

Reconstruction of extensively diseased Left Anterior Descending Coronary Artery by Endarterectomy and Patch Plasty: Short term results

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Abstract

Background: Ischemic heart disease was the leading cause of death worldwide. Patients with increasingly complicated anatomic substrates are being referred for surgery as a result of the expanding use of percutaneous coronary procedures to achieve cardiac revascularization.

Objectives: This study aimed to compare different techniques of LAD surgical reconstruction using endarterectomy, patched with internal mammary artery or venous graft. Discussing it as a solution for complex LAD anatomy and chronic occlusion in the diffusely diseased atherosclerotic artery.

Patients and Methods: This prospective study included 30 patients who underwent CABG surgery at the Cardiac Surgery Department, Sohag Specialized Center and Cardiothoracic Surgery Department, Qena University Hospital.

Results: In our study, the pre-operative data were as follows: 21 patients (70%) had unstable angina, 11 patients (36.7%) had left main artery damage, and 16 patients (53.3%) had previous MI with mean EF of 53.5 ± 9.9 . Half of the patients had NYHA class III, 13 (43.3%) class IV and two patients (6.7%) class II. The endarterectomy group had a significantly higher mean reconstruction length 6.95 ± 1.9 cm than the patch plasty group 4.8 ± 1.2 cm ($p=0.008$). While the number of anastomoses, cross-clamp time, ventilation time, ICU stay, hospital stay, and inotropic support days showed insignificant differences between the two groups. The endarterectomy group had higher patients with AF, mediastinitis, and bleeding requiring exploration than the patch plasty group. The patch plasty group had higher patients with MI, need for dialysis, stroke and mortality but with statistically insignificant differences.

Conclusion: Endarterectomy or patchplasty reconstruction of a diffusely damaged LAD results in good and comparable results in both procedures. The atherosclerotic plaque's features and extent should be taken into account when selecting the procedure. Both groups showed improvement in ejection fraction and NYHA classification postoperative.

Keywords: CAD; LAD; Endarterectomy; Patch plasty.

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Introduction

Ischemic heart disease was the principal cause of death worldwide in 2010 as the recent decades have witnessed a dramatic rise in the number of patients with coronary artery disease (CAD). This rise in number is due to the widespread use of modern techniques in diagnosis and management. (Forget, 2016)

The major goal of coronary artery bypass grafting is complete revascularization of the coronary arteries, particularly the left anterior descending artery (LAD), which is important for postoperative results (CABG). Patients with more complicated anatomic substrates are now being referred for surgery as a result of the percutaneous coronary interventions (PCIs) that are being used to accomplish myocardial revascularization. Furthermore, surgical candidates are typically older in age, have more serious coronary lesions, and have several concomitant conditions. One of the most challenging circumstances the surgeon must handle is possibly diffuse CAD. (Santini et al., 2002; Elsayed et al., 2018)

Therefore, traditional CABG cannot be safely and effectively used to treat up to 25% of patients with diffuse CAD. In these circumstances, endarterectomy has been given another look as a supplement to traditional CABG since a distal anastomosis in a diffusely damaged artery, like the LAD, may leave a sizable myocardial territory supplied by sizable side branches

ischaemic, defying the principle of CABG aiming at complete revascularization. (Nishi et al., 2005; Santini et al., 2002) Endarterectomy can be performed using a variety of surgical procedures, primarily open and closed techniques. The diffusely diseased coronary vessel's atheromatous plaque or calcified core must be removed in each case in order to create a neo-vascular bed that can be revascularized utilising one of the common arterial or venous conduits. (Chi et al., 2015; Nishigawa et al., 2017)

The first description of coronary endarterectomy (CE) as a way of treating coronary artery disease without needing cardiopulmonary bypass and CABG was made by Baily and collaborators in 1957. In the 1960s and 1970s, there were reports of a significant postoperative morbidity and mortality associated with this treatment. As a result, CE was scrutinised and its viability was questioned. (Takanashi et al., 2008; Ghatanatti & Teli, 2017)

But with the current trend of treating more cases of diffuse coronary artery disease, surgical therapy for severe and diffuse coronary artery disease has become increasingly necessary, which has led to a resurgence in interest in CE. (Papakonstantinou et al., 2014)

Coronary artery patchplasty also was revisited in order to achieve complete revascularization. The pericardium, saphenous vein, internal mammary, and pulmonary artery were among the patch materials employed. Patchplasty

alone with bypass grafting or combined with endarterectomy is also an excellent alternative to LAD reconstruction.

