



## A CASE OF MULTIVESSEL CORONARY ENDARTERECTOMY IN OPCABG: A CASE REPORT

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### ABSTRACT

We described a case of multi-vessel coronary endarterectomy due to diffuse coronary artery disease with multiple comorbidities. A 45-year-old man presented with features of ischemic heart disease (IHD) and on evaluation with coronary angiogram (CAG) patients was diagnosed as a case of Triple vessel disease with diffuse involvement of coronary artery. After evaluation patient undergone off pump coronary artery bypass grafting (OPCABG) with Coronary endarterectomy (CE) of left anterior descending artery (LAD), first Diagonal artery and right coronary artery (RCA) for total myocardial revascularization. There were no postoperative complications, and on the 11th post-operative day patient was discharged from the hospital in good ambulatory condition. Follow-up after 6 months, the bypass graft both native artery and conduits were patent.

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### INTRODUCTION

Despite the existence of controversial debates on the efficiency of coronary endarterectomy (CE), it is still used as an adjunct to coronary artery bypass grafting (CABG).<sup>1</sup> This is particularly true in patients with end stage diffuse coronary artery disease. Given the improvements in cardiac surgery and postoperative care, as well as the rising number of elderly patient with numerous co-morbidities, re-evaluating the pros and cons of this technique is needed.<sup>1,2</sup> Despite its first adverse results, several current publications have shown that coronary endarterectomy with on-pump or off-pump coronary artery bypass grafting can be safely performed with acceptable mortality, morbidity, and angiographic patency rates. Coronary endarterectomy can assure complete revascularization supplying the myocardium with satisfactory blood flow in cases of a diffusely diseased or diffuse calcification, thus preventing residual ischemia. Hence, it is important to evaluate current results, rethink this old recipe, and redefine its indications.<sup>3,4</sup>

The spectrum of patients referred for coronary artery bypass graft (CABG) surgery is fast changing in recent decades. Patients are older and more often than not are afflicted with other morbidities such as hypertension, diabetes mellitus,

cerebral and peripheral vascular disease, renal dysfunction, and chronic pulmonary disease.<sup>5</sup> In addition, many patients referred for CABG have advanced and diffuse coronary disease, and one or more catheter-based interventions or surgical revascularization procedures were already performed. Because of the diffuse disease, vessels may not be graftable, and complete revascularization using conventional CABG may not be feasible. Incomplete myocardial revascularization procedure was shown to adversely affect short-term and longterm outcomes after coronary surgery.<sup>3,6</sup> However, up to 25% of patients with diffuse CAD cannot be safely and successfully treated by standard CABG.<sup>7,8</sup> Therefore, several techniques including coronary endarterectomy, which involves the removal of the atherosclerotic core from the coronary artery lumen through an arteriotomy, have been proposed to expand surgical possibilities.<sup>9</sup> We present our experience with simultaneous off-pump coronary artery bypass grafting and endarterectomy in three coronary vessels in a patient.

#### Case presentation

A 45 years old male presented with the complains of central chest pain on exertion for last 6 months which was constricting in nature radiating to the left side of jaw aggravated by heavy exercise and relieved by taking rest and medication. Patient

