The skeletonised right gastroepiploic artery for coronary artery bypass grafting: A case report

Surendra Naidoo

Department of Cardiothoracic Surgery, University of Kwazulu-Natal, Inkosi Albert Luthuli Central Hospital, Durban, South Africa

Address for correspondence:
Dr Surendra Naidoo
Department of Cardiothoracic Surgery
University of Kwazulu-Natal
Inkosi Albert Luthuli Central Hospital
800 Belair Road
Durban
4001
South Africa

Email:
surendranaidoo@hotmail.com

Surenadra Naidoo ID: https://orcid.org/0000-0002-2993-075X
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ABSTRACT

Coronary artery bypass grafting (CABG) has been the mainstay for treating multivessel coronary artery disease for many decades. Various conduits have been studied to optimise surgical outcomes of CABG. The gastroepiploic artery (GEA) has been used as an in situ graft for over 30 years. Multi- and total arterial revascularisation using the internal thoracic artery, radial artery, and GEA grafts are an option for better outcomes.

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INTRODUCTION

Coronary artery bypass grafting (CABG) has been the mainstay for treating coronary artery disease (CAD). Multiple conduit options exist, with each having its benefits and complications. The saphenous vein graft is prone to atherosclerotic changes and is therefore inferior in long-term patency rates than internal mammary artery (IMA) grafts. The gastroepiploic artery was described in the late 1960s in Vineberg's procedure performed by Bailey, et al., where indirect myocardial revascularisation was done using the right gastroepiploic artery (GEA).[1] Anastomosis of the GEA to the right coronary artery was attempted by Sterling Edwards, et al. in the 1970s.[2] The GEA graft has since been utilised as an alternative conduit in numerous landmark procedures by Pym, et al. in Canada and Suma, et al. in Japan.[3,4] Instead of harvesting the artery with its surrounding omentum, the skeletonised GEA allows for a longer conduit, better blood flow, and a larger calibre vessel for distal coronary anastomosis.

CASE PRESENTATION

A 52-year-old male with a history of coronary artery disease sustained a non-st segment elevation myocardial infarction in 2018. His current symptoms were angina and dyspnoea. The coronary angiogram revealed severe proximal stenosis of the left anterior descending (LAD) coronary artery, an occluded mid-circumflex coronary artery with late filling of the obtuse marginal branch (OM), and an occluded mid-right coronary artery. In addition, the posterior descending coronary artery (PDA) received collaterals from the left coronary artery circulation. The ejection fraction was 52%. He was referred for coronary artery bypass grafts. He had severe psoriasis of the lower limbs which precluded harvesting an extended length of saphenous vein for multiple grafts. In addition the Allen test was abnormal which prevented harvesting the radial artery. Triple vessel coronary artery bypass grafts were undertaken with the left internal thoracic artery anastomosed to the LAD, the right gastroepiploic artery anastomosed to the PDA, and a reverse saphenous vein graft anastomosed to the OM. The postoperative course was uneventful, and he was discharged on day 6.

Surgical procedure

The midline incision was made about 5cm longer than the usual sternotomy incision. Following a pericardiotomy, the peritoneum was opened, and the stomach was extracted to the surgical field. The GEA was detected by palpation to determine adequate size and length. It is essential to touch the GEA softly because it readily contracts under mechanical stimulation. The GEA was mobilised from the greater curvature of the stomach using electric cautery and an ultrasonic scalpel in a skeletonised fashion without any surrounding tissue (Figure 1). The skeletonised GEA can be used as a free graft if required. The skeletonised GEA produces a more extended graft and is easier for sequential anastomoses. Also, Y- or I-composite grafts using

a free GEA graft in combination with the in situ left or right IMA graft further increase the possibility of total arterial myocardial revascularisation. The distal end was cut after mobilising the GEA from the pylorus to more than half of the greater curvature. The GEA and coronary artery anastomosis can be performed using cardioplegic arrest or off-pump beating heart surgery. Finally, kinking or twisting is prevented by fixing the GEA to the epicardium (Figure 2).

DISCUSSION

Anatomy

The right GEA is the largest terminal branch of the gastroduodenal artery, a hepatic artery branch. Occasionally, it arises from the left hepatic artery or the celiac trunk or rarely from the superior mesenteric artery. Suppose a cardiologist was unaware of this, hepatic or selective gastroduodenal angiography to seek the GEA graft patency after CABG could fail to find a patent GEA graft. The right GEA reaches approximately half to two-thirds of the greater curvature of the stomach and terminates in a varying fashion with or without communication with the left GEA.[5,6]

Various properties render the GEA an ideal conduit option for CABG. Atherosclerosis of the GEA was found to be less frequent than in the coronary artery.[7] The diameter of the right GEA renders it suitable for CABG as the diameter is about 3mm or greater at its origin and 1.5 - 2mm at the middle of the greater curvature of the stomach. Histologically, the GEA contains many smooth muscle cells in the media, whereas the IMA has rich elastic fibres. Therefore, the GEA is considered a muscular artery, and the IMA is an elastic artery.[7] The GEA contracts more powerfully in response to vasoactive drugs, including phenylephrine and noradrenaline, than the IMA. Hence, it is essential to prevent spasm of the GEA caused by adrenergic agents or platelet aggregators.[8,9] Histamine causes dilation of the GEA, and its blood supply is shown to increase after a meal.[10]

