
症 例

Successful Resection and Replacement of an Aneurysm Involving Entire Transverse Aortic Arch Combined with Left Pneumonectomy

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Surgery for the aneurysm of transverse arch of the aorta has been considered as one of very complicated and difficult surgeries with hazardous consequences. It has been known also that the neighboring organs such as trachea, bronchus and esophagus are frequently compressed by the aneurysm causing symptoms.

Here we present a case who has had an extensive aneurysm from the distal portion of the ascending aorta to the distal portion of the descending thoracic aorta, combined with the atelectasis of entire left lung. Resection of the aneurysm with graft replacement was performed. In addition, left pneumonectomy was performed due to irreversible atelectasis of the lung and unreparable necrosis of left main bronchus. After surgery this patient took uneventful course without any lung complication. She was discharged in good condition 39 days after surgery.

Case report

This patient was a 59 year old female patient. Eight months prior to the admission she started to have pain on her back. This pain has gradually increased and she could not sleep at night in supine position at the time of admission, 10 days before surgery. Recently she developed dyspnea and palpitation even at rest. Forty days prior to the admission, she was seen by a cardiologist and the diagnosis of aneurysm of thoracic aorta was made.

At the time of admission, her blood pressure was 98/64 mmHg. Auscultatorily, right lung was clear, but over left lung field only bronchial breathing sound was heard. Bruit was not audible. Chest x-ray picture revealed the atelectasis of entire left lung with the shift of mediastinum to the left. Electrocardiogram did not show any depression of ST

Key words : Surgery of aortic arch, Aneurysm, Pneumonectomy

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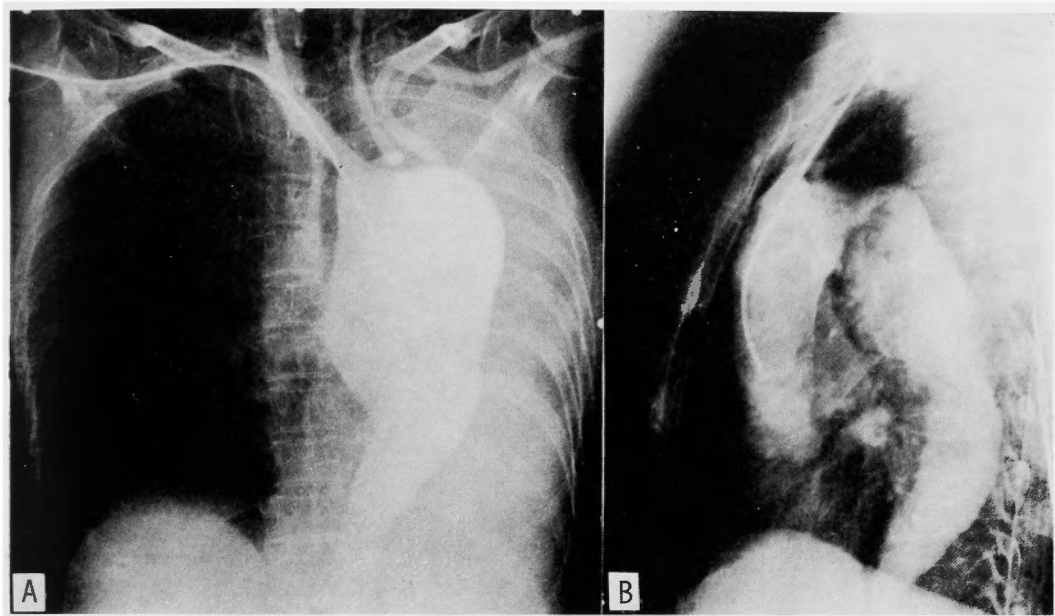


Fig. 1 Preoperative aortogram reveals an extensive aneurysm spreading from the distal portion of ascending aorta down to the distal portion of descending thoracic aorta. Left lung is atelectatic and the mediastinum is shifted to the left. A, Antero-posterior projection. B, Lateral projection.

segment. Serological test for syphilis was strongly positive. Blood urea nitrogen was 47.8mg/dl. PCO_2 and pO_2 of arterial blood taken at room air were 28.4 mmHg and 61.1mmHg respectively. Aortogram was obtained by injecting the contrast medium to the ascending aorta through an arterial catheter. This aortogram revealed an extensive aneurysm spreading from the distal portion of the ascending aorta to the distal portion of the descending thoracic aorta (Fig. 1).

