



Use of the superior pedicled rectus abdominis flap to cover infected aortic grafts

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SUMMARY. Replacement of aortic aneurysms by a prosthetic graft is a common procedure in vascular surgery. Although success is generally achieved, infection or fistula may occur. Prosthetic graft infection has been reported in between one and six percent in most large series and is one of the most dreaded complications of abdominal aorta surgery. Dissatisfaction with extraanatomic procedures has led to the development of techniques of in situ replacement by allogenic material. However, adequate debridement and coverage of the aortic graft is necessary. To our knowledge, this is the first report of the use of a rectus abdominis muscle flap to cover an aortic allograft when other reconstructive options were impossible. © 2003 The British Association of Plastic Surgeons. Published by Elsevier Science Ltd. All rights reserved.

Keywords: allograft, aorto-enteric fistula, surgical flap, rectus.

Introduction

Prosthetic aortic graft infection has been reported in between one and six percent of cases in most large series over the years. An infected aortic anastomosis is associated with a 25–75 % mortality rate and an equally high rate of limb loss, despite improvement in surgical techniques, graft design and antibiotic therapy.^{1,2} The interposition of well-vascularized tissue between an aortic graft prosthesis, and especially its proximal suture line, from overlying intestine, especially the posterior wall of the duodenum is an important factor in limiting the incidence of graft infection, pseudoaneurysm formation, and exsanguinating hemorrhage from aorto-enteric fistula.

The only logical method of management with reasonable success has been complete excision of the graft and all periaortic infected tissues, also including any previous omental flap used to cover the graft, when this was deemed necessary. Conventionally the further management consisted of secure closure of the proximal aortic stump and extra-anatomic reconstruction in the form of axillo-femoral and femono-femoral grafts. Since these techniques carried a high complication rate, at the end of the 1980s the in situ techniques with arterial allografts was developed.

The authors report on the salvage of a severely infected aortic prosthetic graft leading to sepsis and hemorrhage, previously already covered by a pedicled greater omental flap. This salvage was done by a superior pedicled rectus abdominis muscle flap.

Case report

A 45-year-old man, referred by a regional hospital, presented with increasing abdominal pain radiating to the back, in the

presence of fever. The patient's history included multiple vascular procedures and multiple episodes of both deep and superficial thromboses, starting at the age of 33, most recently when an infrarenal aortic aneurysm was replaced by an aorto-bi-iliac Dacron graft. During this operation the omentum was used to cover and separate the graft from the bowel.

An indium labelled leucocytes scan showed uptake of white blood cells prevertebrally at the L2-L3 level. A CT scan showed a slight infiltrated aspect of the peri-aortic tissue without any collections. The day after his admission, he suddenly developed septic shock with haematemesis. An urgent laparotomy was performed with a transperitoneal approach to the abdominal aorta. This showed two aorto-enteric fistulae, one to the duodenum at the proximal anastomosis the other at the distal anastomosis. There was a lot of pus with bowel adhesions. The greater omental flap from the previous operation and the graft were debrided and had to be excised. The enteric fistulas were handled by duodenorrhaphy, partial enterectomy and reanastomosis of the jejunum followed by extensive irrigation of the peritoneal cavity. The prosthetic Dacron graft was replaced by a cryopreserved arterial allograft.

The left rectus abdominis muscle was mobilised from its fascial sheet medially. After the muscle was elevated from the anterior rectus sheath the rectus abdominis was detached from its pubic and costal insertions (fig. 1, fig. 2). The deep inferior epigastric artery and its comitant veins, were ligated and the flap remained supplied by the superior epigastric artery. The flap was transposed into the abdominal cavity through the mesocolon transversum and was wrapped around the allograft. The limb of the graft and both proximal and distal anastomosis were covered by the pedicled rectus abdominis muscle flap.

Peroperative cultures revealed a mix of *Enterobacter Cloacae*, *Klebsiella Oxytocola* and specific intravenous antibiotic therapy was maintained postoperatively for 6 weeks.