Hence in this study, we tried to clarify the different modalities of LAD reconstruction, studying the morbidity and mortality associated with these techniques and whether these techniques provide a solution for diffuse coronary artery diseases.

Patients and methods

This prospective observational study was conducted in the Cardiac Surgery Department, Sohag Specialized Center and Cardiothoracic Surgery Department, Qena University Hospital on 30 patients who underwent CABG surgery with the following criteria;

Inclusion criteria:

Elective CABG patients required LAD reconstruction (endarterectomy, patchplasty).

Exclusion criteria: The patient requires endarterectomy in other coronary arteries rather than LAD, redo CABG and associated valvular heart disease.

Methods & Data Collection

The collection of data was done through a preformed datasheet that included the following:

A- Pre-operative data:

- a thorough history taking, clinical examination, blood tests, electrocardiogram (ECG), and radiographic testing.
- Detailed pre-operative echo was done, clarifying left ventricular dimensions (End diastolic diameter and End

systolic diameter), function (Ejection fraction EF) and segmental wall motion abnormalities.

- Coronary angiography showed the percentage of stenosis, calcifications, and residual lumen diameter.
 - Operative risk assessment using Euro score and NYHA(New York Heart Association) classification for dyspnea and angina assessment.
- B- Operative data:** Anesthetic procedure, total operative time, cross-clamp time, total bypass time and intraoperative complications or events.
- All patients had CABG using a conventional cannulation and a median sternotomy incision. The left mammary artery was always anastomosed to the left anterior descending artery, unless the harvested mammary artery was short or the anastomosis was exceptionally long. In these circumstances , we first employed a venous patch on the LAD, and then we anastomosed the LIMA to the vein patch. When a normal LIMA anastomosis to the LAD was not possible, the LAD was rebuilt.
 - We created a mid-LAD arteriotomy that may extend proximally or distally depending on the situation.
 - The atheromatous plaque was excluded from the LAD lumen during reconstruction.
 - In patients undergoing endarterectomy, Using a micro dissector, the atheroma was

painstakingly separated from the LAD by the separation between the atheromatous plaque and the latter.

- Endarterectomy was performed on patients who had ulcers, big, soft, or brittle plaques, or insufficient distal run-off. The atheromatous cylinder was given enough traction to disrupt the proximal end, but smooth tapering of the distal cylinder should be accomplished.
 - Different anastomosis techniques for reconstruction were documented.
- C- **Postoperative data:**
- Postoperative course: total ICU stay, duration of mechanical ventilation, use of inotropic support (pharmacological or mechanical), need for blood transfusion, presence of arrhythmia and total hospital stay.
 - Postoperative echocardiographic assessment is done before discharge and at six months clarifying the function and dimensions of LV and segmental wall motion abnormalities.
 - Postoperative complications: bleeding, low cardiac output state, acute renal failure, respiratory complications and neurological complications.
 - Clinical assessment of angina and dyspnea degree using NYHA classification.
 - Angiographic study at six months postoperative (MSCT angiography or coronary catheterization).

Outcomes operational definitions

Operative Death was defined as occurring within 30 days of discharge or during the same hospital stay during which the surgery was conducted, unless it was clearly unconnected to the procedure.

Stroke was described as a group of neurologic symptoms with an abrupt onset brought on by a disruption in the cerebral blood flow that lasted more than 24 hours.