Surgery was performed on July 30, 1976. Patient was cooled by surface cooling method. Skin incision was started at 32°C. Lowest rectal temperature during surgery was 29°C.

Chest was opened through the left fifth intercostal space. This incision was extended to the middle of sternum, then up to the suprasternal notch by splitting the upper two thirds of sternum (Fig. 2). Upper portion of the left anterior chest wall was lifted up like a

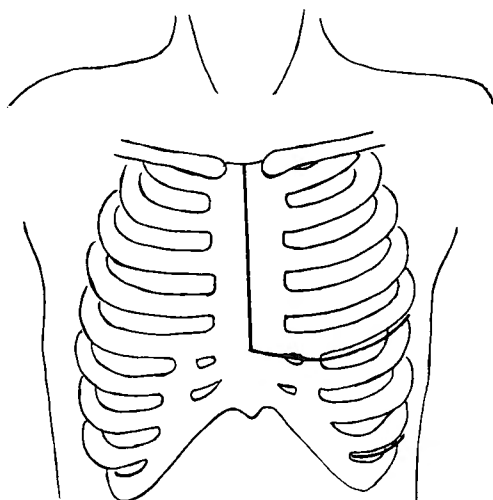


Fig. 2. Thoracotomy incision is indicated by solid line.

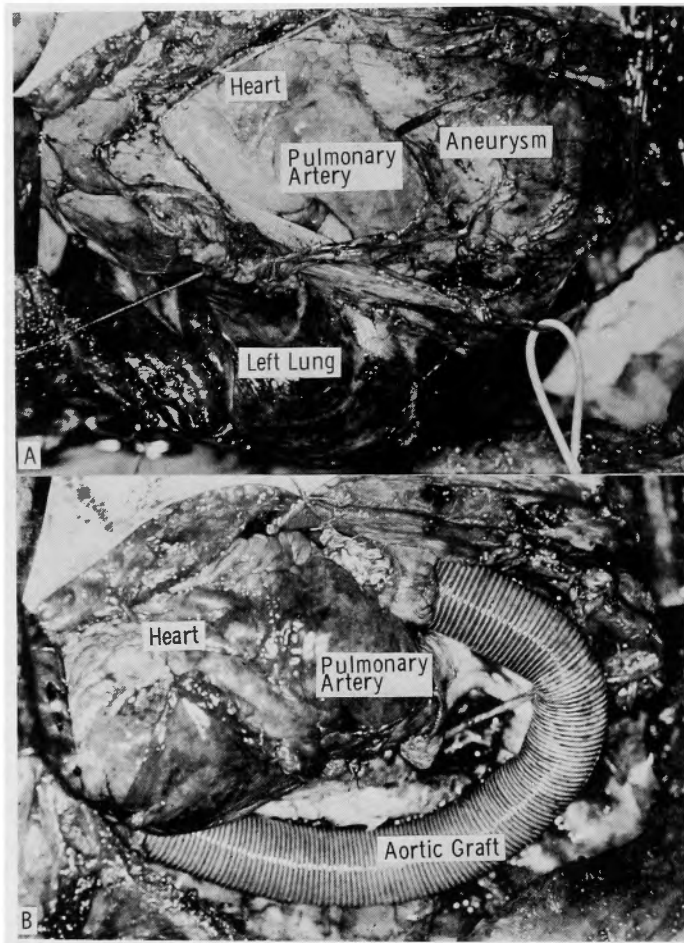


Fig. 3 Photographs taken during surgery. A, Before resection of aneurysm. Notice atelectatic left lung! B, Aorta was replaced. Left lung was removed.

flap. Ascending aorta and transverse aortic arch as well as its three major branches were well exposed. Bilateral thoracotomy and transection of sternum were avoided in order to minimize postoperative respiratory impairment. Pericardium was opened. It was confirmed that the aneurysm was a fusiform one extending from the distal portion of the ascending aorta to the descending thoracic aorta ending at 7 to 8 cm above the diaphragm. In order to provide better exposure of distal part of descending aorta, incision of the left eighth intercostal space was added. It was noticed that the left lung was completely atelectatic (Fig. 3A).