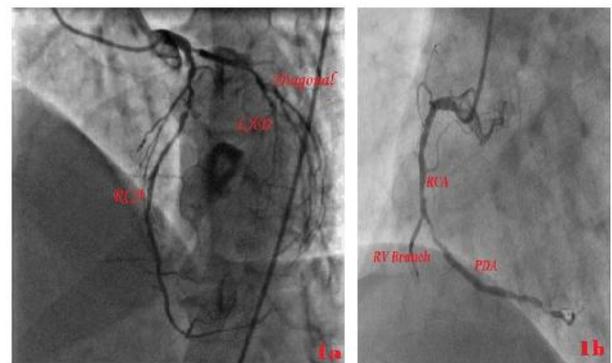
has had past medical history of hypertension, diabetes and chronic renal insufficiency. His ECG showed features of IHD (left axis deviation, old antero-septal myocardial infarction, inverted T-waves). He underwent coronary angiogram which revealed Triple vessel disease that includes lesion in proximal LAD 80%, Diagonal 70- 80%, 80% stenosis after origin of principle OM and also 80% stenosis in the proximal part of RCA (Figure-1). After evaluation and routine check-up, patient was scheduled for OPCABG. The operation was performed through standard median sternotomy. Skeletonized Left internal mammary artery (LIMA) and left great saphenous vein was harvested with ACT more than 350 seconds. The Starfish Heart positioner and Octopus Tissue Stabilizer were applied to the heart. A bloodless field was obtained using a proximal 5-0 prolene suture and oxygen blower. Coronary endarterectomy (CE) was done from the left anterior descending artery (LAD), 1<sup>st</sup> Diagonal artery and right coronary artery (RCA) before distal anastomosis was performed; however, we used left internal mammary artery (LIMA) as a conduit for LAD graft and reverse saphenous venous graft used for Diagonal and RCA anastomosis (Figure-2). We decided to performed CE per-operatively because of diffuse severe and circumferential atheromatous lesion, which could not be excluded by extensive reconstruction and only CABG was insufficient to provide good distal run off because of severely calcified plaques. A 10mm coronary arteriotomy was done in the middle portion of the LAD and atheromatous core was carefully dissected from the adventitia with fine forceps, and extracted plaque with slow sustain and continuous traction. Then LIMA was incised to match the length of the LAD arteriotomy and anastomosed to the LAD with 7-0 polypropylene sutures. Similarly, endarterectomy of the 1<sup>st</sup> Diagonal artery and right coronary artery was done as mention above. Then the anastomosis was done using reverse saphenous vein graft; proximally to the ascending aorta using a side biting clamp and distally to diseased vessel after the endarterectomy has been performed.

Postoperatively, anticoagulation therapy with Heparin (5,000 IU 8 hourly for 48 hours) bridging to Warfarin (5mg) was prescribed from early postoperative period usually from 1<sup>st</sup> postoperative day. Low-dose Aspirin (75 mg/day), Clopidogrel (75 mg/day), and warfarin (titrated to a target international normalized ratio of 1.5 to 2.5) were started after the initiation of oral intake. His postoperative recovery was uneventful. On the Follow-up of the patient after 6 months, there was symptomatic improvement in the patient.

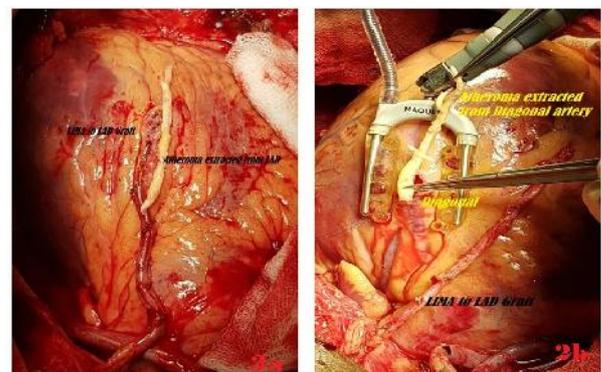
## DISCUSSION

In our review, coronary endarterectomy provide total myocardial revascularization in case of diffuse coronary artery disease and we used closed endarterectomy technique in which CE were performed manually by slow sustain and continuous traction of atheromatous plaque with the aid of delicate Ring Forceps, utilizing the closed methods trailed by reproduction of anastomosis with preplanned graft; which is similar to other study described by Ranjan *et al.*<sup>2,3</sup> However, in this case we extracted 10.5cm atheromatous plaque from RCA during OPCABG (Figure-3); though longest one atheroma was described by Ranjan *et al* which was 14cm long.<sup>2</sup> The arteriotomy incision was approximately 10mm, however incision was stretched out for another 2-3mm in case of RCA endarterectomy; which is also similar to other study.<sup>3-5,8-10</sup>

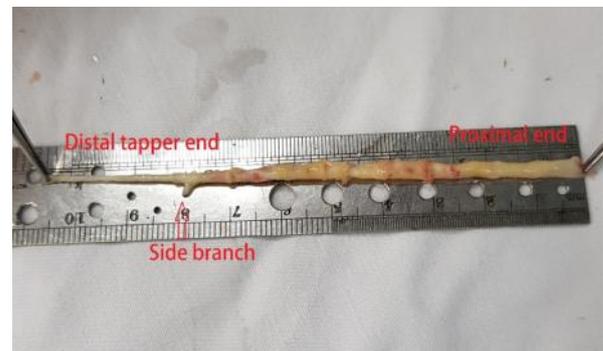
Coronary artery bypass grafting is a worldwide routine cardiac surgery procedure to revascularized ischemic myocardium of patients with severe coronary artery disease.<sup>11,13</sup> Coronary endarterectomies with aortocoronary bypass grafting is controversial, with rates for mortality of 0%-10%, perioperative infarction of 5%-30%, and anastomosis patency rate is of 38%-100%.<sup>14,15</sup> This variability in outcome, clinical improvement and disappearance of symptoms in 74-95% of endarterectomy patients, makes it impossible to clearly identify the limit between precise indication and excess practice of the procedure. Therefore, surgery should be personalized according to the perioperative findings and be performed carefully, since increased troponin-I and CK-MB levels have been reported with coronary endarterectomy.<sup>3,16-18</sup>