The patient recovered well without any wound problems or septic complications but he developed an occlusion of the left branch of the aorto-bi-iliac bypass which resulted in intermittent claudication without trophic changes of the leg. The patient

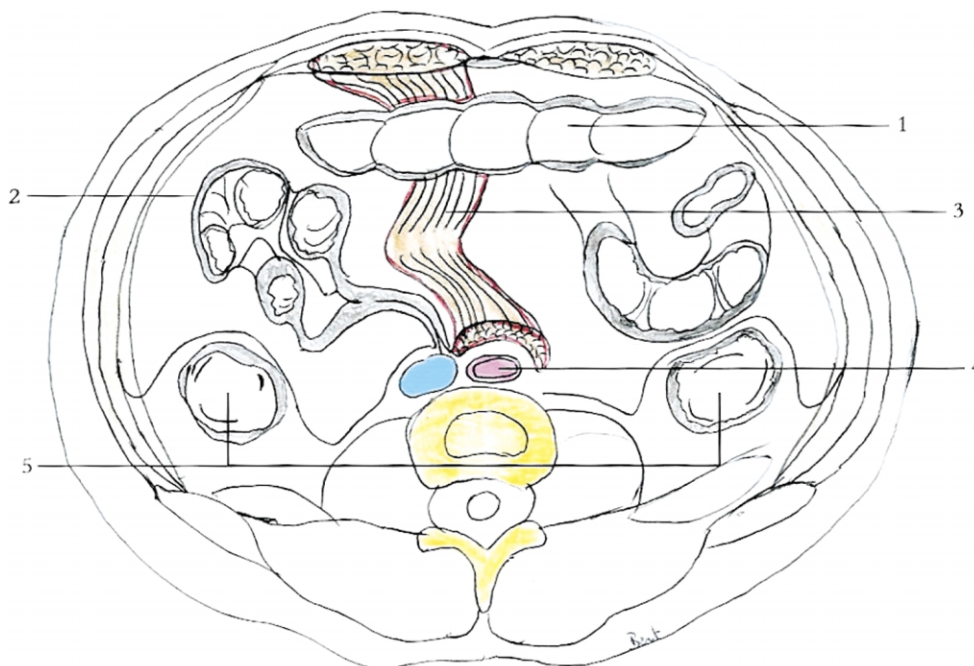


Figure 1—Transverse section 1. Transverse colon 2. Small intestines 3. Rectus Abdominis 4. Aortic allograft 5. Ascending and descending colon.

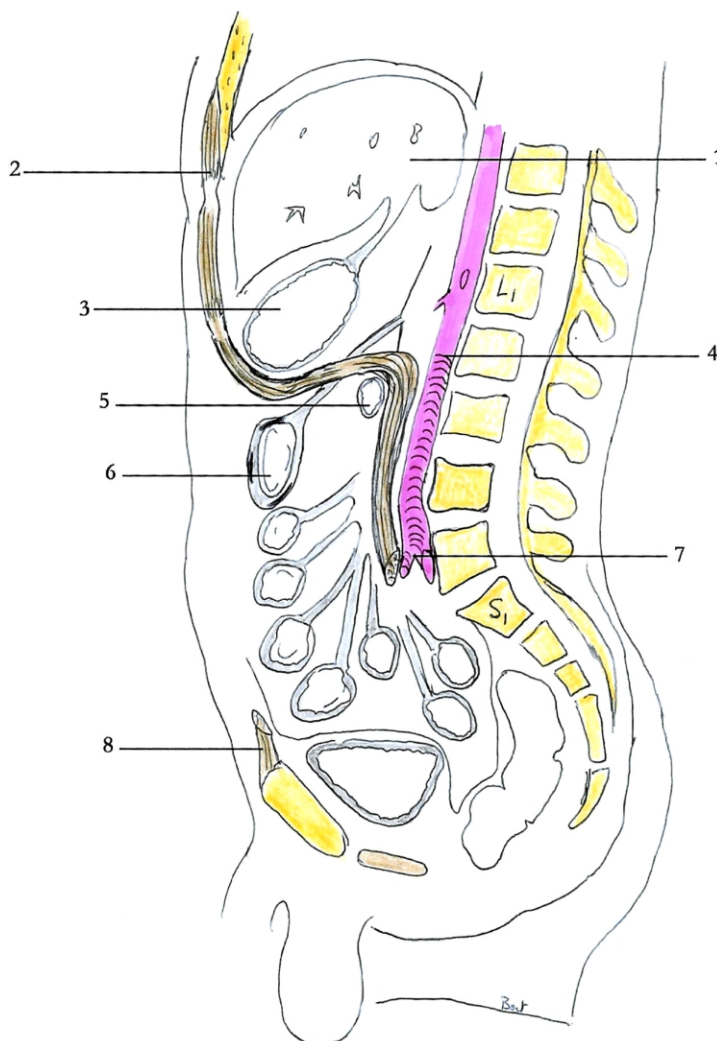


Figure 2—Sagittal section 1. Liver 2. Rectus muscle 3. Stomach 4. Proximal anastomosis 5. Duodenum 6. Transverse colon 7. Distal anastomosis at bifurcation 8. Distal rectus stump.

