

## CASE REPORT

## DIFFUSE CORONARY ARTERY DISEASE – A CHALLENGE TO REVASCULARIZE AND THE ROLE OF CORONARY ENDARTERECTOMY

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Coronary endarterectomy is a useful adjunct procedure in patients with diffuse coronary artery disease when isolated coronary artery bypass grafting does not permit adequate revascularization. The primary aim of this procedure is to enable ample blood flow by removing the obstructing plaque. Herein we discuss the case of a middle-aged patient who underwent coronary endarterectomy.

**Keywords:** Coronary endarterectomy; Diffuse coronary artery disease; CABG

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### INTRODUCTION

Diffuse coronary artery disease (CAD) continues to present a challenge for interventional cardiologists and cardiac surgeons looking to achieve adequate revascularization. Coronary artery bypass grafting (CABG) is a common procedure widely used in CAD patients; the resulting revascularization however may not be adequate in all patients undergoing CABG. This is especially true for patients with widespread and extensive involvement of the coronary arteries. Inadequate revascularization has been shown to adversely affect short-term and long-term outcomes.<sup>1</sup> An ancillary procedure commonly performed in patients with diffuse CAD is coronary endarterectomy (CE), which by way of plaque removal permits sufficient blood flow following CABG. CE has divided opinion among surgeons globally ever since its inception over half a century ago. There have been growing concerns about the risks inherent to this procedure; one of the more notable drawbacks frequently mentioned is the loss of protective intima leading to a higher risk of thrombosis<sup>2</sup> and thus intraoperative myocardial infarction (MI).

Nevertheless, due to current lack of superior alternatives as well as some recent literature showing favourable outcomes<sup>3,4</sup> there is a case to be made for performing this procedure in patients with diffuse involvement of the coronary arteries. Many surgeons perform this procedure regularly to achieve good short-term and long-term revascularization in such patients.

In our experience we have encountered three types of plaques: 1) Caseous, 2) Calcific, and 3) Fibrous. Caseous plaques are soft and cheesy

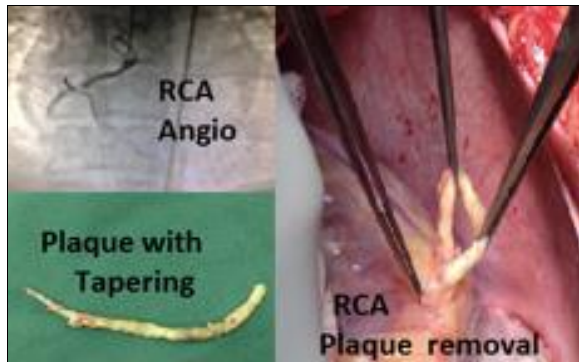
and thus cumbersome to remove completely. A combination of irrigation and long arteriotomy is needed for complete removal. In contrast, calcific plaques pose an entirely different challenge. These plaques are brittle and break easily. The third type, a fibrous plaque, is relatively easy to remove and can be adequately pulled out of the vessel intact with tapering ends using the right surgical technique.

### CASE PRESENTATION

In this article we discuss the case of a 42-year-old male patient presenting with diffuse triple vessel disease. The patient presented with angina symptoms along with increasing fatigue on exertion. He had a normal ejection fraction on echocardiography, but coronary angiography revealed extensive triple vessel disease (Figure-1). No history of previous surgeries was noted. Given the extent of involvement seen on angiography and subsequently intra-operatively, it was decided that the patient would benefit from right coronary artery (RCA) endarterectomy (Figure-1).

We performed an on-pump CABG for this patient in the Cardiothoracic Surgery ward of Rehman Medical Institute Peshawar. For the RCA endarterectomy we made a 0.5 cm longitudinal arteriotomy incision with a No.11 blade, staying anteriorly on the vessel and extending with Potts scissors. The plaque was elevated with the use of forceps and mosquito clamp. The endarterectomy was performed using meticulous traction and counter traction aiming to remove the plaque intact. The plaque was kept on traction as coronary artery adventitia was pushed in the opposite direction using forceps, enabling removal of the plaque in one piece from the entire vessel along its length.

The extracted specimen had smooth tapering ends indicating eradication of a preserved plaque (Figure-1). The process was done both proximally and distally along the vessel. Subsequently the saphenous venous graft was anastomosed to complete the coronary artery bypass. Following the anastomosis flow was assessed through the graft.



**Figure-1: Coronary Endarterectomy of RCA**

## DISCUSSION

CE as an adjunct to CABG in diffuse CAD has been around for many decades. Given the relative abundance of CE in literature in developing countries it is a plausible theory that a larger number of patients require CE with CABG in these countries. One possible explanation for this trend might be the delay in diagnosis and surgical management leading to the formation of long segment plaques. Poor general care of CAD risk factors such as diabetes and hypertension may contribute to the formation of extensive lesions in coronary vessels. Another possible contributing factor explaining the recent abundance of this procedure might be the widespread adoption of PCI and the resulting influx of primarily complicated lesions in the cardiothoracic surgery department.

Predictably the outcomes of CE in general depend on the surgical technique used as well as the extent of plaque removed. Although some literature showing questionable early post-operative outcomes in CABG patients who underwent concurrent CE<sup>5,6</sup> resulted in surgeon disinclination to perform the procedure, recent studies have demonstrated efficacy and safety of this procedure with improvements in surgical techniques<sup>3,7</sup>. One of the greater concerns, an increase in thrombosis risk following CE and possibly an explanation for the higher intra-operative MI risk, might be the loss of intact endothelium.<sup>2</sup> Loss of anti-aggregation substances such as prostacyclin and nitric oxide coupled with the exposed underlying collagen favour a pro-

thrombotic state when the endothelium is lost. Moreover, the possibility of destabilizing the plaque might be another contributing factor. Nevertheless, refraining from performing CE when indicated may not permit adequate graft anastomosis resulting in poor long-term revascularization. Studies have shown that despite the uncertain short-term risk, the long-term outcomes are comparable among those patients who underwent CE with CABG compared to those who underwent isolated CABG.<sup>1,2,4</sup>

Expectedly the operative mortality for multi-vessel endarterectomy is higher compared with single vessel in literature.<sup>1</sup> It can be reasonably deduced that CE should be limited only to patients with diffuse disease at risk of insufficient revascularization following CABG, where favourable long-term outcomes justify the risk.

Certain clinical situations that may necessitate CE concurrently with a CABG procedure are discussed here. Decision to perform CE is mainly based on the results of pre-operative coronary angiography and intraoperative findings of the target coronary vessel. CE is usually indicated in patients with long segment total occlusion of a dominant vessel that has an insufficient lumen for appropriate anastomosis, as was the case with our patient. Other indications include a calcific plaque along the wall that makes stitching near impossible; this highlights an important situation where a CE might be indicated despite a visibly patent lumen. A third indication often encountered is a plaque that has dissected from the vessel wall prior to or while the anastomosis suturing is being done, making it a very treacherous anastomosis with an unstable plaque.

## CONCLUSION

In accordance with the general consensus, it is advisable to avoid CE whenever possible. Complete revascularization however is the principal aim of CABG. Patients with diffuse long segment plaques with little to no lumen provide additional challenges in revascularization that may benefit from concurrent CE with CABG. We recommend that this technique be appropriately utilized in these cases to achieve adequate revascularization.

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