Renal failure: one or more of the following due to acute or deteriorating renal function. Increase the most recent pre-operative creatinine value by two times, the serum creatinine level to over 2 mg/dL, or the need for dialysis. (Elsayed et al., 2018)

Statistical analysis

Data were tabulated using a statistical spreadsheet program, and these data were analyzed using SPSS version 26.0. Data were grouped as discrete and continuous variables: Discrete variables: were represented in the form of frequency and percentage tables. Continuous variables: were presented in the form of mean and standard deviation. Pearson's chi-square test of significance and Yates' correction for 2x2 tables to determine the statistical significance among them were used to compare qualitative variables among groups. The Whitney U test was used to compare quantitative data between two groups, while the Wilcoxon rank-sum test was used to compare quantitative data before and after the intervention. A p-value < 0.05 was considered to represent a significant difference.

Results

This prospective study included 30 patients who underwent CABG surgery in the cardiac surgery department, Sohag specialized center and Cardiothoracic Surgery Department at Qena University Hospital. The patients had a mean age

of 59.3±9.1 years old, and most were males (80%), with a mean BSA of 1.97±1.39. Nearly all the patients, 29(96.7%), had dyslipidemia, 21(70%) had hypertension, 19(63.3%) had DM and 16(53.3%) were smokers. (Table.1).

Table 1. Basic demographic data of the patients (N=30)

Variables	N=30
Age (years)	
mean±SD	59.3±9.1
median(range)	59(26-74)
Gender (n,%)	
Male	24(80%)
Female	6(20%)
BSA (m ²)	
mean±SD	1.97±1.39
median(range)	1.95(1.73-2.23)
Risk factors (n,%)	
DM	19(63.3%)
Insulin use	8(26.7%)
HTN	21(70%)
Smoking	16(53.3%)
Dyslipidemia	29(96.7%)
Comorbidities (n,%)	
COPD	14(46.7%)
Renal impairment	2(6.7%)
Previous CVD	6(20%)
PVD	3(10%)

Abbreviations: *BSA*=body Surface Area, *COPD*=chronic obstructive pulmonary disease, *CVD*=cardiovascular disease,

DM=diabetes mellitus, *HTN*=hypertension, *PVD*= Peripheral vascular disease.

In (Table.2), 21(70%) of patients had unstable angina, 11(36.7%) had left main artery damage, and 16(53.3%) had previous

MI with a mean EF of 53.5±9.9. Half of the patients had NYHA class III, 13(43.3%) class IV and 2(6.7%) class II.

Table 2. Pre-operative data of the patients (N=30).

Variables	N=30
Cardiac profile	
Unstable angina	21(70%)
Left Main Artery	11(36.7%)
Previous MI	16(53.3%)
EF % mean±SD	53.5±9.9
NYHA class	
II	2(6.7%)

III	15(50%)
IV	13(43.3%)

Abbreviations: *EF*=ejection fraction, *MI*=myocardial infarction, *NYHA*= New York Heart Association.

(Table.3) shows that three and four anastomoses were the most commonly used. Also, two third of patients did patch plasty and one-third did endarterectomy. The mean time of

ICU was 3.3 ± 1.3 days, the mean hospital stay was 7.8 ± 2.2 days and the mean inotropic support day was 1.4 ± 1.3 days.

Table 3. Intra-operative data of the patients (N=30).

Variables	N=30
No. of distal anastomosis	
2	1(3.3%)
3	14(46.7%)
4	14(46.7%)
5	1(3.3%)
Cross clamp time (minute)	
mean±SD	60.5±16.4
median(range)	59(35-90)
Method of reconstruction	
Patchplasty	20(66.7%)
Endarterectomy	10(33.3%)
Length of reconstruction (cm)	
mean±SD	5.5±1.8
Median(range)	5.3(3-10.5)
Time of ventilation (hours)	
mean±SD	6.8±5.1
median(range)	5(3-24)
ICU stay (days)	
mean±SD	3.3±1.3
median(range)	3(2-6)
Hospital stay (days)	
mean±SD	7.8±2.2
median(range)	7(6-15)
Inotropic support days	
mean±SD	1.4±1.3
median(range)	1(0-6)

Abbreviations; *ICU*=intensive care unit.

