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Brief communication - Coronary

Awake subxyphoid minimally invasive direct coronary artery bypass grafting yielded minimum invasive cardiac surgery for high risk patients

Go Watanabe*, Shohjiro Yamaguchi, Shigeyuki Tomiya, Hiroshi Ohtake

Department of General and Cardiothoracic Surgery, Kanazawa University School of Medical Science, 920-8641, Takara-machi 13-1, Kamazawa-shi, Ishikawa, Japan

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Abstract

Off-pump coronary artery bypass graft (CABG) surgery has become a widely used modality and has received recognized as a minimally invasive surgery with few complications. However, for patients with severely impaired pulmonary function, further considerations have to be given to reduce the complications associated with general anesthesia. We have accumulated experience in awake off-pump surgery combined with high thoracic epidural anesthesia. In this report we describe the use of alternative subxiphoid approach in patients with severe pulmonary dysfunction. A catheter for high thoracic epidural anesthesia was inserted one day before surgery. After obtaining an adequate level of anesthesia, a small subxiphoid incision was made and the pericardium was opened to expose the left anterior descending branch. The conduit for bypass, gastroepiploic artery was accessed through a minilaparotomy, and separated under the same surgical field and anatomozed under beating heart. This procedure was performed in three patients. Patency was confirmed by postoperative angiography in all three cases. All patients were discharged after an uneventful postoperative course. Awake subxiphoid approach has the advantages that both thoracotomy and sternotomy can be avoided thus permitting surgery with extremely low invasiveness. This method is recommended for patients with severe pulmonary dysfunction.

Keywords: Cardiac surgery; Coronary artery; Minimally invasive surgery; Off-pump bypass

1. Introduction

Off-pump coronary artery bypass graft (CABG) surgery has markedly reduced the mortality and morbidity of CABG, and especially drastically improved the surgical outcome in elderly patients [1, 2]. However, among patients with comorbidities, there exits a considerable population with severe pulmonary dysfunction who are predicted to be at high risk of postoperative complications associated with general anesthesia and positive pressure breathing. For these ultra high risk cases, the conventional off-pump CAGB using a median sternotomy cannot solve the problem. Recently we have experienced large series of awake off-pump CABG for multiple co-morbid patients. Here we have reported a surgical method that not only avoids thoracotomy but also obviates median sternotomy for patients with severe pulmonary dysfunction.

2. Material and methods

2.1. Patient

The selection criteria were cases in which surgical method was selected based on preoperative coronary angiography, and awake CABG was indicated considering the preoperative comorbidities. Among the eligible patients, those who had severe emphysema, severe pulmonary apical disease or giant pulmonary bulla were especially selected to undergo awake CABG using a small subxiphoid incision combined with high thoracic epidural anesthesia. All patients had single coronary disease which was considered as impossible to perform percutaneus coronary intervention. They had multiple comorbidities including cerebrovascular accident chronic obstractive lung disease and old age. The patients were aged 76, 76 and 78 years. Their European system for cardiac operative risk evaluation (EuroSCORE) scores were 37, 38 and 53%. The mean %VC was 68±7%, and $FVC_{1.0}$ was 57±9%. One patient had both severe internal carotid artery stenosis, and another patient had severe right internal carotid artery stenosis. There was one diabetic patient.

We obtained informed consent from patients to perform this procedure. This study was approved by the local Ethics Committee.

2.2. Anesthesia

One day before surgery, an epidural catheter was inserted at the T1-T2 or T2-T3 level using a fluoroscopic device. After insertion, the position of the catheter was confirmed

*Corresponding author. Tel.: +76-265-2355; fax: +76-222-6833.
E-mail address: gucci-s@ya2.so-net.ne.jp (G. Watanabe).

using contrast medium. On the day of surgery, epidural infusion was started in the operation room. Epidural thoracic administration of the anestheasia was performed with 40 ml of solution, composed of 20 ml bupivacain, 1% lidocain, 2 mg of morphine, was continuously infused at a speed of 20 ml/h by epidural tube during the procedure. Before surgery, the extent of sensory block was confirmed by conducting pin prick test and warm cold discrimination test. The region of motor block was also confirmed.

2.3. Operative procedures

In all patients, single-vessel bypass grafting was performed. Considering severe pulmonary dysfunction, a median sternotomy was not conducted. Instead, the xiphoid process at the lower end of the sternum was excised. An approximately 8-cm subxiphoid incision was made. From the opening, the pericardium was accessed, and the pericardium was incised vertically. Then, a minilaparotomy was performed under the same surgical field, and the right gastroepiploic artery (RGEA) was harvested using an electric cautery. After administrating heparin, the site of the RGEA used as graft was sectioned. After identifying the left anterior descending artery (LAD), coronary anastomosis was performed using a stabilizer. The RGEA was anastomosed to the LAD using 8-0 prolene running suture (Fig. 1). During the entire time of surgery, the patients keep fully awake and breathe deeply without mechanical ventilation.

