

# Simultaneous Carotid Endarterectomy, Coronary Artery Bypass Grafting and Abdominal Aortic Aneurysm Surgery

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**A case with a disease triad of an ulcerative lesion in the left internal carotid artery (LICA), severe coronary insufficiency, and an infrarenal abdominal aortic aneurysm (AAA) is presented in whom we performed simultaneous carotid endarterectomy (CEA), coronary artery bypass grafting (CABG), and Y-graft replacement of the AAA. The operative technique is detailed and justification of the simultaneous approach in such patients is discussed. (Ann Thorac Cardiovasc Surg 2002; 8: 167–9)**

**Key words:** simultaneous operation, carotid endarterectomy, coronary artery bypass grafting, abdominal aortic aneurysm

## Introduction

Various combined procedures are performed in cardiovascular surgical specialty. Coronary artery bypass grafting (CABG), valve surgery, aortic replacement, and abdominal aortic aneurysm (AAA) repair have all been done in different combinations of two procedures at a time with variable outcomes. Reports of carotid endarterectomy (CEA) performed in combination with CABG have also increased steadily since Bernhard and colleague's initial report of 16 such cases in 1972.<sup>1)</sup> However, to the best of our knowledge, simultaneous CEA, CABG, and AAA surgery has not been reported to date. We had this unique experience in a patient with severe coronary disease, an ulcerative lesion in the left internal carotid artery (LICA), and an AAA.

## Case Report

The patient was a 56 year-old male of average physical build. He had been having asymptomatic hypertension and hyperlipidemia since 1995. In 1996, electrocardio-

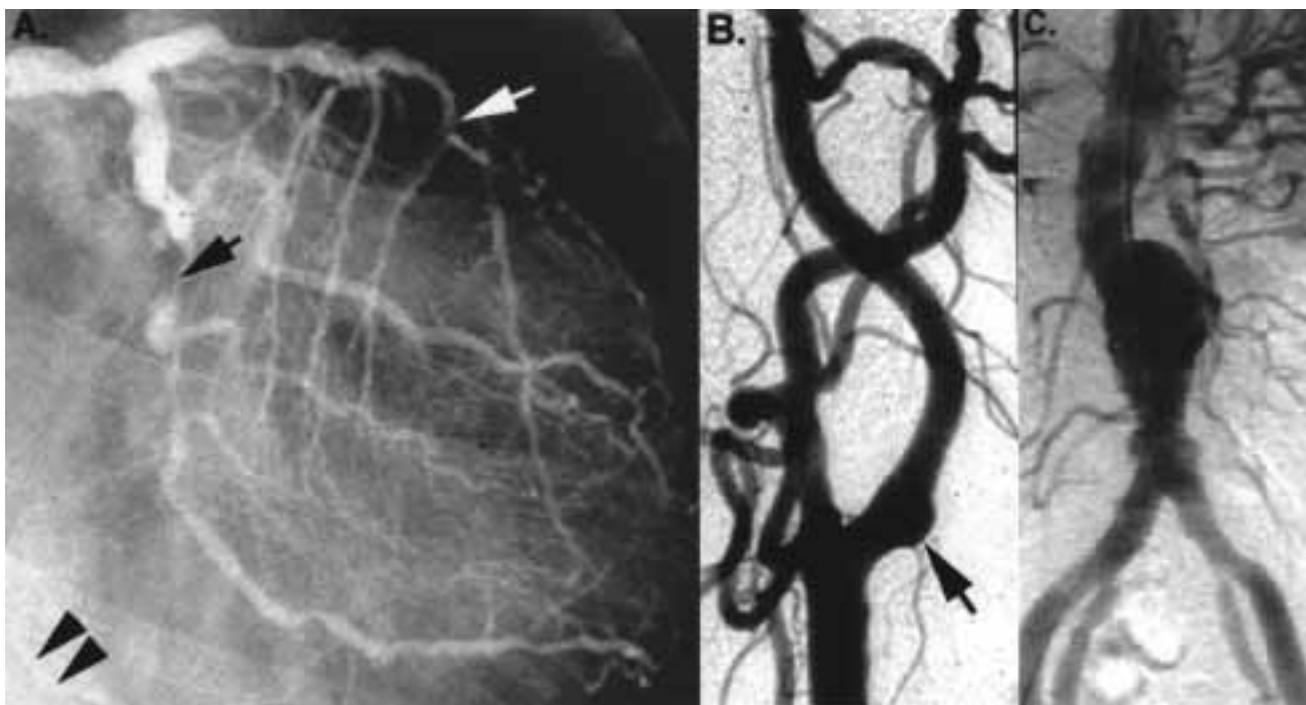
gram (ECG) taken during a routine check-up showed, for the first time, an ST depression in leads II, III, aVF, V<sub>4</sub>, V<sub>5</sub>, and V<sub>6</sub> for which he was consulting the cardiologists of our institute. In October 1998, the patient suffered a cerebral infarction on the left side manifested by motor aphasia only and was admitted to the cardiology unit. Coronary angiography (CAG) which was performed in March 1999 because of the ECG abnormality, revealed total occlusion of the right coronary artery (RCA), 99% stenosis of the mid-left anterior descending artery (LAD), and 90% stenosis of the postero-lateral branch (Fig. 1A). An ulcerative lesion was found in the LICA on carotid arteriography (Fig. 1B) and as a third pathology, an infrarenal AAA of 4 cm diameter with an irregular shape was detected (Fig. 1C). He was then referred to our surgical unit. On physical examination, the patient was normothermic and normotensive with a regular pulse of 68/min and without any precordial or neck auscultatory abnormality. Respiratory and renal functions were normal. We planned a simultaneous operation for the correction of the carotid and coronary artery lesions and repair of the AAA.

