

Successful Surgical Repair of an Infectious Thoracic Aortic Pseudoaneurysm Accompanied by Aortobronchopulmonary Fistula and Advanced Hepatic Dysfunction without Assisted Circulation

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The patient was a 59-year-old female. Because of massive hemoptysis, she was brought to our emergency center by ambulance. Thoracic computed tomography led to a diagnosis of an infectious thoracic aortic pseudoaneurysm accompanied by an aortobronchopulmonary fistula. Emergency surgery followed. Also noted was an advanced hepatic dysfunction, assessed as Child-Pugh score B, caused by an alcoholic liver disease. A localized affected area made it possible for us to perform an aneurysmectomy using a temporary bypass rather than assisted circulation. A patch plasty using expanded polytetrafluoroethylene completed the procedure. *Streptococcus agalactiae* (GBS) was detected in a sample obtained during the surgery from an abscess located in the aneurysm. The patient made satisfactory postoperative progress and left the hospital walking unaided on the 36th postoperative day. (Ann Thorac Cardiovasc Surg 2010; 16: 35–39)

Key words: advanced hepatic dysfunction, aortobronchopulmonary fistula, infectious thoracic aortic pseudoaneurysm, temporary bypass

Introduction

For a patient's condition of advanced hepatic dysfunction with a Child-Pugh score of B or higher, it is argued that cardiac surgery involving the thoracic artery and relying on the use of a cardiopulmonary bypass is associated not only with extremely high mortality, but also with a high incidence of complications and therefore should not be

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Received October 21, 2008; accepted for publication February 10, 2009

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classified as elective surgery. Unless surgically treated, an aortobronchopulmonary fistula (ABPF) caused by thoracic aortic pseudoaneurysm may be life threatening. This is a report on successful emergency surgery without assisted circulation performed on such a patient. The patient, suffering from an infectious thoracic aortic pseudoaneurysm accompanied by ABPF and advanced hepatic dysfunction with a rating of B according to the Child-Pugh system, successfully underwent emergency surgery in which assisted circulation was not used. The details are presented below.

Case

Patient: A 59-year-old female

Chief complaint: Hemoptysis

Present medical conditions: The patient woke up at midnight, coughing persistently, with subsequent hemoptysis. The blood expectorated amounted to one-third of

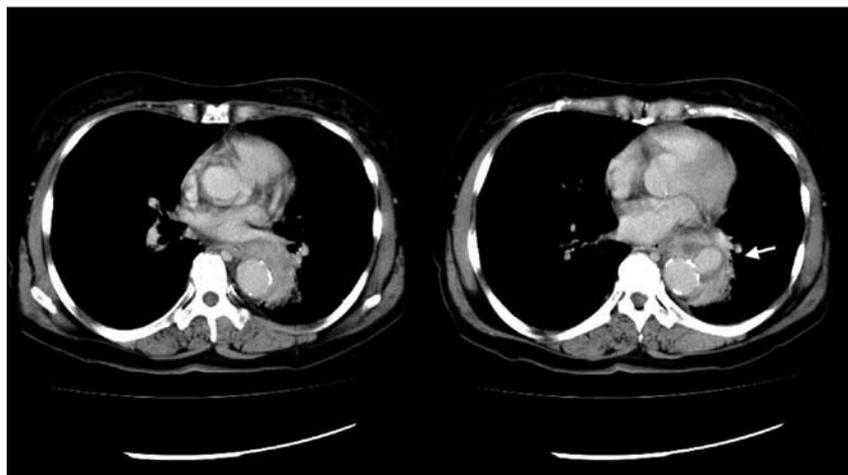


Fig. 1. The arrow shows the ruptured aneurysm, leaving adventitia of the arterial wall barely intact.

In part, radiation absorption was evidently low, being distinguished from the rest.

an average-sized washbowl. An ambulance service was requested, and the patient was admitted to our emergency center.

Medical history: Alcohol dependency and depression, 1991; alcoholic liver cirrhosis, 2004; untreated diabetes mellitus, at present.

