CASE REPORTS

From the Eastern Vascular Society

Use of fascia-peritoneum patch as a pledget for an infected aortic stump

Timur P. Sarac, MD, Peter Augustinos, MD, Sean Lyden, MD, and **Kenneth Ouriel, MD,** *Cleveland, Ohio*

Treatment of aortic prosthetic graft infections remains a challenge. One frequently encountered technical difficulty when removing an infected prosthetic aortic graft is how to close a short, friable remnant aortic stump. We present three case reports in which we used a layer of posterior rectus fascia-peritoneum to bolster oversewing a short infected aortic stump after removal of an infected aortic graft. All three patients underwent staged extra-anatomic axillary-to-femoral artery bypass procedures, with subsequent removal of the infected aortic graft as a second operation. Two of the three procedures were semi-elective, and one was done urgently because of a recurrent aortoenteric fistula. All three patients had less than 1 cm of remaining aortic neck below the renal arteries for closure. In each instance a segment of autogenous posterior rectus fascia-peritoneum was harvested and used as a circumferential pledget to bolster the anastomosis. No patient had stump blowout, and in no case was there computed tomography evidence of aneurysmal enlargement of the stump with follow-up of 12 and 24 months in two of the three survivors. Use of autogenous fascia-peritoneum is a durable and effective method to assist stump closure and prevent stump blowout after removal of infected aortic grafts. (J Vasc Surg 2003;38:1404-6.)

The true incidence of aortic graft infection after repair of AAA and aortobifemoral bypass surgery to treat occlusive disease is unknown. However, it is estimated to be as high as 0.8%,[1] and mortality rate has been reported as high as 18%[2] to 75% in experienced centers. Different paradigms for treatment of aortic graft infections include in situ repair with antibiotic bonded grafts,[3] in situ repair with aortic allograft,[4] in situ repair with superficial femoral vein,[5] and staged extra-anatomic repair followed by graft removal.[6] The pros and cons of these treatment methods have been extensively debated, but in certain clinical scenarios there is little option but to use one specific approach.

Although each one of these tactics has unique technical challenges, one frequently encountered difficulty with staged repair is closure of a short, friable aortic stump. We describe three cases in which we used a layer of posterior rectus fascia-peritoneum as a large pledget to bolster and reinforce oversewing a short, friable infected aortic stump after removal of an infected aortic graft.

From the Department of Vascular Surgery, The Cleveland Clinic Foundation.

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Reprint requests: Timur P. Sarac, MD, Department of Vascular Surgery, The Cleveland Clinic Foundation, Desk S40, 9500 Euclid Ave, Cleveland, OH 44195 (e-mail: SaracT@ccf.org).

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CASE REPORTS

Case 1. A 74-year-old man was referred from an outlying facility with fever of unknown origin and bacteremia. Three years previously he underwent repair of a "leaking" abdominal aortic aneurysm (AAA) with an aortobiiliac Dacron graft. Preoperative workup included computed tomography (CT), which demonstrated air around the graft, along with a periaortic fluid collection and a psoas abscess. Arteriography of the aortic arch was performed to define the subclavian and axillary artery anatomy, and arteriography of the aorta and pelvis was performed to define lower-extremity runoff. Preoperatively the patient was given intravenous antibiotic therapy, which was continued in the postoperative period. Surgical repair consisted of a staged extra-anatomic approach, which included an initial right axillary bifemoral bypass procedure. On postoperative day 2 the patient was returned to the operating room for definitive removal of the infected graft. Operative findings included pus around the graft and an unincorporated "free-floating graft." Proximal clamp placement was suprarenal, because the previous graft had been placed at the level of the renal arteries. Just before aortic cross-clamping an 8 × 4-cm segment of posterior rectus fascia-peritoneum (Fig 1) was harvested from the patient's abdominal wall. This was accomplished by excising the posterior rectus fascia-peritoneal layer lateral to the linea alba and posterior to the left rectus abdominus muscle. After clamp placement and graft removal, there was 0.5 to 1.0 cm of remnant aortic neck left for oversewing, with the orifices of the renal arteries clearly visible. The stump was oversewn in one layer with a fascia-peritoneal cuff to pledget and bolster the anastomosis (Fig 2). No suture line bleeding was observed, and there was insufficient omentum left to cover the area. The remaining graft was removed, the common iliac

arteries were ligated, the retroperitoneum was debrided, and drains were placed. The midline fascia was then closed without difficulty. The patient was discharged to home on postoperative day 13. Cultures grew *Escherichia coli, Bacillus fragilis,* and *Candida albicans,* and intravenous antibiotic therapy was continued for 12 weeks.

