Case Report

AORTA

AORTA, April 2015, Volume 3, Issue 2: 86-89
DOI: http://dx.doi.org/10.12945/j.aorta.2015.14-061

Received: October 10, 2014
Accepted: February 12, 2015
Published online: April, 2015

An L-Shaped Incision for an Extensive Thoracic Aortic Aneurysm and Coronary Artery Bypass Using the Left Internal Thoracic Artery

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Abstract

An L-shaped incision combining an upper half mid-sternotomy and a left antero-lateral thoracotomy at the fourth intercostal space has been proposed by several authors for extensive aneurysms involving the aortic arch and the proximal thoracic descending aorta. This approach usually requires the division of the left internal thoracic artery at its mid position, thus making it unusable for coronary artery bypass. We herein report a modified surgical approach for simultaneous extensive arch and proximal thoracic descending aorta replacement and coronary artery bypass using the left internal thoracic artery combining a left antero-lateral thoracotomy at the sixth intercostal space and upper mid-sternotomy. The visualization of the whole diseased aorta down to the level below the hilum of the left lung was good, and the integrity of the left internal thoracic artery graft was preserved by early heparin administration before sternotomy.

Key words

Thoracic Aortic Aneurysm • Coronary Artery Bypass • Mammary Arteries

Introduction

Many surgical approaches have been published to accomplish graft replacement of extensive aortic aneurysms involving the aortic arch [1-4]. Since most of them include partial or complete transverse sternotomy and division of the left internal thoracic artery (LITA) [1, 3, 4], some modification is necessary to use the LITA for coronary artery bypass. We herein report a modified L-shaped incision combining an upper mid-sternotomy and a left antero-lateral thoracotomy to use the LITA for its whole length.

Case Presentation

A 61-year-old male was referred from the Department of Cardiology for surgical treatment of a thoracic aortic aneurysm (Figure 1). The patient was hypertensive, and was an ex-smoker. He had undergone a coronary angiogram as a part of preoperative evaluation, and it showed a long 50–75% lesion in his proximal left anterior descending artery (LAD) (Figure 2). His cardiologist indicated that a coronary artery bypass to the LAD was also needed.

The aneurysm was large, with a maximal short axis diameter of 60 mm, and extended from the level of the left subclavian artery to the level below the hilum of the left lung (Figure 1). Although we usually prefer to perform aortic arch replacement via median sternotomy [5], we considered that the distal end of the aneurysm was too far to sew just from a me-

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Published by Science International Corp.
ISSN 2325-4637

Accessible online at:
http://aorta.scienceinternational.org

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Figure 1. A preoperative computed tomography scan showed a thoracic aneurysm extending from the level of the left subclavian artery to a level below the hilum of the left lung.

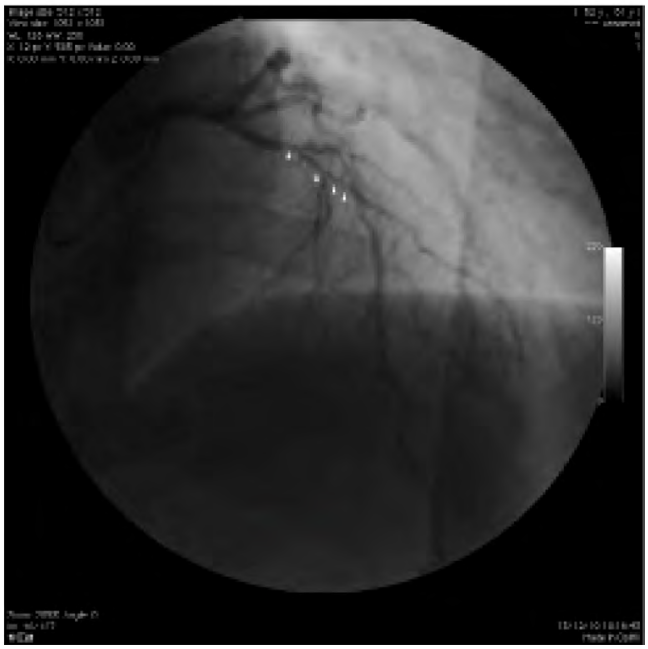

Figure 2. A preoperative coronary angiogram showed a long 50-75% lesion (white arrows) in the proximal left anterior descending artery.

dian sternotomy.

We typically make an L-shaped incision in such cases, combining upper partial mid-sternotomy and left intercostal thoracotomy at the fourth or fifth intercostal space (ICS) [1]. For this patient, however, we thought that it would be better if we could use the LITA for coronary artery bypass, and we thought that this might be possible by making a lower thoracotomy. We planned to make an L-shaped incision combining partial upper sternotomy and left thoracotomy at the sixth ICS.

For surgery, the patient was placed in the supine position. A rolled pad was placed behind the left scapula. A gentle curved skin incision was made from the suprasternal notch to the left chest over the seventh rib (Figure 3). The subcutaneous areolar tissue and the periostium were incised with a cautery device over the sternum. The sixth ICS was reached by dividing the pectoralis fascia and lower fibers of the pectoralis major muscles. The ICS was entered by dividing the intercostal muscles along the top of the seventh rib. At the left lateral sternal border, the ICS was carefully dissected, being careful not to injure the internal thoracic artery. At this point, we carefully checked the hemostasis, and gave 5,000 units of intravenous heparin.