**Figure 1** Coronary angiogram (CAG) illustrates multi-vessel coronary artery disease. (1a) Lesion in left anterior descending artery (LAD), Diagonal artery, right coronary artery (RCA); (1b) Severe stenosis in mid part of RCA after right ventricular branch.



**Figure 2** Per-operative figures demonstrate atheroma specimen and distal anastomosis. (2a) Left internal mammary artery to left anterior descending artery graft with extracted atheroma specimen; (2b) Atheroma removed from Diagonal artery.



**Figure 3** Long segment atheroma specimen (10.5cm) extracted from right coronary artery during OPCABG.

With the recent progress in percutaneous coronary intervention (PCI) using drug-eluting stents, multiple overlapping stents

(full-metal jacket) have been increasingly used for the treatment of diffuse coronary artery disease; however, in-stent restenosis still remains a major complication after PCI, although its incidence has declined.<sup>10-12,16</sup> Moreover, particularly in the left anterior descending artery (LAD), PCI is frequently unable to achieve complete revascularization of the myocardium supplied by the side branches (stent jail). Therefore, only CABG has been the main treatment option for diffusely diseased coronary arteries. However, conventional distal anastomosis to a non-diseased segment is often difficult to perform in the diffusely diseased LAD and does not relieve the myocardium supplied by those side branches affected by diffuse atheromatous plaques.<sup>11,15,18</sup>

Coronary endarterectomy (CE) is a surgical option to achieve complete myocardial revascularization in such cases. Several reports have described the improved surgical outcomes of CE, which had been initially reported to be associated with perioperative death and morbidity.<sup>1,14-18</sup> With the advent of percutaneous transluminal coronary angioplasty, the patients now referred for surgery with presenting diffuse, complex lesions in which sometimes only CABG fail to bring total myocardial revascularization and influence postoperative surgical outcome. Therefore, coronary endarterectomy is an option that can be used in combination with anastomosis of aortocoronary bypasses to overcome this incomplete revascularization.<sup>16</sup> On-pump or off-pump endarterectomy helps to achieve effective and total myocardial revascularization that otherwise appear to be inoperable.<sup>19</sup> However, we should consider the various factors like, apparent increase in myocardial infarction rates, vessel rupture due to inappropriate traction, low long-term patency rates without endarterectomy, and mortality rates, in order to offer total revascularization in patients who cannot receive percutaneous angioplasty and to provide a surgical option for patients who would otherwise be inoperable.<sup>3,18,19,21</sup>

Post-operative anticoagulation therapy is vital to prevent graft occlusion as well as native endarterectomized artery occlusion by thrombus.<sup>9,16-18</sup> Following coronary endarterectomy, routine Heparin infusion was prescribed to prevent thrombosis in the early post-operative period followed by oral Warfarin for next 6 months, and double anti-platelet agent for life long.<sup>2,3,18,19</sup> In our study, we started Heparin in early postoperative period usually for 48 hours, followed by bridging to Warfarin (5mg) orally from 1<sup>st</sup> post-operative day. From 3<sup>rd</sup> Post-operative day, we started Warfarin (2.5-5mg) for next 3-6 months and dose adjusted according to INR findings (Targeted was INR 1.5-2.5). We also advised Clopidogrel and Aspirin (75mg) for lifelong following CE with OPCABG, which also described in other articles.<sup>2,3,20,21</sup> This present case report observed that multi-vessel CE (Coronary endarterectomy) with off-pump coronary artery bypass graft is attainable and provide total myocardial revascularization; when only CABG is inadequate to achieve sufficient myocardial revascularization.

## CONCLUSION

CE offers a good surgical option for patients with diffuse calcified coronary artery disease in whom total myocardial revascularization otherwise could not be obtained.

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