Family medical history: Unremarkable

Medical conditions at the time of hospitalization: Lucid mental state; body height, 158 cm; weight, 52 kg; blood pressure, 152/78 mmHg; pulse, 124 bpm (regular); and moist rales detected from bilateral lung fields at auscultation.

Thoracic X-ray radiography: CTR, 52%; slightly augmented shadows on pulmonary arteries.

Electrocardiography: Tachycardia of 128/min, sinus rhythm.

Hematological examination: CRP 6.9 mg/dL, T-P 7.8 g/dL, ALB 3.2 g/dL, T-BIL 3.2 mg/dL, D-BIL 1.6 mg/dL, AST 58 IU/L, ALT 17 IU/L, LDH 523 IU/L, ALP 255 IU/L, γ -GTP 398 IU/L, ChE 158 IU/L, BUN 4 mg/dL, Cr 0.4 mg/dL, HbA1c 8.2%, WBC $10.5 \times 10^3/\mu\text{L}$, RBC $3.78 \times 10^6/\mu\text{L}$, Hb 14.1 g/dL, PLT $70 \times 10^3/\mu\text{L}$, PT 18.4 sec, PT INR 1.6, PT% 54%.

As noted above, increased inflammatory reaction, a decreased serum albumin level that accompanies alcoholic liver cirrhosis, increased total serum bilirubin content, a decrease in platelets, and a decreased prothrombin activity were noted. An untreated diabetic condition was indicated with HbA1c of 8.2%.

Thoracic computed tomographic (CT) scan: A localized saccular aneurysm with a maximum diameter of 60 mm

and a lesion measuring 50 mm was recognized. The arrow shows the ruptured aneurysm, leaving adventitia of the arterial wall barely intact. In part, radiation absorption was evidently low, being distinguished from the rest (Fig. 1).

Based on findings of inflammation that suggested hemoptysis or infection and also on the CT findings, a diagnosis of an infectious thoracic aortic pseudoaneurysm with ABPF was given. Emergency surgery was performed on the aneurysm. A Child-Pugh total score of 8, classified as grade B (1 point each for the absence of encephalopathy and ascites, 2 points for the increase in serum bilirubin, 2 points for decreased serum albumin, and 2 points for the decrease in prothrombin activity), together with a history of alcoholic liver cirrhosis, suggested possible postoperative exacerbation of her hepatic dysfunction if a cardiopulmonary bypass was used. Furthermore, the patient was considered to be more susceptible to infection because of her uncontrolled diabetic condition. Thus aiming for minimally invasive surgery, we prepared a temporary bypass by using the descending thoracic aorta instead of resorting to assisted circulation, and the vascular prosthesis replacement or patch plasty was scheduled.

Surgical findings: With the patient lying on her right side, the thoracic cavity was approached via intercostal posterolateral thoractomy of the left 7th rib. Although no intracavity adhesion was found, the localized aneurysm was found adherent to the lung. Two 8-mm aortic arch cannula (Edwards Lifesciences, Irvine, CA) were used to form a temporary bypass. Following aortic interruption,

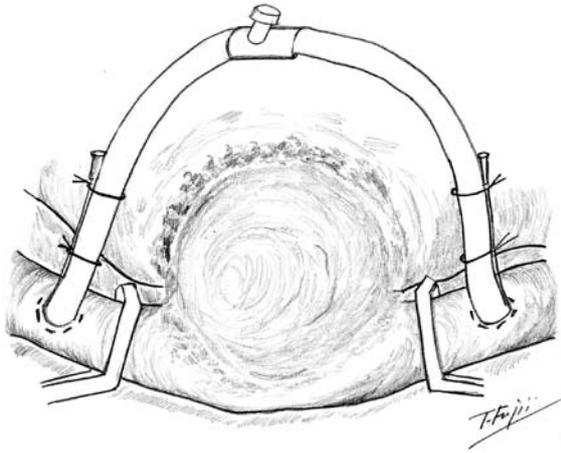


Fig. 2. Illustration of surgeon's view.

Two 8-mm aortic arch cannula (Edwards Lifesciences, Irvine, CA) were used to form a temporary bypass.

the central and peripheral blood pressures were 100 and 60 mmHg, respectively (Fig. 2).

