

### SIMPLE EXPOSURE OF THE INTERNAL THORACIC ARTERY FOR MINIMALLY INVASIVE CORONARY ARTERY BYPASS

Inderjit S. Gill, MD

A simple method is described for harvesting a pedicle of internal thoracic artery for minimally invasive coronary artery bypass grafting with the use of a small scapular retractor. The technique has been used successfully in 39 patients. All patients were followed up early postoperatively by angiography, and the patency rate was 96%. Follow-up angiography (mean [and standard error] 9.6 [4.8] months) was carried out in 63% of the patients, demonstrating a cumulative patency rate of 95.4% with no evidence of steal. None of the patients died and there were no cases of myocardial infarction perioperatively. Recurrent angina developed in 2 patients. This technique is safe, effective and inexpensive.

On décrit une façon simple de prélever un pédoncule d'artère thoracique interne afin de réduire au minimum le caractère effractif du pontage aortocoronarien en utilisant un petit rétracteur scapulaire. La technique a été utilisée avec succès chez 39 patients. On a suivi tous les patients tôt après l'intervention en procédant à une angiographie et le taux de patence s'est établi à 96 %. On a procédé à une angiographie de suivi (moyenne [et écart type] de 9,6 [4,8] mois) chez 63 % des patients et établi un taux cumulatif de patence de 95,4 % sans indication de détournement. Aucun des patients n'est mort et il n'y a eu aucun cas d'infarctus du myocarde pendant la période peri-opératoire. Une angine à répétition a fait son apparition chez deux patients. Cette technique est sûre, efficace et peu coûteuse.

Harvesting of the internal thoracic artery (ITA) for minimally invasive coronary artery bypass grafting (CABG) through a left minithoracotomy is difficult because of the limited exposure of the ITA. Various techniques making use of thoracoscopic assistance<sup>1,2</sup> or direct vision<sup>3</sup> have been described. Various retractor systems designed to facilitate the ITA take-down in minimally invasive CABG have recently been introduced, each adding over Can\$500 in disposable costs per case. At the Ottawa Heart Institute, we have used a small scapular retractor

(Fig. 1) successfully for ITA harvest in 39 patients.

#### METHOD

The study population comprised 51 consecutive patients who underwent CABG done by one surgeon between January and September 1997 through a left minithoracotomy (39 patients) or median sternotomy (12 patients) on a beating heart. The mean (and standard error) age was 59.6 (13.2) years, 31 (61%) were women and the mean ejection fraction was 0.575 (0.131). The proce-

sure was carried urgently in 21 (41%) patients.

#### TECHNIQUE

The patient, in a supine position, is intubated with a standard orotracheal tube. Anesthesia is induced with propofol or midazolam and maintained with isoflurane, sufentanil, midazolam and non-depolarizing muscle relaxants as required.

An 8- to 10-cm anterior thoracotomy is made over the fourth rib, medial to the nipple. A portion of the fourth intercostal cartilage is excised,

*From the University of Ottawa Heart Institute, Ottawa, Ont.*

*Accepted for publication Apr. 7, 1999.*

**Correspondence to:** Dr. Inderjit S. Gill, Thoracic & Cardiovascular Surgery, Cleveland Clinic Foundation, Ste. H907, 2500 MetroHealth Dr., Cleveland OH 44109; fax 216 778-3062, gilli@cesmtp.ccf.org

© 2000 Canadian Medical Association (text and abstract/résumé)

and the pleural space is opened. The ITA is dissected distally, well under the fifth rib and proximally under the third rib with a small Finochietti retractor in place. The rib cage is then elevated by an assistant with a small (5 m blade) scapular retractor (Davidson scapular retractor; Pillings, Fort Washington, Penn.), which is placed lateral to the ITA pedicle. The force vectors are directed parallel to the sternum and vertical. This allows the dissection of the ITA pedicle using a long-tipped electrocautery up to the first intercostal space in most cases or occasionally up to the second intercostal space. The first intercostal artery can be clipped in these instances. Harvesting is further facilitated by having the patient in a slight Trendelenburg position. After partial heparinization (1.5 mg/kg body weight), the ITA is divided distally.

Before closing, an intercostal nerve block of 1% bupivacaine is instilled into the intercostal space. Postoperative pain is controlled with morphine and ketoralac initially, then with nonsteroidal anti-inflammatory agents and codeine.

## RESULTS AND COMMENT

A patent ITA to left anterior descending artery graft is a potent predictor of long-term and complication-free survival after coronary revascularization.<sup>4</sup> Safe and optimal harvesting of



FIG. 1. The small scapular retractor.

the ITA pedicle is one of the most essential steps to that end. Since the advent of minimally invasive CABG, several techniques have been developed, and several specially designed retractors have become available.

We did not have access to stabilization platforms during the study period. Since then, we have used either the Cardiothoracic system (Cupertino, Calif.) or the Medtronic Octopus (Medtronic Inc., Minneapolis, Minn.) for stabilization. This has made the procedure even safer and more reproducible and suitable for resident training.

The technique described here has been used at the University of Ottawa Heart Institute exclusively for dissecting the ITA pedicle. We have used it successfully in 39 of 51 procedures on the beating heart. The others were done by a midline sternotomy. Only 1 ITA (the second case) was damaged in our early experience.<sup>5</sup> Two patients required conversion to a standard sternotomy (intramyocardial left anterior descending artery in one and bleeding from the right ventricle at the snare site in the other). All 51 patients survived and there were no instances of myocardial infarction perioperatively. All patients underwent follow-up angiography with 96% early patency and 95% patency at a mean (and standard error) follow-up of 9.6 (4.48) months. There was no evidence of steal, delayed conduit damage or anastomotic stenosis. Recurrent angina developed in 2 patients at a mean follow-up of 18 months.

The average harvest time is approximately 40 minutes. The only limitation we have encountered was narrow intercostal spaces in some obese patients, in whom it was difficult to elevate the rib cage. This technique was also used successfully in 3 patients who had previously undergone CABG through a standard sternotomy and left pleural

opening. In all cases, the lung was easily peeled off the mediastinal pleura with a swab on a sponge stick.

There were no instances of post-thoracotomy neuralgias, probably because excising a costal cartilage gives optimal exposure of the target vessel and avoids stretching the intercostal bundles above and below the interspace with the retractor.

This technique has proved to be safe and effective and has the advantage of simplicity, ease of application and minimal costs compared with the current retractors in use for minimally invasive CABG.

## References

1. Robinson MC, Gross DR, Zeman W, Stedje-Larsen E. Minimally invasive coronary artery bypass grafting: a new method using an anterior mediastinotomy. *J Card Surg* 1995;10(5):529-36.
2. Benetti FJ, Ballester C. Use of thoracoscopy and a minimal thoracotomy, in mammy-coronary bypass to left anterior descending artery, without extracorporeal circulation. Experience in 2 cases. *J Cardiovasc Surg (Torino)* 1995;36(2):159-61.
3. Jansen WE, Mansvelt Beck HJ, Gründeman PF, Bredée JJ. Facilitated exposure of the internal mammary artery in minimally invasive direct-vision CABG. *Ann Thorac Surg* 1997;63(6):1797-9.
4. Cameron A, Davis KB, Green G, Schaff HV. Coronary bypass surgery with internal-thoracic-artery grafts — effects on survival over a 15-year period. *N Engl J Med* 1996;334(4):216-9.
5. Gill IS, FitzGibbon GM, Higginson LA, Valji A, Keon WJ. Minimally invasive coronary artery bypass: a series with early qualitative angiographic follow-up. *Ann Thorac Surg* 1997;64(3):710-4.