New Method

Bi-directional Single Anastomotic Technique for the Proximal Anastomosis of Free Grafts (the Saphenous Vein or Radial Artery) to the Ascending Aorta in Coronary Artery Bypass Grafting Surgery

Akihiko Nabuchi MD, PhD, Atsushi Kurata, MD, Kazuhiko Tsukuda, MD, Yutaka Miyoshi, MD, and Kon-il Kim, MD

In an operation involving coronary bypass grafting, anastomoses to the ascending aorta with saphenous vein or radial artery grafts may increase the possibility of post-operative strokes by the dislodgement of embolic particles into the arterial vasculature. We report a bi-directional single anastomotic technique to decrease the possibility of intra and postoperative strokes and to allow earlier cardiac perfusion by the graft anastomosed to the ascending aorta, in the case of coronary artery bypass graft (CABG) with 2 free grafts from there. (Ann Thorac Cardiovasc Surg 2001; 7: 122–4)

Key words: CABG, proximal anastomosis, free graft

Introduction

Proximal anastomoses of venous grafts to the ascending aorta may result in a cerebral vascular embolism from the dislodgement of intra-luminal atheromatous plaques and lesions or surgical residues at the anastomotic location on the ascending aorta.[1)] Moreover, in coronary artery bypass grafts (CABGs) where multiple "free grafts" are utilized, these grafts are not perfused until the completion of all the proximal anastomoses of the free grafts and subsequent removal of the side-biter clamp, or the aortic cross clamp in the "single cross clamp technique." We describe a technique involving a single aortic anastomosis to provide an arterial bifurcation with two proximal ends in the saphenous vein or radial artery grafts that are available for perfusion if necessary. Not only does this reduce the probability of any potential embolic dislodgements at the anastomotic location, it also provides earlier cardiac perfusion via one proximal end of the graft, while the other proximal end is in the process of anastomosis if required.

From the Cardiac Disease Centre, Yamato Seiwa Hospital, Kanagawa, Japan

Received July 5, 2000; accepted for publication October 31, 2000.
Address reprint requests to Akihiko Nabuchi MD: Cardiac Disease Centre, Yamato Seiwa Hospital, Yamato, Kanagawa 242-0006, Japan.

Technique

After all the necessary distal anastomoses are completed for the coronary arteries, the aortic cross clamp is displaced and the side-biter clamp employed as usual. The saphenous vein grafts are usually of sufficient length, which permits the anastomotic location and parallel incision to be made with at least 2 cm of residual length proximally (Fig. 1a), checking that part does not have a valve. Side to side anastomosis is performed with a 6-0 monofilament suture between the incisional opening approximately 2 cm from the proximal end on the saphenous vein graft and the ascending aorta (Fig. 1b). This creates an arterial bifurcation at the anastomotic site from the ascending aorta to the graft. After the completion of the anastomoses, the side-biter clamp is removed. As long as the residual part of the vein graft does not have any valve, blood flow ejecting from the proximal end of the venous graft will be observed, which washes any air particles or surgical debris from the procedure, while cardiac perfusion is allowed from the other bifurcation, which would be considerably helpful for the recovery of the cardiac muscle after cardioplegic arrest. In the "single cross clamp method" without placing the side-biter clamp, the aortic cross clamp is removed at this stage (Fig. 1c).

The proximal end of the venous graft is then clamped and used, if required, for an "end to end" anastomosis

with another graft to another coronary artery. Ideally, the "end to end" anastomosis and sutures should be fashioned obliquely at an angle to the grafts to produce a wide anastomosis and to avoid stenosis (Figs. 1d, 2, 3). There was no difference in technique whether the other graft was a saphenous vein, radial artery, or free internal mammary graft.