A 16mm woven straight graft was attached to the side of 25 mm woven bifurcated graft and was prepared for use of temporary bypass. The proximal end of this bifurcated graft was attached to the side of intact proximal portion of the ascending aorta. Two

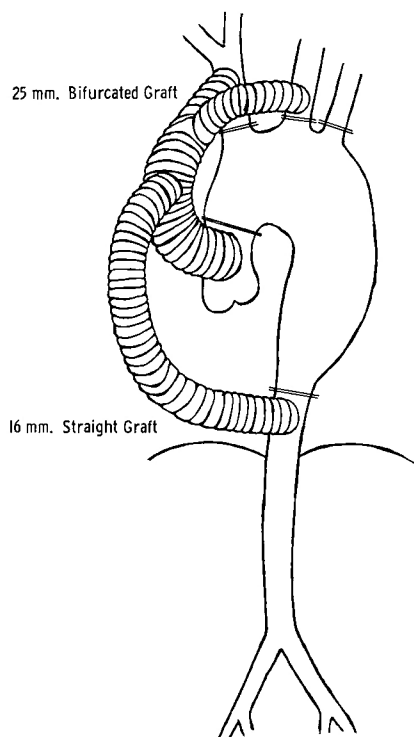


Fig. 4 Diagram showing attachment of temporary bypass graft during surgery.

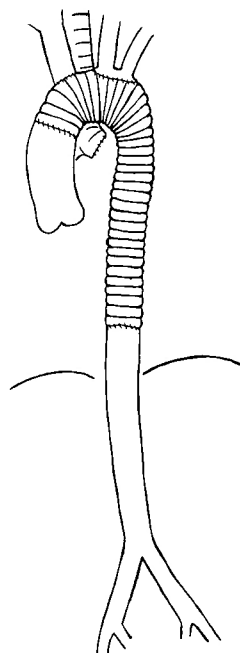


Fig. 5 Diagram showing replacement of aorta involving entire transverse aortic arch and left pneumonectomy.

limbs of bifurcated graft were attached to the sides of innominate and left common carotid arteries. Then the open end of straight graft which was previously attached to the bifurcated graft was anastomosed to the side of descending aorta just above the diaphragm (Fig. 4). Heparin was given at a dose of 1.5 mg/kg of body weight and was added later at a dose of 1mg/kg. After starting temporary bypass, aorta and its three major branches were cross-clamped excluding the aneurysm. Aneurysm was opened longitudinally. It was noticed that the left main bronchus was compressed and was occluded by the aneurysm. Vertebral column was eroded remarkably. There was a large amount of blood clot inside of the aneurysm. Atelectatic lung was not inflated at all by decompressing the bronchus. While evacuating the clot inside of the aneurysm, necrosis and perforation of the wall of left main bronchus was noticed. So, left pneumonectomy was performed.

One end of 25 mm. woven Dacron straight graft was attached to the distal open end of ascending aorta. Then, innominate artery was attached by end to side anastomosis to the side of the graft. Left common carotid and left subclavian arteries together with a small cuff of the aortic wall were attached to the side of the graft. Then the other end of the graft was anastomosed to the distal open end of descending aorta (Fig. 3 B and Fig. 5).

