How-to-do-it

Needle-guided mini-entry in video-assisted coronary artery bypass

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Abstract

In minimally invasive coronary artery bypass (MICAB), a video-assisted needle-guided technique was used to make a mini-thoracotomy or an access-port just above the target site in the left anterior descending coronary artery (LAD). After thoracoscopic preparation of the left internal thoracic artery (LITA) and pericardiotomy, a 7-cm, 23-gauge needle was used to examine the skin-point where the needle vertically penetrated the chest wall and thoracoscopically indicated the target site in the LAD. This point was used as the mid-point of the skin incision for a 6-cm thoracotomy (six cases) or a 33-mm access-port (four cases). Consequently, there was no conversion of approach except in the patient with pulmonary dysfunction, and each LITA–LAD anastomosis was completed directly through the mini-entry. There was no mortality and no procedure-related morbidity. Patency of each graft was confirmed within a week after surgery. After a mean follow-up period of 12.5 ± 7.8 months, all of the patients except one, who died of stroke 1 year after surgery, are alive with no ischemic events.

Although our experience is limited, the present video-assisted needle-guided technique can be a simple method to facilitate appropriate positioning of a mini-entry in MICAB to the LAD with a thoracoscopically prepared LITA graft.

Keywords: Minimally invasive coronary artery surgery; Mini-thoracotomy; Access-port; Video-assisted needle-guided technique

1. Introduction

In minimally invasive coronary artery bypass (MICAB) from the left internal thoracic artery (LITA) to the left anterior descending coronary artery (LAD), a small entry into the thoracic cavity must be made just above the coronary anastomosis site. When the entry becomes smaller, it is more challenging to place it in the correct position. This communication describes a simple needle-guided technique for video-assisted LITA–LAD MICAB, which was devised to ensure optimal positioning of a mini-thoracotomy or access-port.

2. Technique

General anesthesia was induced through a double-lumen endotracheal tube. Patients were placed in the 20° right lateral position and the left axilla was extensively exposed.

With left hemi-pulmonary collapse, the LITA was entirely mobilized. The technique for thoracoscopic LITA harvest via three 5-mm ports has been described elsewhere by the first author [1]. The first port for a 5-mm, 30° thoracoscope was placed at the fourth intercostal space (ICS) on the anterior axillary line, and the other two ports – for an ultrasonic coagulator (Harmonic Scalpel, Ethicon Endo-Surgery, Cincinnati, OH, USA) and an endoscopic dissector – were placed at the third and fourth ICSs on the mid-axillary line, respectively. With systemic heparinization, the distal end of the LITA was clip-ligated and divided with endo-instruments. A longitudinal anterior pericardiotomy was made with the ultrasonic coagulator, and the target portion in the LAD, which had been assessed preoperatively with angiography, was confirmed thoracoscopically.

Thereafter, a 7-cm, 23-gauge needle was used to examine the optimal location for a mini-thoracotomy or port. With video-thoracoscopic assistance, the guide-needle examined the appropriate point on the skin where the needle vertically penetrated the anterior chest wall and accurately indicated the selected target site in the LAD (Fig. 1). The skin-point was marked with a sterile pen, and the needle was removed. This mark was used accordingly as the mid-point of the skin incision for the LITA–LAD bypass. In cases where the rib
was positioned above the coronary target site, the center- mark was shifted to the nearest point on the costal margin. Each skin-incision on the left anterior chest wall, parallel to the rib, was made in the fourth or fifth ICS, the length being 6 and 4 cm for a mini-thoracotomy and a 33-mm-port (Circular-stapler Anal Dilator 33, Ethicon Endo-Surgery; Fig. 2), respectively. A small rib-retractor was used for the 6-cm thoracotomy.

The divided distal portion of the LITA was pulled out through the mini-entry. The lateral and medial margins of the pericardiotomy were suspended through each mini-entry, and a reusable heart stabilizer (Olympus, Tokyo, Japan, patent pending, Fig. 2) was attached to the beating heart; the flexible arm was fixed to the operating table and the heart stabilizer was able to pass through the 33-mm port. Under direct vision through the limited entry, LITA–LAD anastomosis was performed using regular instrumentation for coronary artery bypass.

3. Patients and results

A single surgeon applied the present technique to 11 consecutive patients (seven men and four women, 72.5 ± 7.7 years old) who required a single LITA–LAD bypass. Six (54.5%) of the patients were diabetic, four (36.4%) were octogenarians, and one male patient had obstructive pulmonary dysfunction due to emphysema. In the first seven patients, the left mini-thoracotomy was applied, whereas in the four later cases the 33-mm port was applied.

The mean operation/thoracoscopy time was 170.5 ± 22.2/48.4 ± 10.5 min. There was no conversion of the approach except in the patient with lung dysfunction; hemipulmonary collapse was not possible and thoracoscopy was therefore converted to a 10-cm anterior thoracotomy. There was no mortality and no procedure-related morbidity. Patency of the LITA graft was confirmed in all cases within 1 week after surgery. After a mean follow-up period of 12.5 ± 7.8 months, all of the patients except one, who died of stroke 1 year after surgery, are alive with no ischemic events.

4. Discussion

The present video-assisted needle-guided technique was used in ten (90.9%) patients, and a 6-cm thoracotomy (six cases) or a 33-mm port (four cases) was placed just above the target portion in the LAD. Thus, the thoracoscopically prepared LITA was directly anastomosed to the LAD via each mini-entry.

Diegeler et al. [2] favorably compared MICAB with stenting in patients with high-grade lesions in the proximal LAD. Thus, it seems that LITA–LAD MICAB can still play a significant role, and could be refined further reduce its invasiveness. Starting from a left anterior thoracotomy approach in the mid, 1990s [3], less traumatic approaches have been evolving and a totally endoscopic port-access technique has been devised using robot and computer technology. Dogan et al. [4] and Mohr et al. [5] reported encouraging outcomes of this pioneering technique, and Wolf [6] predicted that it would be used by a growing number of cardiac surgeons. Although the present video-assisted port-access technique is limited to LAD or diagonal branch disease and requires basic thoracoscopic skills for LITA preparation and pericardiotomy, it can be achieved simply and cost-effectively using a needle and regular instrumentation for coronary artery bypass and thoracoscopic surgery.

In conclusion, although our experience is limited, the present video-assisted needle-guided technique can be
a simple, viable method to facilitate appropriate positioning of a mini-thoracotomy or port in MICAB to the LAD with a thoracoscopically prepared LITA graft.

References


