Surgical Management of Ascending Aortic Graft Infection

No-Sedation-Technique for Open Mediastinal Irrigation

Two patients with ascending aortic graft infection were successfully treated. The first patient underwent ascending aortic replacement using a Dacron graft for aortic dissection, and developed graft infection. After 25 days' open mediastinal irrigation, allograft replacement and rectus muscle flap transfer were performed. The second patient underwent translocation of the aortic valve with a composite graft for calcific aortic stenosis, and developed graft infection. After 29 days' open irrigation, omental and rectus muscle flap transfer were performed. We were able to perform long-term open mediastinal irrigation using our original no-sedation-technique without any severe complication such as bleeding or secondary infection. We believe this technique is helpful in the management of severe ascending aortic graft infection.

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Graft infection is a life-threatening complication in aortic replacement. This paper reviews our experience with two patients who had severe ascending aortic graft infection and were successfully treated with a combination of procedures including open irrigation, allograft replacement, omental transposition, and rectus muscle flap transfer. We performed long-term open irrigation without heavy sedation or tracheal intubation. We believe this technique is helpful in the management of severe ascending aortic graft infection.

Cases

Case 1. A 52-year-old man with a past history of gastrectomy and omentectomy for gastric cancer underwent ascending aortic replacement with a woven Dacron graft for DeBakey type I acute aortic dissection. Purulent discharge from the sternotomy wound was noted and a revision was performed on the 13th postoperative day. Pus completely surrounded the graft, including the proximal and the distal suture lines. Pus culture grew methicillin-resistant Staphylococcus epidermidis and Candida parapsilosis. We continued open irrigation (details are described below in ‘Discussion’) and systemic administration of antibiotics (1–2 g per day of panipenem/betamiprom and 200–300 mg per day of amikacin sulfate; the dosages were always determined so as to maintain an appropriate blood concentration, and renal dysfunction did not occur) for 25 days. Although the mediastinum remained open during this period, secondary infection did not develop, and cultures of the mediastinal tissues all turned negative. Maximum WBC and CRP levels were 16,700/mm$^3$ and 12.5 mg/dl, but these levels decreased to 9,800/mm$^3$ and 2.8 mg/dl, respectively, by the end of this period. After this treatment, we excised the infected graft and Teflon felt strips, implanted an aortic allograft, and filled the dead space with a rectus muscle flap. Culture of the excised felt still revealed methicillin-resistant Staphylococcus epidermidis and Candida parapsilosis. Postoperatively, antibiotics (1–2 g per day of vancomycin hydrochlo-
ride, 1–2 g per day of panipenem/betamiprom, and 200–300 mg per day of amikacin sulfate) and an antymycotic (50–100 mg per day of fluconazole) were administered for 50 days, and the patient was discharged with a CRP level of 1.9 mg/dl. No recurrence of infection has been observed to date at three years after the primary operation.

Case 2. A 56-year-old man who had been undergoing hemodialysis for six years was admitted for surgical treatment of severely calcified aortic stenosis. We performed translocation of the aortic valve with a composite graft made of a woven Dacron graft and a CarboMedicus valve, and aortocoronary bypass with three saphenous vein grafts, since ordinary aortic valve replacement was impossible because of severe calcification of the annulus. Purulent discharge from the sternotomy wound was noted and reoperation was performed on the 18th postoperative day. Pu complete around the graft, including the suture lines of the Dacron graft and the vein grafts. Although the culture of the pus was negative, fungal infection was suspected, since the \( \beta \)-d-glucan level had increased to 191 pg/ml (normal range is under 20 pg/ml). We continued open irrigation and systemic administration of antibiotics (0.5 g per day of panipenem/betamiprom and 300 mg per day of clindamycin phosphate) and an antymycotic (25 mg per day of fluconazole) for 29 days. No secondary infection developed during this period. Maximum WBC and CRP levels during this period were 21,700/mm\(^3\) and 21.6 mg/dl, but these levels decreased to 8,800/mm\(^3\) and 12.5 mg/dl, respectively, by the end of this period. After this treatment, we excised the infected sternum and transposed the omentum and the rectus muscle flap. Postoperatively, antibiotics (0.5 g per 2–4 days of vancomycin hydrochloride and 100–200 mg per 2–4 days of amikacin sulfate) and an antymycotic (25 mg per day of fluconazole) were administered for 30 days, and the patient was discharged with a CRP level of 0.5 mg/dl. No recurrence of infection has been observed to date at three years after the primary operation.

Discussion

Cases of ascending aortic graft infection can be classified into two types according to the route of infection. In one type, grafts are infected from mediastinitis, mainly in the early postoperative period, as in our cases. For this type, treatment of mediastinitis as well as of graft infection is necessary. In the other type, grafts are infected hematogenously, mainly in the late postoperative period. For this type, surgical treatment of mediastinitis is not always necessary since infection occurs mainly inside the graft.

In most cases of mediastinitis with graft infection, wound irrigation is necessary since infection is highly resistant to treatment and is likely to recur. Mediastinal irrigation can be classified into two types, closed-chest irrigation and open-chest irrigation. Although closed irrigation is often used, it should be limited to cases of relatively mild infection, since it may leave some areas washed and make debridement impossible. On the other hand, open irrigation is more aggressive, and is indicated for severe mediastinitis. Although open irrigation is generally performed under heavy sedation and tracheal intubation, long-term heavy sedation and bedrest may lead to complications such as pneumonia, decubitus, or disuse muscle atrophy. We therefore performed open irrigation without sedation or tracheal intubation. Our method was as follows:

1. Irrigation was performed every 12 hours. No general anesthetics or sedatives were needed.
2. The skin around the wound was sterilized with 10% povidone iodine (Isodine), and covered with dressings.
3. Debridement was performed. Fibrinolysin ointment (Elase ointment) was applied to the area where surgical debridement was required but could not be performed.
4. The mediastinum was washed thoroughly with 1,000 ml of 0.3% povidone iodine solution. The povidone iodine solution was pressurized in a pressure bag, and infected tissues were washed out with a strong jet of the solution. Narrow spaces could be washed well using a Nelaton catheter. The solution was suctioned with a suction tube (Fig. 1).
5. Antibiotics and antymycotics (0.5 g of vancomycin hydrochloride per 10 ml saline, 200 mg of amikacin sulfate per 10 ml and 25 mg of fluconazole were used in our cases) were sprinkled in the mediastinum. Although all the efficacy and side effects of local administration of these drugs were not clear, we believe this was effective in controlling infection especially in a poorly vascularized area such as the surface of a Dacron graft.
6. Iodoform gauze was packed into the mediastinum. It was important to pack a sufficient amount of iodoform gauze between the split sternum to avoid sternal injury and hemorrhage.
7. The wound was covered with sterilized gauze and transparent waterproof dressing materials (Perm-