(Table.4) shows the frequency of the postoperative complications as atrial fibrillation was the highest 6(20%), then stroke and exploration 4(13.3%), need for dialysis and Mediastinitis 2(6.7%), one patient had MI and one mortality case. This table

showed that patients had mean postoperative EF of 55.2 ± 14.2 , with most of them in NYHA class I (83.3%), 93.3% had patent LIMA and only one patient was admitted to CCU. Most patients took clopidogrel (63.3%) and (33.3%) took NOAC.

Table 4. Postoperative complications during hospital stay among the patients (N=30).

Variables	N=30
Myocardial infarction	1(3.3%)
Need for dialysis	2(6.7%)
Stroke	4(13.3%)
Atrial fibrillation	6(20%)
Mediastinitis	2(6.7%)
Bleeding requiring exploration	4(13.3%)
Mortality	1(3.3%)
Post-operative ejection fraction	
mean±SD	55.2±14.2
median(range)	58.5(25-68)
Postoperative NYHA class	
I	25(83.3%)
II	4(13.3%)
LIMA patency	28(93.3%)
CCU admission	1(3.3%)
Medications	
Plavix	19(63.3%)
NOAH	10(33.3%)

(Table.5) showed that patients differed significantly in their NYHA classification before and after treatment ($p < 0.001$). Patients had a

statistically significant increase in mean EF postoperative 55.2 ± 14.2 than pre-operative 55.2 ± 14.2 ($p = 0.005$).

Table 5. Comparison between pre and postoperative data.

Variables	Pre-operative N=30	Postoperative N=29	P-value
NYHA class			
I	0(0%)	25(83.3%)	<0.001*
II	2(6.7%)	4(13.3%)	
III	15(50%)	0(0%)	
IV	13(43.3%)	0(0%)	
Post-operative ejection fraction			0.005*
mean±SD	53.5±9.9	55.2±14.2	
median(range)	53(25-68)	58.5(38-73)	

*Statistically significant at $P < 0.05$; McNemar test used for comparing pre and postoperative; NYHA: New York Heart Association.

The endarterectomy group had a significantly higher mean reconstruction length 6.95 ± 1.9 cm than the patch plasty group 4.8 ± 1.2 cm ($p=0.008$). While the number of

anastomoses, cross-clamp time, ventilation time, ICU stay, hospital stay, and inotropic support days showed insignificant differences. (**Table.6**).

Table 6. Comparison of intra-operative data according to reconstruction methods.

Variables	Patch plasty N=20	Endarterectomy N=10	P-value
No. of distal anastomosis			
2	1(5%)	0(0%)	0.413 ¹
3	8(40%)	6(60%)	
4	10(50%)	4(40%)	
5	1(5%)	0(0%)	
Cross clamp time (minute)			
mean±SD	60.3±16.8	60.9±16.3	0.926 ²
median(range)	59(37-90)	59(35-90)	
Length of reconstruction (cm)			
mean±SD	4.8±1.2	6.95±1.9	0.008*¹
Median(range)	3.5(3-7)	6(4.5-10.5)	
Time of ventilation (hours)			
mean±SD	6.9±4.8	6.7±5	0.920 ¹
median(range)	8(4-24)	7(4-17)	
ICU stay (days)			
mean±SD	3.05±0.32	3.7±0.24	0.215 ¹
median(range)	3(2-6)	3(2-5)	
Hospital stay (days)			
mean±SD	7.5±1.3	8.3±1.5	0.365 ¹
median(range)	7(6-14)	8(6-15)	
Inotropic support days			
mean±SD	1.3±0.89	1.7±1	0.429 ¹
median(range)	1(1-6)	1(0-4)	

Abbreviations; ICU=intensive care unit. Man Whitney U test used, 2. Fisher exact test was used. *Statistically significant as $p < 0.05$.

The endarterectomy group had higher patients with AF, mediastinitis, and bleeding requiring exploration than the patch plasty group. The patch

plasty group had higher patients with MI, need for dialysis, stroke and mortality but with statistically insignificant differences (**Fig.1**).