Endarterectomy of the LICA was performed before instituting the cardiopulmonary bypass (CPB) using a standard technique. A Brener shunt (C.R. Bard, Inc., NJ) was used during the procedure and the artery was closed with a saphenous vein patch. Median sternotomy with upper median laparotomy was then performed, grafts to be used were harvested and normothermic CPB was established

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**Fig. 1.** Preoperative angiograms.

A: Coronary angiogram showing total occlusion of the right coronary artery, 99% stenosis of the mid-left anterior descending artery (white arrow), and 90% stenosis of the postero-lateral branch (black arrow). Posterior descending branch is filled through collaterals (black arrowheads).

B: Carotid arteriogram showing an ulcerative lesion in the left internal carotid artery (black arrow).

C: Aortogram showing a saccular infrarenal abdominal aortic aneurysm.

after heparinizing the patient. Myocardial protection was provided with both ante and retrograde cold blood cardioplegia. With the aortic clamps in place, CABG was then performed as usual using 3 grafts in the following arrangement; left internal thoracic artery (LITA) to LAD, right gastroepiploic artery to posterior descending branch, and radial artery (RA) graft to postero-lateral branch. Proximal anastomosis of the RA graft with the ascending aorta was done with the aortic cross-clamps still in place. CPB was discontinued and protamine reverse was done. Abdominal incision was extended downwards and replacement of the AAA was performed using a Y-graft prosthesis of 14×7 mm size (Intergard, Intervascular Inc., FL). All wounds were then closed. A single team of surgeons carried out the whole procedure. Total operation time, pump time, and aortic cross-clamp time were 579, 109, and 86 minutes, respectively. The postoperative course was uneventful with an intensive care unit (ICU) stay of only 24 hours. Postoperative angiogram confirmed technical success and absence of any abnormality in the grafts.

## Discussion

Over the years, opinions have varied as to whether CEA and CABG should be combined or whether they should be staged or “reverse staged”. There are some well-known disadvantages of the staged approach. The perioperative stroke rate after CABG in the patients having atheromatous lesions in one or both internal carotid arteries may be as high as 14%.<sup>2)</sup> Similarly, operative mortality for carotid procedures in the patients having symptomatic coronary disease has been shown to be as high as 20%.<sup>1)</sup> On the other hand, there has been a decrease in mortality and morbidity associated with the simultaneous approach in recent years.<sup>3,4)</sup> A combined procedure has also proved advantageous in patients having coexistent coronary disease and AAA and current recommendations appear to favor this approach.<sup>5,6)</sup> However, the presence of an AAA in the patients who already have carotid and coronary artery disease can put the surgeons in a more serious strategic dilemma. Our decision of the simultaneous approach in the present case was based on a number of consider-

ations. For the last few years, we have been doing combination procedures like CABG plus AAA repair and total arch replacement plus AAA repair in carefully selected patients with satisfactory results. Adding CEA to CABG and AAA surgery undoubtedly makes the whole procedure more challenging but our previous experiences with simultaneous procedures gave us the necessary confidence. More importantly, the relatively young age of the present case as well as his satisfactory respiratory and renal functions and freedom from other co-morbid conditions were seen as factors that would significantly contribute to the success of this extensive surgery. We also thought that in addition to an increase in cost, a staged approach would subject the patient to some attendant risks like multiple anesthesia, longer ICU and hospital stays, and neurologic or cardiovascular events in between the procedures. Nevertheless, we understand that the indication of CEA in the present case can be questioned. While the need for surgical intervention in case of significant carotid stenosis is well recognized, controversy exists regarding the rationale for performing CEA in the patients with ulcerative lesions in the carotid artery. It is generally thought that carotid ulcerative lesions run a benign course, especially when they are small. However, findings of a number of comprehensive clinical studies come to contradict this view. In a retrospective study, Dixon et al. evaluated the natural history of 153 asymptomatic, nonstenotic ulcerative lesions of carotid bifurcation in 141 patients. The authors showed that as many as 21% of patients with large ulcers and 19% of patients with multiple or cavernous ulcers had a hemispheric stroke within 10 years, accounting for an interval annual stroke rate of 4.5% and 7.5% in the two types of lesions, respectively.<sup>7)</sup> Prophylactic operation was recommended for these lesions in good surgical candidates. Similarly, Lusby et al. in a prospective study found that intimal disruption (ulceration) was associated with retinal cholesterol emboli and prolonged neurologic deficits.<sup>8)</sup> Justification of CEA in the present case lies not only in the size of the lesion but also in the fact that the patient already suffered a stroke in the ipsilateral cerebral hemisphere, which es-

entially makes him a symptomatic case and further strengthens the operative indication.

Although the simultaneous CEA, CABG, and AAA surgery was successful in the present case, we recognize that for such stable patients, a staged approach, perhaps by deferring the abdominal procedure, can also be equally successful. As for the surgical strategy, carotid procedure before instituting the bypass and AAA surgery after its termination may be an appropriate sequence as it helps to reduce time on bypass and intraoperative bleeding.

Finally, we think that surgical decisions in the patients having such a disease triad should always be individualized. Success in the present case points to the fact that a simultaneous approach may also be effective in properly selected patients.

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