Brief communication - Coronary

The natural bifurcating internal thoracic artery graft: another technique for bypassing two vessels with one conduit

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Abstract

We present our reproducible technique of achieving two bypasses from selected pedicled internal thoracic arteries. We feel that awareness of this technical modification is to the benefit of patients.

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1. Introduction

The favourable results of internal thoracic arteries (ITAs) as conduits for coronary bypass led to new ‘designs’ of ITA anastomoses, in order to maximise clinical benefit: Y grafts, combinations of left ITA (LITA, LIMA) or right ITA (RITA, RIMA) and other conduits, sequential (‘jump’) grafting, skeletonisation to augment length, all have been extensively described and vouched for.

The LITA and LIMA is commonly utilised as a pedicled graft to the antero-lateral wall of the left ventricle, bypassing stenoses of the left anterior descending (LAD) and circumflex (CX) territories. It is generally dissected with a number of techniques from its first intercostal branch to its bifurcation to left superior epigastric and left musculophrenic arteries. These twin end branches are generally found to be too small for grafting.

In our experience, particularly in young tall muscular males with long sterni, a few left superior epigastric and left musculophrenic arteries have exceptionally large calibre (more than 3 mm). We have, therefore, occasionally found it possible to take advantage of this favourable anatomy to deploy both branches as a double-lumen pedicle for anastomoses.

2. Technique

In our technique, the left pleural space is electively entered so that the ipsilateral lung will not distort the LITA pedicle when expanded postoperatively. A plane is developed with diathermy at a suitable intercostal space on the posterior aspect of the left sternal flap. The LITA pedicle is then gradually developed with ‘no-touch’ technique from the lateral side. The medial aspect of the pedicle is created with a sharp dissection into the anterior mediastinal alveolar tissue as close to the midline as possible, ligating the left pericardiacophrenic artery branch and endeavouring to keep a minimum width of 2.5 cm throughout its length distal to the ITA bifurcation.

The pedicle is transected under systemic heparinisation (300–400 units/kg) distal to the bifurcation. The orifices of the twin end branches are inspected and dissected with coronary scissors. Once flow is confirmed in each branch in excess of 0.5 ml/s (without local spasmolytic or vasodilatory treatment), the end of the pedicle is dichotomised with coronary scissors, in order to create two daughter pedicles of as long a length as possible.

We use the lateral ‘daughter’ pedicle on the most lateral coronary vessel on the LAD territory first (usually the first diagonal) and the medial on another suitable target coronary (usually the LAD). We prefer to graft the less important vessel of the two first, in order to avoid tension on the second anastomosis.

We avoid any possible compromise on the revascularisation of the main vessel (usually the LAD) for the sake of double grafting.

3. Results

We have been able to graft bifurcating LITA pedicles in 20 cases over the last 10 years. To date, we have experienced no technical complication that could be ascribed to the increased complexity of the anastomoses or the theoretical problem of spasm at the distal ITA (less elastic and more muscular in the distal third).

The clinical course was uneventful; there were no fatalities and no follow-up issues attributable to internal thoracic artery failure. Postoperative coronary angiography was not...
indicated in any of the cases due to lack of angina recurrence symptoms.

We found two isolated case reports from Asia that confirm our concept with slight differences in the minutiae of the technique: in three patients in total, two teams of colleagues have reported anastomosing:

- one distal LITA and its pericardiacophrenic branch to two targets on the CX system as a Y graft [1];
- the terminal RITA branches to the LAD system in one patient and the terminal LITA branches to the lateral wall in another [2].

4. Discussion

The benefits of this technique are:

First, procuring enough conduits for two bypasses with a single careful harvesting. The technique described may be useful in patients with a shortage of conduits and adequate proximity of LAD and diagonal targets.

Second, avoiding one aortic anastomosis and harvesting one conduit (vein and radial artery).

Essentially, where applicable this modification offers two bottom ends with no top end. We take advantage of the full length of the internal mammary artery (IMA) pedicle and our selection of targets is only limited by the arch of the twin daughter pedicles.

We feel that, as the suitability of the bifurcation cannot be predicted until the pedicle is prepared, every effort for maximising its length even distally to the bifurcation is advisable in every case that more than one neighbouring coronary arteries on the LAD territory appear to warrant revascularisation on the angiogram. Occasionally, a natural bifurcated IMA offers an extra bypass graft for suitable coronary targets.

We feel that there are the following limitations of this series: the fact that this is not a routine technique and also that as routine coronary angiogram is not part of follow-up in cases with no recurrent symptoms, no angiographic studies were performed in this cohort which can be considered as a limitation of the technique reported.

References
