

Harmonic scalpel harvest of bilateral internal thoracic arteries

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Clinical vignette

A 57-year-old male with end-stage renal failure was discovered to have double vessel coronary disease precluding his chance for renal transplant. He underwent a double coronary artery bypass graft (CABG) off-pump surgery with two *in situ* internal thoracic arteries (ITA) to the left anterior descending artery (LAD) (with 70% stenosis) and right posterior descending artery (PDA), (with 90% stenosis of right main coronary artery).

Surgical techniques

Preparation

The pericardium is opened and the coronary targets are assessed for graftability. Test the harmonic scalpel (HS) (HARMONIC SYNERGY Hook Blade Ethicon Endo Surgery, CVD, Minneapolis, MN, USA) and position the hook with the blunt aspect as the primary dissecting edge.

Exposition

The ITA retractor of choice is inserted and the visceral pleura is swept laterally with gentle blunt and cautery dissection to keep the pleura intact if possible to a point 1–2 cm lateral to the ITA and veins. Drawing a line from where the ITA is seen (usually in the mid-section of the operative site) caudally, incise with Metzenbaum scissors at the most caudal point in a crevice between the medial IT vein and ITA to expose the length of the ITA.

Operation

Dissection of the ITA with the HS can be divided into three

sections: the start-up at the caudal end, the middle segment and the proximal segment at the cephalad end. The HS is used to ‘paint’ the ITA with light strokes briefly touching the artery sweeping the peri-mammary tissues away. Branches of the ITA, usually at the intercostal interspaces are sealed with the blunt end of the HS placed at 1 mm away from the ITA with the help of forceps placed with one prong either side of the branch depressing the ITA (so as to avoid damage to the ITA). The ITA is circumferentially harvested from caudal to cephalad end enabling proximal and distal control should repair with suture of an avulsed side branch be necessary.

Completion

The end of the dissection occurs when the first intercostal branch at the upper end is sealed; one knows this by feeling no restrictions or tethering of the ITA when passing the index finger along the ITA above this sealed branch toward the subclavian artery.

Comments

Clinical results

Use of the HS for ITA harvest began in the late 1990s for minimally invasive CABG surgery (1). In a retrospective review of 2,205 ITA grafts from 1,787 ITA conduits in 1,051 consecutive patients, patients with skeletonization with use of the HS (N=965) were compared to those without use of the HS (N=86) (2). Results were similar with respect to reoperation for bleeding, (2.7% *vs.* 3.5%, $P=0.726$), early reoperation for failed grafts (0.7% *vs.* 0, $P=1.0$), deep sternal infection (1.6% *vs.* 1.2%, $P=1.0$), post-operative myocardial infarction (1.7% *vs.* 2.3%, $P=0.653$) and total operative

mortality (3.7% *vs.* 2.3%, $P=0.763$). Use of the HS facilitated skeletonization of the ITA by being faster: non HS skeletonization harvest time of 77 ITAs averaged 32.2 minutes compared to times for the last 100 HS skeletonized ITAs of the study of 15.4 minutes. Damage to the ITA by the HS was also infrequent: 7 of 1,640 (0.43%) were not usable. Other authors have found that use of the HS not only decreases operative time but also conduit spasm and reduces the number of clips (3).

Advantages

Benefits of HS use include less conduit spasm, damage and use of clips. Fewer clips facilitate sequential ITA grafting and the ITA does not have ‘indents’ at clipped branch locations when the ITA spasm releases, even if one placed clips at a thought-to-be far enough distance from the main body of the ITA. The faster harvest time is important for all—surgeons, patients and the operative team. If harvest time is reduced by 15 minutes/ITA, in a 2 CABG day with use of bilateral ITA in both operations, the day could potentially be finished at 17:00 hours instead of 18:00 hours.

Caveats

The main disadvantage of the HS is its inability to ‘cauterize’ bleeding vessels. For chest wall bleeding, cautery is used but for ITA bleeding either clips or suture with 7.0 or 8.0 Prolene must be used. It is also difficult to ‘seal’ branches in patients on intravenous heparin, or P2Y12 inhibitors such as Clopidogrel or P2Y12 antagonists such as Ticagrelor. Patients with long-standing diabetes mellitus may have fibrosed peri-thoracic artery tissues making harvest longer and more tedious. The learning curve for use of the HS is approximately 20 harvests if a surgeon is not experienced with the skeletonization technique and 10 harvests if

experienced.

Summary

Use of harmonic technology facilitates use of ITAs for arterial CABG by being faster, less damaging, with fewer use of clips and causing less ITA spasm. With increased ease of harvest of arterial conduits, use of bilateral ITA grafting may increase, which will benefit patients long-term.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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