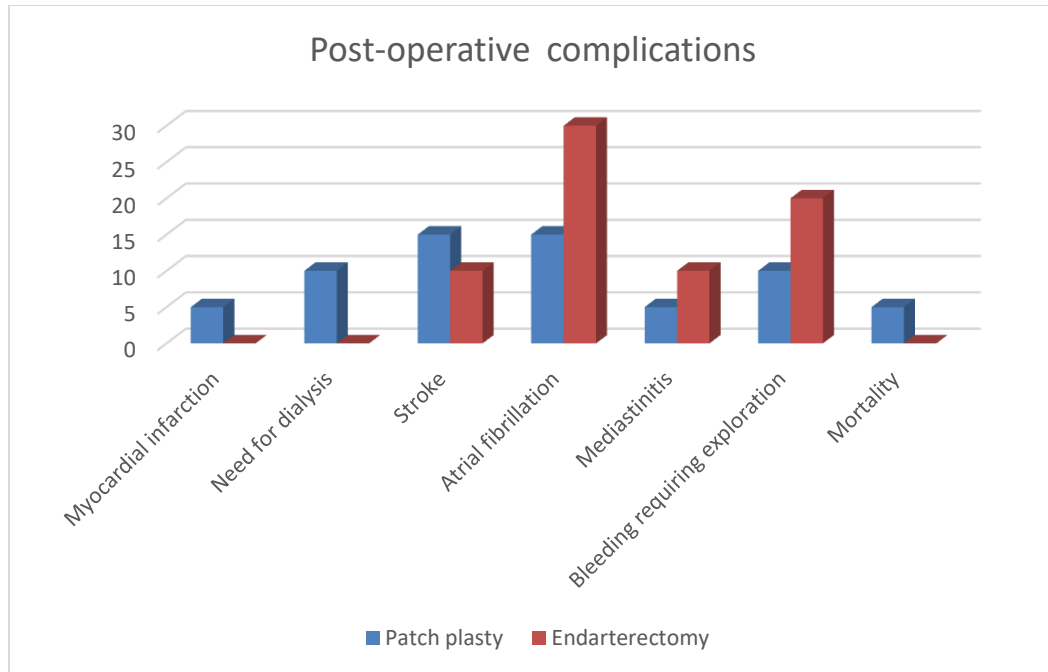


Fig.1. Postoperative complications distribution according to methods of reconstruction.

Discussion

Conventional CABG would not optimally revascularize the ischemic territories in up to 25% of patients with diffuse CAD. Therefore, endarterectomy regained popularity, expanding the surgical choices available for this intricate anatomy. The calcific atheromatous core of the coronary artery is removed during endarterectomy. Using a small incision in the arterial wall and steady, mild traction, the closed endarterectomy procedure, also known as the pull-out approach, removes the atheromatous plaque from the coronary artery. Despite the potential for insufficient endarterectomy, or the so-called "snowploughs effect," to obstruct the distal LAD or its branches, this approach is less complex. (Santini et al., 2002; Shapira et al., 1988)

Therefore, this study aimed to compare different techniques of

LAD surgical reconstruction using endarterectomy, patched with internal mammary artery or venous graft. Discussing it as a solution for complex LAD anatomy and chronic occlusion in the diffusely diseased atherosclerotic artery

This prospective study included 30 patients who underwent CABG surgery at the cardiac surgery department, Sohag specialized center and cardiothoracic surgery department, Qena university hospital.

In our study, the pre-operative data were 21(70%) of patients had unstable angina, 11(36.7%) had left main artery disease, and 16(53.3%) had previous MI with a mean EF of 53.5 ± 9.9 . Half of the patients had NYHA class III, 13 (43.3%) class IV and two patients (6.7%) class II.

Our findings were in line with the perioperative MI rates reported by Schmitt et al. (Schmitt

et al., 2009) of 3%, Byrne et al. (Byrne et al., 2004) of 3%, Myers et al. (Myers et al., 2012) of 4%, Sundt et al. (Sundt et al., 1999) of 2%, and Ni Our cases were therefore more serious than those in these studies.