Three minutes after the heparinization, we performed an upper sternotomy and transverse sternotomy from the sixth ICS to the mid-sternal incision. The LITA was divided with the sternum using a saw. Both ends of the LITA were identified and clipped. After obtaining hemostasis of the sternal edge with bone wax, we started to cut the intercostal muscles further down to the patient's back from inside the left hemithorax. Then, the chest wall was elevated with a retractor. We started to harvest the LITA with a cautery and an ultrasonic scalpel. It was easier than usual to harvest the LITA via a mid-sternal incision, because the chest wall was so highly elevated. The LITA was freed from the chest wall up to the level of the subclavian vein.

After preparing the descending aorta, and exposing the right femoral artery, a full dose of heparin was given. The clip on the LITA was removed, and we confirmed good pulsatile free flow. An extensive aortic replacement was performed using a Dacron graft with four branches with the aid of selective cerebral perfusion [6] (Figure 4). After completing all anastomoses for the arch and proximal thoracic descending aorta reconstruction, the aorta was unclamped and the coronary artery bypass was performed with a beating heart. The total amount of blood lost was

Figure 3. A postoperative photograph showing the curved skin incision over the upper sternum and the left seventh rib.

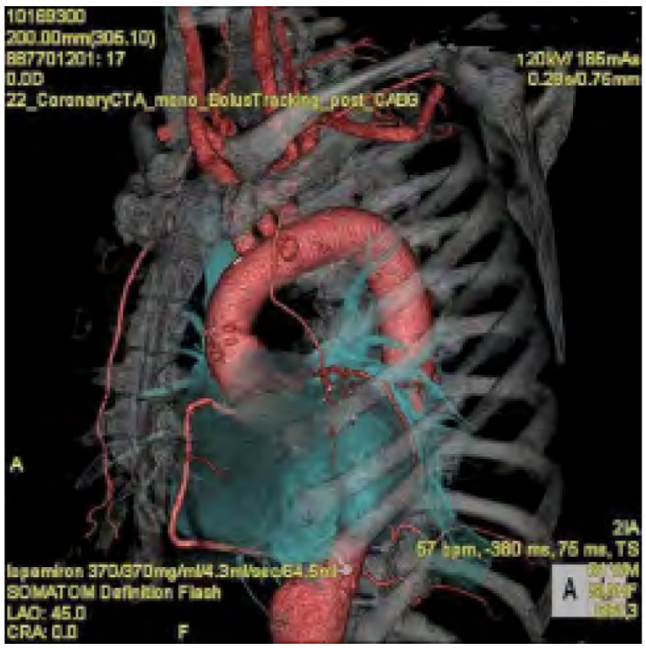

Figure 4. A postoperative computed tomography scan showing the Dacron graft and the left internal thoracic artery anastomosed to the left anterior descending artery.

544 cc. The patient's postoperative course was uneventful, and the postoperative CT angiogram confirmed the patency of the LITA graft (Figure 4).

Discussion

An extensive aortic aneurysm including the aortic arch is a surgical challenge. Conventional aortic repair including replacement with a vascular prosthesis cannot be accomplished by either single mid-sternotomy or left thoracotomy. Many approaches have been published, including two-stage operations [2], bilateral anterior thoracotomy [3], lower sternotomy and thoracotomy [4] and upper sternotomy and thoracotomy [1].

We prefer to use the last approach, since we think this approach provides good access to the arch branches. The division of the left internal thoracic artery at the ICS which we use for the thoracotomy is inevitable. Considering that the patient was in his early 60s, we wanted to use the LITA for this particular patient. The most frequent level of termination of the left internal thoracic artery is the 6th ICS [7], so we made the thoracotomy at this level. We found that the visualization of the aortic arch and the thoracic descending aorta was good, and the LITA could be harvested in good condition with the patient only needing a small dose of heparin. The amount of intraoperative blood loss was small despite early heparinization.

In conclusion, we performed a combined extensive thoracic aortic replacement with an L-shaped incision and a coronary artery bypass to the LAD using the LITA. It was possible to use the full length of the LITA after making the incision and placing the thora-

cotomy at the lower ICS and by performing heparinization before the sternotomy.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

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Cite this article as: Abe T, Suenaga H, Oshima H, Araki Y, Mutsuga M, Fujimoto K, Usui A. An L-Shaped Incision for an Extensive Thoracic Aortic Aneurysm and Coronary Artery Bypass using the Left Internal Thoracic Artery. AORTA 2015;3(2):86-89. DOI: http://dx.doi.org/10.12945/j.aorta.2015.14-061

EDITOR'S QUESTIONS

1. Why did you select your specific approach in preference to a frozen elephant trunk to accommodate the descending aneurysm component?

Frozen elephant trunk is associated with a significant percentage of spinal cord injury with a reported incidence ranging from 0–24%. The incidence has also been quite high based on our own experience. We therefore prefer to perform end-to-end surgical anastomosis under direct vision for young patients who could likely survive the surgery and then go home in a good condition. We reserve the frozen elephant technique, which obviously is a useful modality, for patients who are at high risk to be treated by a direct surgical approach.