Seven months later the patient returned with an infected distal limb of the right axillofemoral bypass graft. This was repaired with extra-anatomic revascularization to the profunda femoris artery, tunneling lateral to the sartorius muscle, placing a left axillary profunda bypass in a similar fashion, and then graft removal. A CT scan at that time demonstrated the aortic stump to be of normal caliber, and there was no abdominal wall hernia. Oral antibiotic therapy was continued indefinitely, and the patient is well at 21 months.

Case 2. A 75-year-old man was referred from an outside facility because of a recurrent aortic enteric fistula. Two months previously he underwent repair of a "leaking" AAA at an outside hospital, and came to the transferring facility with massive upper gastrointestinal hemorrhage. He underwent emergent repair at that facility, with in situ replacement with an expanded polytetrafluoroethylene aortobifemoral bifurcated graft and oversewing of the duodenum. On postoperative day 10 a recurrent upper gastrointestinal bleed developed. Upper gastrointestinal endoscopy was not performed, but a CT scan demonstrated active extravasation of oral contrast medium through the duodenum. After transfer to The Cleveland Clinic, we urgently performed bilateral axillary-to-femoral bypass grafting, reprepared the patient, and then transabdominally removed the graft. A supraceliac clamp was required, and the remnant aortic stump consisted of a very short, infected, friable neck approximately 0.5 cm long. Repair consisted of oversewing the aortic stump with a single layer of monofilament suture, along with an 8 × 4-cm segment of autogenous fascia-peritoneum, harvested as previously described. The duodenum was excluded by placing a large draining sump tube and stapling the pylorus. The retroperitoneum was debrided, and drains were left in place; no omentum was available for covering the graft. A postoperative CT scan demonstrated no evidence of degeneration of the remnant aortic stump. However, disseminated intravascular coagulation and pneumonia developed, and the patient died on postoperative day 40, of sepsis and multisystem organ failure. Cultures grew *Xanthomonas maltophilia* and *C albicans.*

Case 3. A 77-year-old woman was transferred from an outside hospital with bilateral anastomotic aortofemoral graft aneurysms and a draining sinus from the right groin. Six months previously she had undergone repair of abdominal aortic and bilateral common iliac aneurysms, with a Dacron aortobifemoral bypass graft. A "recurrent" right groin aneurysm developed 1 month before she came to The Cleveland Clinic, and this was repaired at the transferring facility with an in situ Dacron graft. Subsequently, a sinus tract developed in the right groin; cultures grew methicillin-resistant *Staphylococcus epidermidis.* A CT scan demonstrated bilateral femoral pseudoaneurysms and perigraft fluid extending up to the proximal anastomosis. After transfer to The Cleveland Clinic, the patient underwent staged repair, with bilateral extra-anatomic axillary profunda bypass procedures, followed 2 days later by removal of the graft and repair of bilateral femoral artery anastomotic pseudoaneurysms. The proximal neck was short and friable, and a segment of posterior rectus fascia-peritoneum was used as a pledget to reinforce the aortic stump during proximal oversewing. The retroperitoneum was debrided, and drains were left in place; there was insufficient omentum available to place over the infected area. The postoperative course was uncomplicated, and the patient was discharged from the hospital on postoperative day 10. She remains well at 9-month follow-up.