As was the case in the studies by Myers et al. (Myers et al., 2012) and Elsayed, there was no statistically significant difference between the two groups receiving endarterectomy and patch plasty in our investigation. (Elsayed et al., 2018)

In our investigation, there was a single occurrence of fatality (3.3%). Mortality was reported to be 1.1% by Nishizawa et al. (Nishigawa et al., 2017), 5.0% by Schmitt et al. (Schmitt et al., 2009), 2.7% by Takanashi et al. (Takanashi et al., 2008), 3.0% by Byrne et al. (Byrne et al., 2004), and 2.9% by Nishi Mortality was 5% in the patch plasty group and 0% in the endarterectomy group when groups were compared, although it was not statistically significant. According to Myers et al. (Myers et al., 2012), the mortality rate in the LIMA group was 4.1%, which was not statistically significant but was somewhat higher than the 3% rate in the saphenous venous patch group.

There was no difference in the 13 percent death rate that Owais et al. (Owais & Abdelfattah, 2016) observed in either of their groups. A CT coronary angiography performed six months after surgery in the current study revealed a patency rate of 93.3 percent, with two

patients having stenotic LIMA to LAD anastomoses. Two patients underwent patch plasty, and there was no statistical difference between them. Early surgical haemorrhage necessitating reexploration and requiring a delayed start to the anticoagulation was our rationale for the patient in the patch group who had occlusion. The CT coronary angiography was performed six months after surgery in the Elsayed et al. (Elsayed et al., 2018) Study, which revealed a patency rate of 93.1%. Coronary angiography was performed in the Nishigawa et al. (Nishigawa et al., 2017) study at a median of 7 days (range 0-85 days), with a patency rate of 91.6 percent. Takanashi et al. (2008) reported a 94 percent early patency rate.

The patients of Nishi et al. (Nishi et al., 2005) were under early and late angiographic control. His early patency rate was 92.1 percent, and at midterm follow-up, which lasted an average of 21 months, it was 89.1 percent. Despite none of the patients being in class 1 preoperatively, the NYHA class considerably altered in our study postoperatively, with 83.3% of patients improving to fall in class 1. According to the Elsayed et al. study, 69% of patients had NYHA class 1 status after surgery, compared to none of the patients before. Schmitt et al. (Schmitt et al., 2009) also reported that the NYHA class had improved following the procedure. Regarding the method of reconstruction, there was no change. Sundt et al. (Sundt et al., 1999) observed that 27% of their patients experienced a

recurrence of angina. At one year, Byrne et al. (Byrne et al., 2004) reported 90% relief from anginal discomfort.

In their examination of 9600 patients who underwent primary CABG, Sergeant et al. (Sergeant et al., 1998) found that 8% of patients experienced a recurrence of angina. Both authors hypothesised that the difference in symptom recurrence between patients undergoing endarterectomy and those receiving primary grafting may be due to the patients who require endarterectomy having preexisting severe and diffuse pathology of the coronary disease as well as inadequate endarterectomy done in the LAD or other coronary arteries.

Our antithrombotic strategy started with unfractionated heparin in the ICU. Acetylsalicylic acid (ASA) 75 to 100 mg and NOAC as early as possible, usually within 6 hours postoperatively, to avoid postoperative bleeding. NOAC with ASA for six months, followed by DAPT for life.

Takanashi et al. (Takanashi et al., 2008) indicated that low-molecular-weight heparin was the first step in their anticoagulation programme, followed by triple treatment.

In addition to low-dose aspirin for life, Myers et al. (2012) utilised LMWH for the first 24 hours before switching to warfarin (3 months) or clopidogrel (1 year) and using LMWH again. Six hours after entering the intensive care unit (ICU), Nishi et al. (Nishi et al., 2005) administered low molecular weight heparin, then

low-dose aspirin and warfarin (INR = 2.0), which were kept up for the rest of their lives.

In this study, the endarterectomy group had a significantly higher mean length of reconstruction 6.95 ± 1.9 cm than the patch plasty group 4.8 ± 1.2 cm ($p=0.008$). While the number of anastomoses, cross-clamp time, ventilation time, ICU stay, hospital stay, and inotropic support days showed insignificant differences.

