Reskeletonization of Patent Graft Using Ultrasonic Scalpel in Redo Surgery

Suguru Ohira, MD, Kiyoshi Doi, MD, PhD, Satoshi Numata, MD, PhD, Sachiko Yamazaki, MD, Tsunehisa Yamamoto, MD, and Hitoshi Yaku, MD, PhD
Division of Cardiovascular Surgery, Kyoto Prefectural University of Medicine, Kyoto, Japan

A patent graft is one of the major concerns in redo cardiac surgery. A full skeletonization technique using an ultrasonic scalpel is a breakthrough method to harvest the internal thoracic artery, being first reported in 2000. Here, we describe a reskeletonization technique to safely dissect a patent internal thoracic artery graft using an ultrasonic scalpel in redo cardiac surgery after coronary artery bypass graft surgery. This technique can be used not only to expose the patent graft to simply mobilize or clamp it, but also to recycle a patent graft to revascularize other coronary arteries.

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Address correspondence to Dr Ohira, Division of Cardiovascular Surgery, Kyoto Prefectural University of Medicine, 465 Kajii-cho, Kawaramachi-Hirokoji, Kamigyo-ku, Kyoto 602-8566, Japan; e-mail: s-ohira@koto.kpu-m.ac.jp.

Technique

A 64-year-old man with a history of CABG required redo aortic valve replacement. Preoperative examination demonstrated patency of the right ITA (RITA) to the left anterior descending artery (LAD). Redo median sternotomy was performed. The pericardium had not been closed in the first operation. First, the thymus, which covered the RITA, was dissected using the ultrasonic scalpel (Harmonic Scalpel; Ethicon Endo-Surgery, Cincinnati, OH [Fig 1]) is a unique method to harvest the ITA, first reported by Higami and colleagues [2] in the early 2000s. A feature of this technique is a combination of the cavitation phenomenon (quick touch method) and protein coagulation (close coagulation method) [3]. Here, we describe the application of this technique as a “reskeletonization” technique to safely expose and dissect a patent ITA graft in redo cardiac surgery after CABG.

Comment

In redo cardiac surgery with patent grafts, there are two major problems: firstly, there is a risk of graft injury while dissecting the adhesion [1]; secondly, it is necessary to consider cardiac protection during cardiac arrest [4]. One of the most important points to safely dissect a patent ITA is to identify grafts buried inside the surrounding tissues. Sharp dissection by scissors or an electric scalpel is technically demanding. An ultrasonic scalpel is widely used in laparoscopic surgery to dissect
and achieve adequate hemostasis. The quick touch method and close coagulation are unique procedures of the skeletonization technique to harvest the ITA, reported by Higami and colleagues [2]. We applied these techniques to dissect patent ITA grafts in redo surgery as a reskeletonization technique. A feature of the quick touch method is that it avoids thermal injury of the ITA graft, and it can effectively remove surrounding fat tissues. The remnant tissues after the quick touch procedure can be cut using the close coagulation method. These techniques are not time consuming compared with electrical dissection. Of course, it is also applicable for partial exposure of a patent ITA graft to perform clamping of the graft during cardiac arrest. When the patent RITA crosses the anterior surface of the aorta, the reskeletonization technique would be effective to expose the patent graft. We have encountered 3 redo cases with a patent RITA to the LAD, which could be dissected without causing any graft injury.

This technique could be applied to patent graft translocation, such as we previously reported for recycling the ITA in redo CABG [5]. Shortly after, the patent in situ left ITA (LITA) grafted to the LAD was dissected and transposed to the left circumflex area, and the LAD was reconstructed with the in situ RITA. To achieve this, adequate mobilization of the patent ITA graft was performed with the reskeletonization technique. After identifying the previously anastomotic site of the LITA with the quick touch method, it was dissected along the graft all the way to the superior edge of the first rib (Fig 3A). The reskeletonized LITA was dissected over a sufficient distance to reach the obtuse marginal branch (Fig 3B). Postoperative computed tomography and angiography demonstrated the complete patency of both

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Fig 1. Harmonic Scalpel (Ethicon Endo-Surgery, Cincinnati, OH). It has a curved surface and a hooked part. The curved surface (arrowhead) is useful to perform a sweeping or stroking motion for cavitation and pushing for protein coagulation. The hooked part (arrow) is used to dissect fibrous tissues with protein coagulation.

Fig 2. (A) The quick touch method. The tip of the ultrasonic scalpel is swung quickly in synchronization (double arrow). The period of touching the internal thoracic artery (ITA) is 0.1 to 0.2 s to avoid thermal injury. (B) Intraoperative photograph showing the surgeon’s view. The patent right ITA is freely mobilized with the reskeletonization technique (arrows). (Ao = aorta.)

Fig 3. (A) Intraoperative photograph. The left side is the patient’s head, and the right side is caudal. The old left internal thoracic artery, which had been previously anastomosed to the left anterior descending artery, was fully reskeletonized (arrows). Then, it was divided and anastomosed to the obtuse marginal branch. The right internal thoracic artery had already been anastomosed to the distal left anterior descending artery (arrowheads). (B) Postoperative angiography showing the patent left internal thoracic artery. The graft was long enough to be transferred from the left anterior descending artery to the obtuse marginal branch with the reskeletonization technique. (C) Postoperative computed tomography showing complete patency of all arterial grafts.
ITA (Fig 3C). We successfully performed two redo surgeries with recycling of the LITA without causing any graft injury.

In conclusion, the reskeletonization technique using an ultrasonic scalpel is a safe and simple method to expose a patent graft in redo cardiac surgery after CABG.

References