Having made an incision, the aortic lesion was found to be a pseudoaneurysm with the presence of thrombi and abscess formation. This finding suggested that it was an infectious pseudoaneurysm. *En bloc* extirpation was performed on the adherent aneurysmal wall and part of the lung. The infected portion was removed as much as possible; because complete excision was possible, aortic patch plasty was conducted, using a 0.4 mm expanded polytetrafluoroethylene (e-PTFE) vascular patch. Circulation was interrupted for a total of 43 minutes. There was concern about hemorrhaging because of a compromised coagulation capacity; but hemostasis was achieved with the intraoperative administration of 10 units of fresh frozen plasma (FFP) and 20 units of concentrated platelets (Fig. 3). Following a lavage with strongly acidic water, the surgery was completed without omentum coverage.

Postoperative clinical course: Despite concerns about an organ perfusion disturbance at the distal side of the temporary bypass, the serum bilirubin level, which had transiently climbed to 4.5 mg/dL, thereafter gradually decreased, indicating an improving hepatic function. The intra- and postoperative urinary output was maintained, and the postoperative serum Cr level remained within the normal range, indicating a satisfactory renal status. Neither was postoperative ileus or any other symptom noted (such as bloody diarrhea suggestive of bowel ischemia). *Streptococcus agalactiae* (Group B streptococcus: GBS) was identified in a specimen collected from the aneurysmal



Fig. 3. Hemostasis was achieved with an intraoperative administration of 10 units of FFP and 20 units of concentrated platelets.

wall. After consultation with an infection control physician, 2 g/day of vancomycin hydrochloride was administered for 14 days. On the 8th postoperative day, the patient was transferred to the general ward for diabetic treatment. Hospital discharge took place on the 36th day with the patient walking unaided.

Discussion

The principal rule in the treatment of a pseudoaneurysm with ABPF is complete excision of its cause at the site where the wall of the aneurysm adheres to the lung. Fujii and colleagues stated that unless surgically treated, ABPF caused by a thoracic aortic pseudoaneurysm will inevitably take a fatal turn.¹⁾ Several articles report surgical success on severe cirrhosis, but no clear surgical indication has been found. According to Klemperer and colleagues, it is meaningful to operate on those patients with an advanced hepatic dysfunction if their Child-Pugh classification is of grade A; however, surgery requests involving the use of a cardiopulmonary bypass for patients with hepatic cirrhosis and a Child-Pugh grade higher than A should not be accepted.²⁾ Using a cardiopulmonary bypass, Hayashida and colleagues performed surgery that involved the heart and major vessels on 15 of 18 patients with hepatic cirrhosis and who were classified according to their Child-Pugh scores.³⁾ They reported that the incidence of complications as well as mortality were higher for those patients with more advanced stages of hepatic cirrhosis, as indicated by their Child-Pugh scores. Fur-

ther, although grade A patients were operable, operations on grade B and C patients were difficult. Yet besides the low rate of complications, no deaths occurred among 3 grade B patients who had undergone off-pump CABG. The authors referred to this procedure as a new form of surgical treatment for patients with severe hepatic cirrhosis who needed surgical revascularization.³⁾ These articles suggest that whenever possible, while operating on patients with hepatic cirrhosis of grade B and above, the surgeon should choose a procedure that does not require the use of a cardiopulmonary bypass. In our case, surgery may have been possible by resorting to the use of the sophisticated cardiopulmonary bypass that is now available, but we selected to use a temporary bypass that is simple and easiest to apply. Although surgery with a simple circulatory interruption was considered, the major premise was the completion of the operational process within a very short time interval for circulatory arrest. The aneurysm was infectious in nature, and its morphology was unknown to the surgeon. Depending on the condition of the infected vascular wall, a great deal of time might be needed for the reconstructive procedure. Moreover, from the standpoint of protecting the internal organs, a surgical procedure employing a temporary bypass was selected.