In 166 patients, Bitan and his associates contrasted the two methods of LAD restoration. They discovered no distinctions in in-hospital results. They noted extended ischemia and CPB durations in endarterectomy patients, which they attributed to the patients' concurrent valve surgery and advanced age. (Bitan et al., 2018)

In the present study, the endarterectomy group had higher patients with AF, mediastinitis, and bleeding requiring exploration than the patch plasty group. While the patch plasty group had higher patients with MI, need for dialysis, stroke and mortality but with statistically insignificant differences. In comparison to individuals who received CABG without endarterectomy, coronary endarterectomy was linked to higher postoperative complications and mortality. Despite the fact that individuals who underwent endarterectomy had more severe pathology than those who did not, According to a recent meta-analysis, patients in high-risk categories or those with severe LAD disease who underwent

endarterectomy together with CABG as opposed to solo CABG had greater rates of postoperative renal problems, myocardial infarction, and overall mortality. However, they discovered no distinction between the groups' short- and long-term outcomes when they compared more current data released after 2000. In **(Byrne et al., 2004)**

In a study on LAD reconstruction without endarterectomy in 524 individuals, Ogus and colleagues observed 1.9% mortality, 6.9% myocardial infarction, and 91.4% long-term patency of the LIMA-LAD anastomosis. **(Ogus et al., 2007)** Some surgeons claimed that off-pump reconstruction of the LAD had better results than on-pump reconstruction. **(Shen et al., 2019)** The LAD was patched using a number of techniques, such as an on-lay LIMA patch or a saphenous venous patch followed by LIMA grafting. In 96 patients, Berretta and colleagues evaluated the two methods of LAD patching and found that LIMA resulted in greater hospital and long-term survival. **(Beretta et al., 1992)** Other entities can be addressed using patch reconstruction of the LAD. In six patients with numerous overlapping stents, Demir and colleagues conducted stent endarterectomy of the LAD and patching; they reported positive postoperative angiographic results. **(Demir et al., 2015)** .

A coronary artery after endarterectomy lacks the endothelial lining. The rapid coagulation cascade in the early

postoperative period and the thrombus formation cascade are both started by this exposed area, which accounts for the increased postoperative MI rate. Therefore, thromboprophylaxis plays a crucial role in how such patients turn out. However, the anticoagulant protocols used are based on the protocol of the performing institute. This is because there aren't enough comprehensive studies out there, and there aren't any published guidelines that make it obvious when anticoagulant and antiplatelet medication should be used in endarterectomy patients. Neurological issues varied from 0 to 6 percent, perioperative MI was 0% to 19%, and operative-related mortality was 0% to 19%, according to a review by Soylu et al. The satisfactory patency rates following coronary endarterectomy ranged from 56% to 100% at postoperative follow-ups lasting anywhere between 6 months and 10 years. In line with our trial, where coronary endarterectomy was accompanied by a 100% patency rate. **(Soylu et al., 2014)** Our findings are consistent with those of the Elsayed et al. **(Elsayed et al., 2018)** study. In severely damaged coronary arteries, coronary endarterectomy is regarded as a beneficial surgical method. It can be done with acceptable morbidity, mortality, and angiographic patency rates and result in positive results in a high-risk population with the right patient selection and skilled hands.

The prospective design of the study, which is suitable for reporting these uncommon

procedures, is one of the study's many advantages. One of the study's flaws is the lack of long-term follow-up, which is necessary to ascertain the effect of both operations on the long-term patency of the grafts, re-intervention, and survival. Additionally, we did not routinely perform coronary angiography for all patients, and ECG was the primary technique for detecting postoperative ischemia that needed further investigation. Additionally, it is not random. To identify early ischemic episodes, we advise doing CA or MSCT angiography before hospital discharge.

Conclusion

The results of endarterectomy or patching after reconstructing a severely damaged LAD are good and comparable in both methods. The atherosclerotic plaque's features and extent should be taken into account when selecting the procedure. Both groups showed improvement in ejection fraction and NYHA classification postoperative.

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