Discussion

CABG with the above-described technique was performed for 83 patients since September 1997, out of 473 total CABG. End to end anastomosis was performed between saphenous vein and radial artery in 24 patients, saphenous vein graft and free internal mammary artery in 3, saphenous vein to saphenous vein in the rest. There was an angiographical occlusion at the end to end anastomotic site in 3 patients out of 83 patients studied immediately after surgery, and no occlusion in the long-term period out of 41 patients studied over 12 months.

The described technique has 3 beneficial aspects compared with the conventional technique where the proximal ends of the grafts are anastomosed at different sites on the aorta. Firstly, only one anastomosis is necessary in the ascending aorta to provide a bifurcation for potentially two venous grafts, thereby reducing the probability of any potential embolic dislodgements from intraluminal atheromatous plaques and lesions. Secondly, the brief period during which blood is ejected from the proxi-

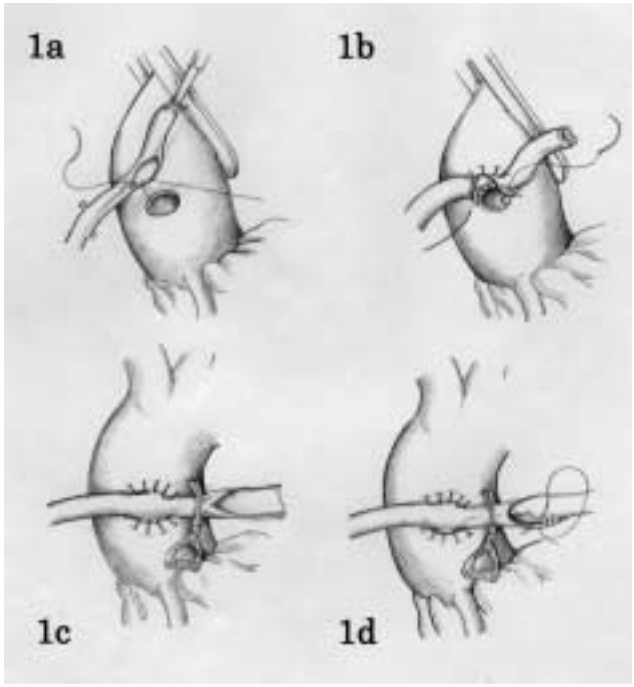

Fig. 1. Side to side anastomosis is performed with a 6-0 monofilament suture between the incision opening approximately 2 cm from the proximal end on the saphenous vein graft and the ascending aorta (a, b). After the completion of the anastomosis, the aortic cross clamp, or the side-biter clamp is removed, while cardiac perfusion is allowed from the other bifurcation (c). The proximal end of the venous graft is then clamped and used for an "end to end" anastomosis with another graft to another coronary artery. Ideally, the "end to end" anastomosis and sutures should be fashioned obliquely at an angle to the grafts to produce a wide anastomosis and to avoid stenosis (d).