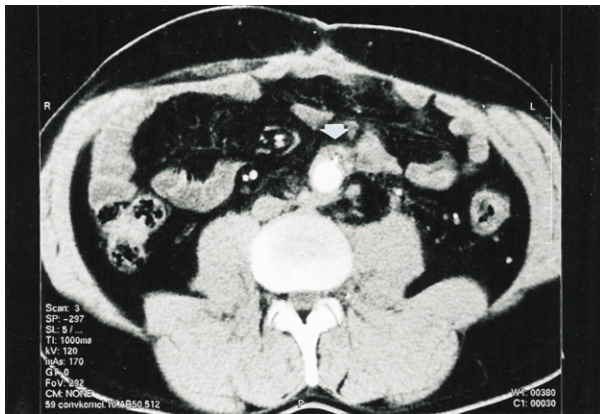


Figure 3—CT scans at 3, 6, and 9 months revealed a good function of the graft without any signs of infection covered by the muscle flap (arrow).

was discharged after 46 days. No further major complications in this very fragile patient were encountered. CT scans at 3, 6, and 9 months revealed a good function of the graft without any signs of infection (fig. 3).

Discussion

Prosthetic graft infection has been reported in most large series.^{1,2} In such situations radical management is required. Despite the fact that it has been shown that arterial allografts (in situ replacement) proved to be significantly resistant to infection in both experimental and clinical settings,^{3,4,5} adequate debridement and coverage is mandatory and avoids the complications of the axillo-femoral procedure,⁶ improving limb salvage rates.^{7,8,9}

Mathes et al¹⁰ proved that a musculocutaneous flap could decrease the bacterial counts in an infectious terrain. Increasing the oxygen delivery and wound oxygen tension in infected tissues may improve leucocytic action and bacterial elimination whilst improving antibiotic delivery.¹¹

This supports the research done by Mehran et al¹² who investigated combining in situ graft replacement with a highly vascular tissue flap in a series of 52 pigs as an alternative to resection of the graft and extra-anatomic bypass, the latter with significant morbidity and mortality rates. In this experimental study, the incidence of graft infection was significantly reduced in groups treated with a rectus abdominis island flap when compared to the groups treated with debridement alone or debridement with replacement of the graft.

The prosthetic graft infection in our patient was successfully eradicated using a cryopreserved allograft, covered by a superior pedicled rectus abdominis flap, as a salvage procedure because of lack of sufficient omentum of good quality. To our knowledge, this is the first report of the use of a rectus abdominis muscle flap to cover an aortic allograft.

The abdominal aorta is not easily covered by local flaps, and the first choice is the greater omentum.¹³ However, its usefulness is limited by:

- (1) the considerable variation between the length, mobility, and availability from patient to patient.

- (2) the lower degree of vascularity compared to muscle flaps, especially in obese patients, with a very fat omentum.
- (3) the application of the omentum around the aorta creates a string in the abdomen, predisposing to internal herniation of intra-abdominal organs.
- (4) previous surgery in which the omentum can show serious adhesions, making dissection very difficult.

In our patient, the omentum showed serious adhesions, and was insufficient.

As an alternative for the greater omentum Gerota's fascia flap has been described.¹⁴ This appears to be ideal if a retroperitoneal approach to the aorta is used since no additional exposure is needed. The disadvantage is the bulk of tissue that is occasionally present, especially in obese patients. Moreover, it has not as rich a vascular network as the omentum or other muscular flap. A second alternative is a seromuscular patch, used by Shah et al to cover an infected abdominal aortic stump.¹⁵ This type of flap is very fragile and thin, but extremely vascular. Because of its small size, this flap was excluded for our patient although Mehran suggested its use in cases of graft enteric erosion or fistulae in which the bowel lumen is already exposed.¹²

Conclusions

This case confirms the ability of muscle flaps to control infection and protect vascular grafts. Although the rectus abdominis muscle flap was not the first choice to cover the abdominal aorta, it was a last resort and should be considered as a satisfactory alternative in cases if the omentum is not available.

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