3. Results

All three patients who underwent the subxiphoid approach awake MID CABG for grafting the left anterior descending branch to RGEA received CABG for the first time. The time of RGEA to LAD anastomosis was from 10 to 12 min and time of whole procedure was ranging 70–100 min. During the procedure, no hemodynamic instability or arrhythmias occurred.

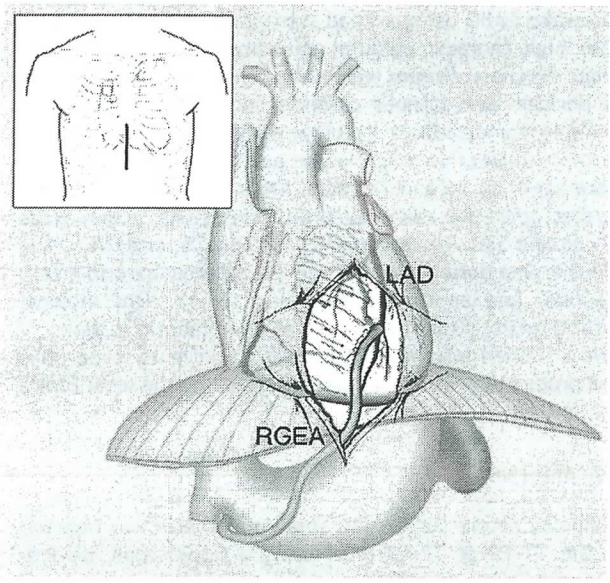

Fig. 1. Schema of this procedure.

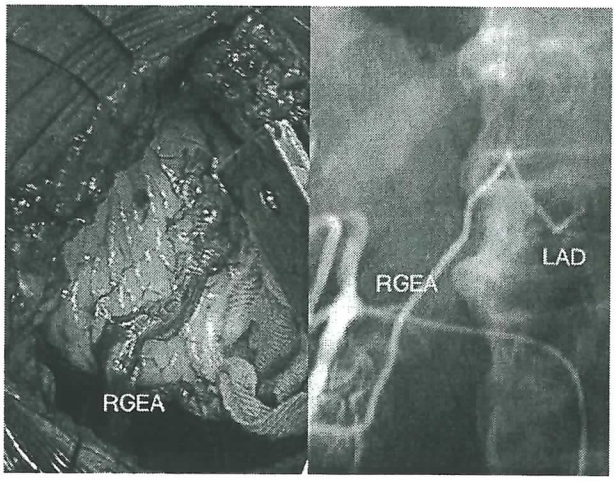

Fig. 2. Operative finding, and postoperative angiogram revealed to be patent of the rGEA.

The postoperative ICU stay was one day. There was no death, and postoperative catheter intubation was not required. Postoperative angiography revealed all grafts to be patent (Fig. 2). All patients were discharged after a hospital stay of 7–10 days.

4. Discussion

Awake subxiphoid MID CABG using right epiploic gastoric artery (rGEA) was a very safe bypass technique and an excellent method for revascularization of the left anterior descending branch. Since this method involves absolutely no sternotomy and the subxiphoid approach avoids opening of the pleura, also this method is superior to a median sternotomy in terms of eliminating the risk of intraoperative pneumothorax. In addition, harvesting of the rGEA was easy under the same surgical field. Since the RGEA has been proven to be a good in-situ arterial graft, there is absolutely no problem with grafting to the LAD [3]. Especially in patients with pulmonary complications, use of the RGEA is more effective than using the internal thoracic artery, because there is no risk of pneumothorax during surgery. The technique of awake cardiac surgery elsewhere first described in 2000 [4]. As reported was high thoracic epidural anesthesia is a highly favorable surgical strategy for angina pectoris because the coronary arteries are dilated and visceral vessels such as internal thoracic artery and the RGEA are also dilated [5]. Since the sympathetic nerve efferent fiber is blocked, high thoracic epidural anesthesia reduces the heart rate during beating heart CABG and permits highly stabilized anastomoses during surgery [6]. Needless to say, the method provides excellent perioperative pain management.

While the technique described in this article is suitable for revascularization of the LAD, diagonal branch and the right coronary artery, revascularization of the circumflex branch of coronary artery would be difficult. For patients with lesions including the circumflex branch, choice of

hybrid treatments such as MID CABG plus catheter intervention may be necessary [7]. The RGEA can not show better long term result compared to the ITAs. This procedure is not recommended for young patients.

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