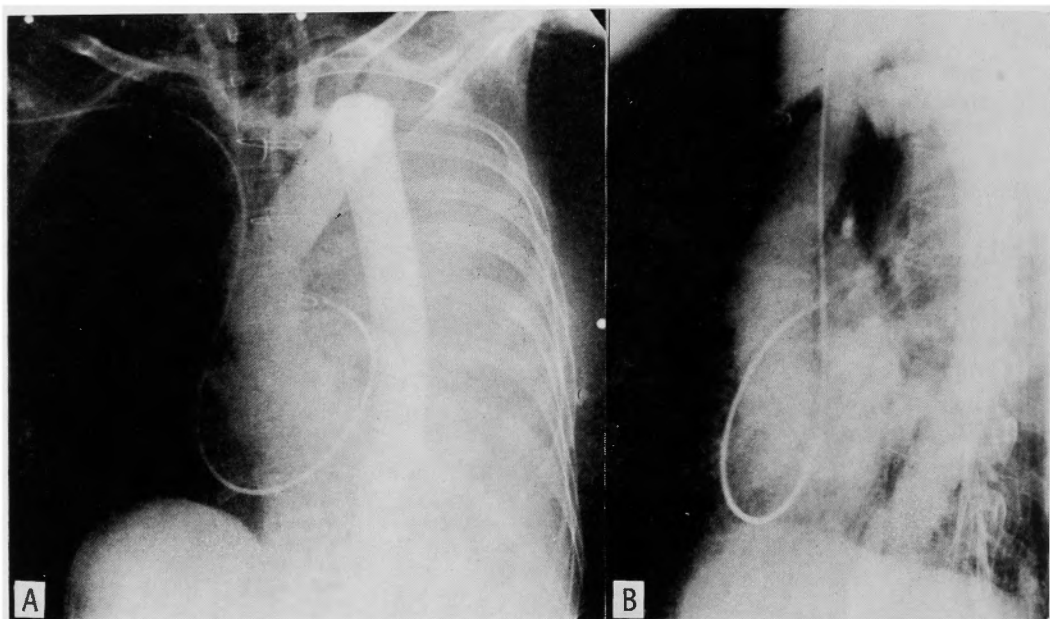


Fig. 6 Postoperative aortogram. (Postop. 1 month) A, Antero-posterior projection. B, Lateral projection

There was no fluctuation of blood pressure by placing the aortic clamp for temporary bypass and interrupting normal circulation. Urine volume during temporary bypass time of approximately two hours and fifty minutes was 380 ml. Operation time was 9 hours and 5 minutes. Patient was soon awake after cessation of anesthesia leaving no nervous symptom.

Postoperative course was uneventful without any lung complication. She started to be out of oxygen tent 17 hours after surgery. At that time, $p\text{CO}_2$ and $p\text{O}_2$ of arterial blood taken at room air were 40.9mm Hg and 73.6mm Hg respectively. There was no sign of renal impairment due to the surgery. She was discharged in good condition 39 days after surgery (Fig. 6).

Discussion

For the surgery of aneurysm involving transverse aortic arch, either temporary bypass technique or extracorporeal circulation have been employed widely. Insitution of total cardiopulmonary bypass and perfusion by separate cannulae in the major branches may provide adequate support for the temporary interruption of transverse aortic arch. However, if the proximal portion of the ascending aorta is uninvolved by the aneurysm, the technique of temporary bypass of the aorta can be used in preference to complete cardiopulmonary bypass. With the improvement of such supportive technique as well as of surgical techniques, operative result for the transverse aortic arch has become favorable¹⁾²⁾³⁾⁵⁾.

However, it would still be very difficult to succeed in replacing the aorta involving the entire transverse aortic arch and in removing entire left lung at the same time.

Deliberate performance must be needed. Otherwise, hazardous complications such as respiratory impairment will be likely to occur and fatal outcome may follow.

It is not rare that the aneurysm of transverse aortic arch compresses the neighboring organs causing symptoms²⁾³⁾⁴⁾. In our present case, the atelectasis of entire left lung was not relieved at all after opening and decompressing the aneurysm. Moreover, there was unreparable necrosis and perforation of compressed left main bronchus. Consequently pneumonectomy was necessary. Fortunately this patient took uneventful postoperative course. The reasons for the success of this surgery may largely be due to the followings.

1) Bilateral thoracotomy and transection of sternum were carefully avoided for the purpose of minimizing postoperative respiratory impairment. 2) Heart lung bypass which might elicit lung complication was avoided.

Summary

This is a case report of 59 year old female patient who has had left pneumonectomy and replacement of aorta including distal portion of ascending aorta, entire transverse aortic arch and major portion of descending thoracic aorta with the aide of temporary bypass technique combined with hypothermia by surface cooling method. Bilateral thoracotomy and transection of sternum were carefully avoided in order to minimize postoperative respiratory impairment. Her postoperative course was quite uneventful. There was no respiratory complication. The patient was out of oxygen tent 17 hours after surgery and thereafter. To the author's knowledge, there has not been any similar report in the literature.

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和文抄録

弓部大動脈全体を含む胸部大動脈瘤の置換と
左肺全摘を同時施行した1手術治験例

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上行大動脈遠位部から下行胸部大動脈遠位部に及ぶ紡錘状大動脈瘤を切除し, 人工血管を置換, 同時に修復不能な左気管支壁壊死と左肺無気肺のため左肺全摘を実施した1手術治験例を報告した. この症例は59才の女性である. 手術の補助手段は1時的バイパス法を採用し, 表面冷却低体温法を併用した. 術後の呼吸障

碍を出来るだけすくなくするため両側開胸や胸骨横断を行うことを避けた. これらの配慮により呼吸器合併症はなく, 患者は術後17時間で酸素テントを最早必要としなくなった程であった. 術後は全く順調で術後39日目に退院した.