In this operation, the aortic arch cannula used for the in- and outflow of blood was easily inserted by a purse-string suture. Ease of manipulation was achieved by simply connecting two aortic arch cannulas; the length of the bypass was adjustable; and the operative field was unobstructed. We have used this method in a case of aortic infiltration of a lung cancer with no serious problems.⁴⁾ The renoprotective effect of a temporary bypass was demonstrated by maintaining intra- and postoperative urinary outputs as well as serum Cr values within normal ranges. Perioperative total serum bilirubin transiently increased to 4.5 mg/dL, then gradually decreased. The serum cholinesterase content was also lower than at the preoperative level; on the 20th postoperative day it reached the lowest, then began to rise thereafter. This reversible outcome appears to show that our procedure worked to protect the liver functions. Its beneficial effect on intestinal blood circulation is attested to by the absence of postoperative ileus or symptoms such as bloody diarrhea, which is suggestive of bowel ischemia. To reconstruct the aneurysmal site, we selected patch plasty with an e-PTFE vascular patch because the aneurysm was localized and the infected site could be extirpated with certainty. In Europe and the United States, cryopreserved

homografts are accepted as material usable where infection is present.⁵⁾ Because these materials are now hard to obtain in Japan, their availability for emergency surgery is out of the question. The development of a pseudoaneurysm is certainly a possibility. For the current case, the surgery was conducted to minimize the extent of separation and excision and to complete the procedure in the shortest possible time so that the patient's life might not be threatened in any way. For that reason, the femoral vein was neither collected nor used, though there are several reports with valid results.⁶⁾ Besides surgical procedures, the use of an endovascular stent is another promising therapeutic option. The procedure would be included in those facilities where the physicians are skilled in the use of this device. An infection-resisting capacity on the part of e-PTFE was indicated in a report by Bandyk and colleagues.⁷⁾ Imamura and colleagues reported on the effectiveness of the e-PTFE prosthetic vascular graft, cleaning with strongly acidic water, and omentum coverage in the infected or contaminated surgical field.⁸⁾ We accepted that it is also useful, though without evidence. But the omental coverage was not applied for the following reasons: complete excision of the infected part was possible with thorough infection control; an omental coverage requires laparotomy, causing high surgical stress and prolonging surgical time, which in turn increases the amount of blood loss because of the deteriorating coagulability; and hypoalbuminemia may be caused by a prolonged intrathoracic accumulation of ascites.

Streptococcus agalactiae (GBS), the causative microorganism of infected aortic aneurysms, was detected in a specimen taken from the excised aortic wall. This gram-positive coccus, which resides in the genitourinary system or the upper respiratory tract, is known for its weak pathogenicity and tends to cause infections mediated by foreign bodies or anatomical abnormalities. The organism is also known to cause infections among elderly people who already have underlying diseases, such as diabetes mellitus or chronic renal failure.⁹⁾ After consultation with an infection control physician, vancomycin at a dosage of 2 g/day was administered over 14 days to avert the sepsis by *Streptococcus agalactiae* (GBS). Thereafter, oral intake of a cephem antibiotic was continued. Even for those cases in which MRSA was detected on the arterial wall, methods such as those cited in the current study were selected, supplemented by irrigation drainage. The reason is that even when a nonanatomical bypass surgery is adopted, foreign bodies are likely to persist at the resection stump, making infection control difficult. In the

event of a failure in infection control in spite of irrigation drainage, it was planned that sufficient quantities of FFP and concentrated platelets will be kept ready. Further, a temporary bypass will be used as in the initial surgery to remove the infected portion, followed by replacement with a vascular prosthesis and a filling of the region with omentum. The patient continues to visit this hospital for the necessary long-term observations.

Conclusion

Emergency surgery was performed on a female patient diagnosed as having an infectious thoracic aortic pseudoaneurysm with an ABPF, presenting symptoms of advanced hepatic dysfunction. The hepatic function was rated grade B according to the Child-Pugh classification. Because of her condition, the operation was performed without using assisted circulation; a temporary bypass was formed at the thoracic descending aorta; and for patch plasty, e-PTFE was employed. *Streptococcus agalactiae* (GBS) was detected in the excised aortic wall. No recurring symptoms have been observed since the perioperative administration of vancomycin. Long-term observation of the clinical course is considered necessary from now on.

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