coronary endarterectomy and concluded that it can be used with great success and less chances of postoperative morbidity and mortality.¹⁴

In the present study postoperatively it was noted that operative time, hospital stay and ICU duration were all significantly longer in the CABG with endarterectomy group compared to CABG alone. Many previous studies have also shared evidence of shorter hospital stay after isolated CABG than CABG with endarterectomy. Sabzi F et al noticed a longer ICU stay in the CABG + CE group than CABG alone.¹⁰ Another previous trial, also reported a longer ICU and overall hospital stay in the CABG

+ CE group than patients managed with CABG alone.¹⁵

Many previous studies have also witnessed lesser morbidity and mortality with CABG alone when compared with CABG + CE.¹⁶ In the current study the peri-operative and post-operative MIs were noted in (6% versus 3%) in combination and CABG alone group. This is in continuation with previous literature on the topic.^{17,18} Nardi P et al recently concluded that perioperative MI is not negligible, in the presence of diffusely diseased coronary artery vessels CE associated with CABG appears to be a feasible adjunctive surgical tool. Furthermore they stated that CE on the LAD suggests a higher degree of freedom from late cardiac death.¹⁹ Ghatnatti R and colleagues found that graft patency is better with open technique. Anticoagulation regimen though not uniform, the overall outcome remains the same in most studies including ours. Therefore, it is important to focus on the current results to accept CE with CABG as a routine procedure in diffusely diseased coronaries, like conventional CABG.²⁰ Despite abundance of evidence, many still suggest careful approach. A meta-analysis by Song et al concluded that use of CE in CABG requires novel studies with detailed observational data from bench to bedside and to see its feasibility, surgeons should always weigh the benefits and complications after CE and prepare the patient for surgery accordingly.²¹ The peri and postoperative findings suggest that though CABG plus endarterectomy has similar success in coronary artery diseases as CABG alone, the complications post operatively are of great concern and suggest that the latter should be continued as primary choice with safety and great success. And ways to improve and alter these interventions should be searched continuously.

This study has many advantages; firstly, very few studies on this topic are available from our national settings. The limitations were mainly related to the observational retrospective design such as selection bias and missing information of long term outcome and follow-ups.

The limitations of the study were that it is a retrospective study and selection of cases is biased so future studies may be carried out in prospective manner, so selection bias may be avoided.

CONCLUSION:

Coronary endarterectomy may be a feasible method for adequate and complete revascularization of complex and diffuse coronary artery disease in patients undergoing CABG.



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