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How-to-do-it

Open anastomosis: an alternative for proximal vein graft anastomoses in significantly diseased aortas

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Abstract

We describe a simple technique of constructing proximal vein graft anastomoses, in an open fashion, under brief periods of very low pump flows. We have used this technique without complications in more than 100 patients with significantly diseased ascending aorta wall. In our opinion, this technique is a good alternative to other, more complex, approaches often described.

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1. Introduction

Despite the increasing use of arterial conduits for surgical coronary re-vascularisation, vein grafts are still used in a large proportion of patients. Vein graft requires total or partial clamping of the ascending aorta. This has been correlated with an increased incidence of cerebrovascular accidents of embolic origin [1,2]. Patients with significant atherosclerotic disease and/or calcification of the ascending aorta are particularly at risk. In this case, alternative techniques must be used, such as preferential use of pedicled arterial grafts, Y and T grafts and, in the case of vein grafts, proximal anastomoses to other aortic branches or to the internal thoracic arterial grafts. Off-pump coronary surgery also aims at reducing handling of the diseased aortic wall [3].

In the past 10 years, we have constructed proximal vein graft anastomoses to significantly diseased ascending aortas in an open fashion under very short periods of very low pump flows.

2. Technique

We routinely use moderate systemic hypothermia (30–32 °C), without aortic cross clamping and cardioplegia, in a decompressed beating or fibrillating heart for coronary re-vascularisation. Unexpected aortic wall abnormalities are usually identified and located during cannulation for cardiopulmonary bypass (if they had not been identified

preoperatively), requiring alternative approaches to both cardiopulmonary bypass and grafting. Direct visualisation or superficial palpation of the ascending aorta permits identification of relatively normal areas of the aortic wall. These are chosen strategically for positioning of the proximal vein anastomoses. For the construction of each anastomosis, the pump flow is reduced to 100 cc and a 5- to 6-mm incision is made with a no. 11 scalpel blade in the aortic wall, transversely for circumflex branch grafts and longitudinally for right coronary grafts. A punch may also be used. The minimal blood ‘waterfall’ permits identification of the edges of the wall, and a continuous suture of the vein, generally using 6/0 polypropylene, is easily constructed with tactile handling of the needle within and outside the aortic wall. Each period of low flow is rigorously kept under 2 min, during which the flow is returned to normal and the orifice with the uncompleted anastomosis occluded by the surgeon’s or assistant’s index finger. After 1–2 min, the pump flow is lowered again and the anastomosis is completed. A third period of low flow is seldom necessary.

In the past 10 years, we have used this method in more than 100 patients with no procedure-related neurological accidents.

3. Comment

Atherosclerotic disease not only involves the coronary arteries, but also affects the aorta and its main branches, especially the iliac and the carotid arteries. Manipulation of the ascending aorta for cannulation during cardiopulmonary bypass and for cardioplegic arrest or partial clamping during

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aortic cross-clamping and for construction of proximal vein or arterial graft anastomoses has been associated with embolic events, especially to the central nervous system. For this reason, no-touch strategies have been devised, with special emphasis on avoiding or reducing the number of episodes of clamping. Pre- and perioperative imaging of the aortic wall is routinely used by some to detect significant aortic wall disease [4–6], but this has not been proven to have a positive impact on the incidence of neurological events.

This was one of the considerations that led us to switch to a non-cardioplegic approach to coronary re-vascularisation. We have routinely used this approach in the past two decades, as previously reported, in more than 7000 patients, with improved results [7]. Off-pump coronary surgery has been used with the same intention as well.

Hence, it is prudent to avoid manipulating the aorta for proximal anastomoses, especially if it is suspected to be significantly involved by atherosclerotic process or is calcified. Several methods, such as preferential use of pedicled arterial grafts, including Y and T grafts, and, in the case of vein grafts, proximal anastomoses to other aortic branches or to the internal thoracic arteries and use of sutureless anastomotic devices, have been suggested [8]. All of these methods have some degree of complexity, which may impact on the results.

The construction method of the proximal anastomoses described here is paradoxically easy. Maintaining the pump flow at 100 cc min^{-1} creates a small ‘waterfall’ of blood through the aortic orifice, which prevents air from entering the aorta while still permitting a fairly good visualisation of the edges, which, along with a tactile handling of the suture needle, permits safe and methodical construction of the anastomoses. Depending on the experience of the surgeon, this should not require more than 2×2 min periods of low flow (perfectly safe in terms of cerebral protection), provided there is good blood oxygenation.

We have had no significant neurological morbidity related to this technique, which has become a routine when the surgeon suspects significant aortic abnormalities. Further-

more, compared to other techniques to avoid or minimise handling of the aortic root, this method does not require alteration of the routines in surgical re-vascularisation of the myocardium or the use of additional arterial conduits when otherwise not justified or feasible. However, it is not suggested as an alternative to no-pump techniques, where aortic clamping is not used, but to any on-pump technique that uses aortic clamping, whether partial or complete. Even a single period of clamping is bound to increase the risk of embolisation of atheromatous material.

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