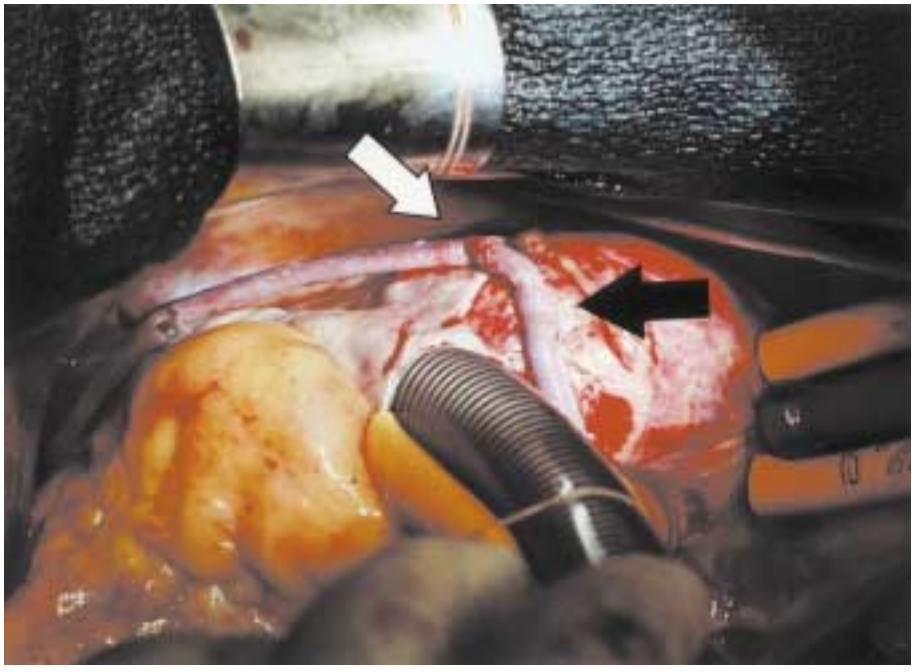

Fig. 2. The photograph is showing the view after completion of both anastomoses, side to side anastomosis of the vein graft with the ascending aorta (black arrow) and end to end anastomosis between the vein grafts (white arrow).

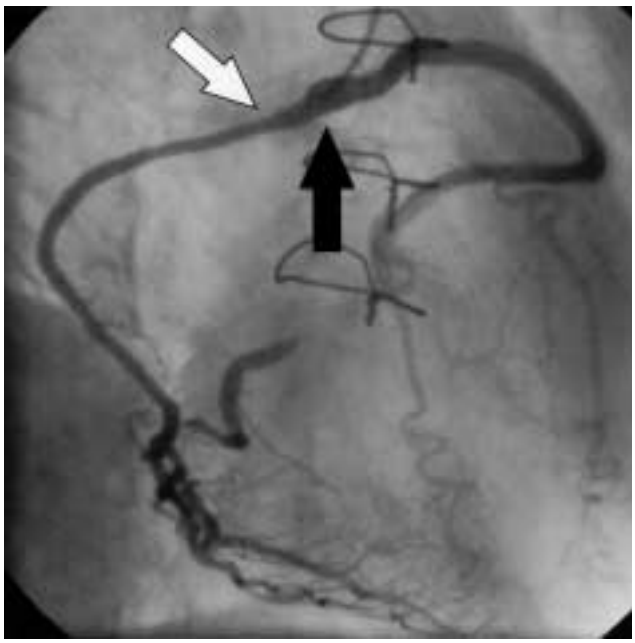

Fig. 3. Postoperative angiogram of the grafts in this technique in an 83-year-old female performed 10 months after CABG. Both of the anastomotic sites, side to side anastomosis with the ascending aorta (black arrow), and end to end anastomosis between the saphenous vein grafts (white arrow) are clearly shown without having any stenosis.

mal end of the graft after the removal of the side-biter clamp has the added advantage of completely washing out any particles of air, dust, fatty tissue, atheromatous lesions or surgical debris that are trapped in the anastomosis during the procedure. Thirdly, the bifurcation created allows one side of the graft to be perfused while the other is clamped and anastomosed to another graft if necessary, whereas the conventional approach requires all anastomoses to be completed before perfusion is possible.

Some descriptions about CABG did not discourage surgeon to perform “end to end” anastomosis between grafts.[2,3] This technique has not been reported in the literatures clearly, but this will bring some benefits to the surgeon obviously.

Reference

1. Mickleborough LL, Walker DM, Takagi Y. Risk factor for stroke in patients undergoing coronary artery bypass grafting. *J Thoracic Cardiovasc Surg* 1996; **112**: 1250–9.
2. Buxton B, Smith J, Foller J. Incorrect graft length, standard grafting technique. In: Buxton B ed. Ischemic Heart Disease Surgical Management. London: Mosby, 1999; p 200.
3. Calafiore A. Composite grafts using the internal thoracic artery, radial artery, and inferior epigastric artery. In: Buxton B ed. Ischemic Heart Disease Surgical Management. London: Mosby, 1999; pp 217–9.