Indications for gastroepiploic artery grafting

The American College of Cardiology Foundation / American Heart Association guideline for CABG stated that arterial grafting of the right coronary artery is contraindicated for patients with less than 90% stenosis of the native vessel.[11] The GEA is most suitable for grafting the distal right coronary artery and

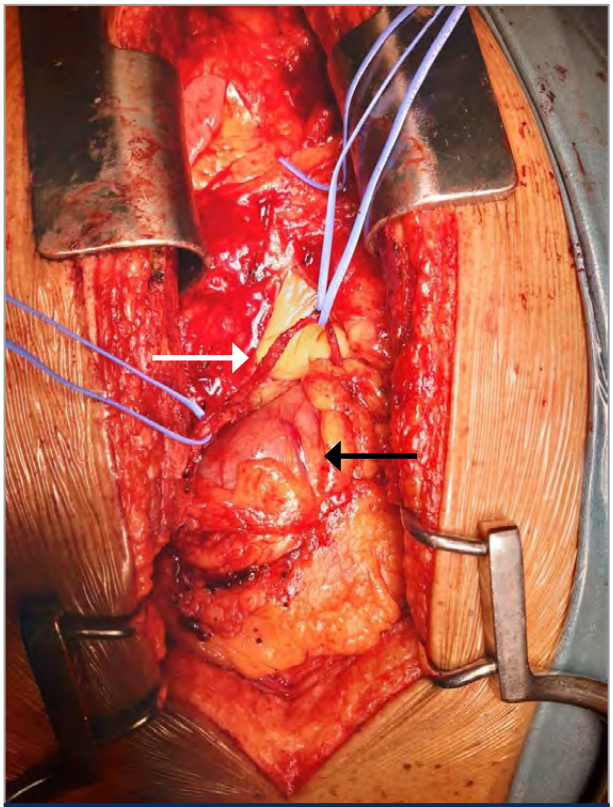

FIGURE 1: Skeletonised right gastroepiploic artery.
Black Arrow: Stomach.
White Arrow: Skeletonised right gastroepiploic artery.

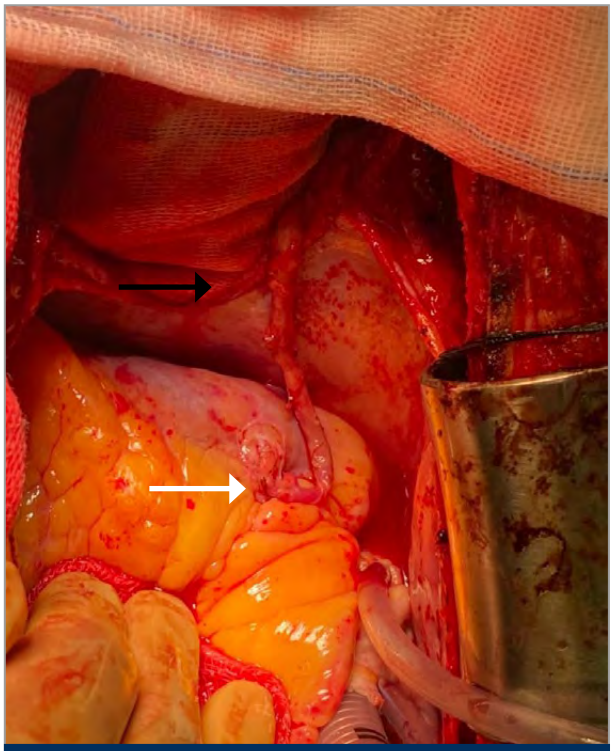

FIGURE 2: Gastroepiploic artery anastomosis to the posterior descending artery..
White arrow: Right gastroepiploic artery anastomosed to posterior descending coronary artery.
Black Arrow: Incision in the diaphragm.

the posterior descending artery because these areas are nearest to the in situ GEA graft and most distant to the right IMA graft. The left anterior descending artery may be a target for the GEA when the LIMA is unavailable. In addition, the distal circumflex artery is also a possible target for the GEA graft. The in situ GEA graft may be utilised during aortic no-touch CABG surgery.[12] The GEA is also helpful in re-do CABG cases as the GEA can be mobilised from the abdomen before re-do sternotomy. GEA grafts are not recommended in very elderly patients or obese patients. In addition, future abdominal operations and unstable haemodynamics during emergency surgery are contraindications to utilising the GEA graft.

Complications

Intraoperative complications include haemorrhage / haematoma formation from gastric and omental branches of the GEA. In addition, kinking and twisting can occur during its course through the diaphragm and at the peri-anastomotic site.

Postoperative complications such as peri-op myocardial infarction, graft occlusion, low cardiac output, vasodilatory shock, arrhythmias, pericarditis, myocarditis, pericardial effusion, and tamponade are rare.

CONCLUSION

The right GEA is an excellent arterial conduit for CABG. It does not induce gastric ischaemia after harvesting and has survival and patency rates comparable to the internal mammary artery (IMA) grafts.[13]

ETHICS

Written informed consent was obtained from the patient.

Conflict of interest: none declared.

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