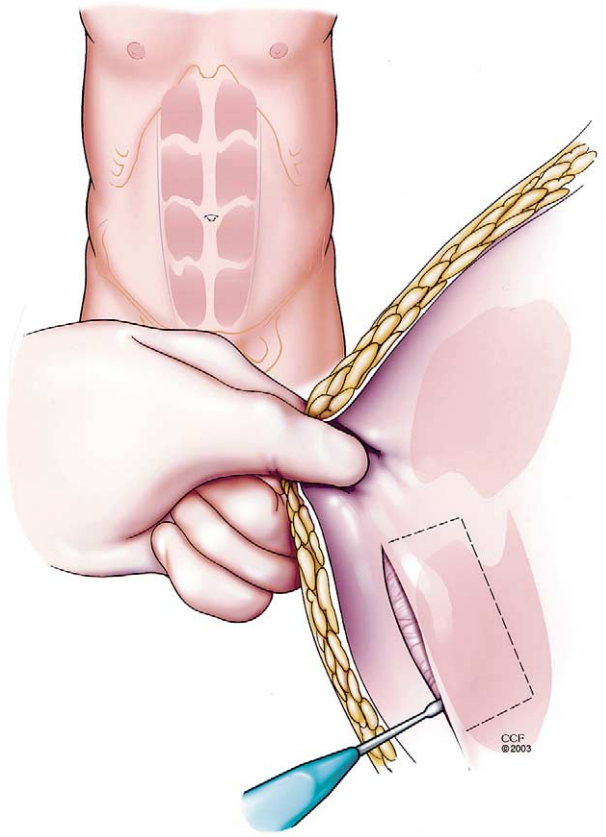

Fig 1. Fascia and peritoneum are harvested approximately 6 cm lateral to linea alba to allow room for midline closure.

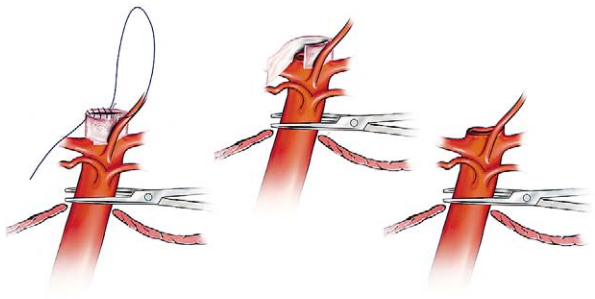

Fig 2. Fascia-peritoneum patch is used as a pledget circumferentially to reinforce closure of aortic stump.

DISCUSSION

The incidence of abdominal aortic graft infection after AAA repair or aortic grafting to treat occlusive disease at The Cleveland Clinic is 0.8%, and the incidence of aortoen-

teric fistula is 0.4%.[1] Although these numbers are relatively low, we treat approximately five aortic graft infections per year. The specific approach used to treat aortic graft infections, staged with extra-anatomic bypass or in situ reconstruction, is dictated by patient anatomy, findings at presentation, and surgeon preference. However, in certain clinical scenarios, such as infection from virulent organisms,[7] aggressive periaortic infection with gross purulence,[8] and recurrent graft infection, in situ reconstruction is not preferred. Historically, staged repair has been the standard and the primary treatment of choice for infected aortic grafts, if technically feasible.[9] The most dreaded complication of this type of repair is aortic stump blowout, with an incidence of 1.8% to 39%.[10]

Traditional treatment of aortic graft infection with a staged approach consists of extra-anatomic bypass surgery with subsequent graft removal. Wide debridement of infected tissue, double-layer closure of the stump, coverage with omentum, irrigation, drainage, and postoperative antibiotic therapy have been the mainstay of this therapy. If staged repair is chosen, lower-extremity ischemic complications secondary to axillary femoral graft patency are now of less concern with the advent of supported prosthetic grafts.[9] Nevertheless, one of the most feared complications of this approach is availability of little remaining viable aortic tissue with which to oversew the infected remnant aortic stump below the renal arteries. Technical concerns include aortic stump blowout and renal failure. Although there is a variable incidence of aortic stump disruption after staged repair, not all stump closures pose the same degree of difficulty. For the difficult closure, remnant aortic aneurysm tissue has been used as a buttress for a friable aortic neck in the treatment of primarily infected AAAs,[11] and, if available, coverage with omentum helps seal the area.[12] However, when dealing with infected grafts, useful aortic tissue is rarely left, and the concept of covering a suture line with infected tissue is unappealing. Other creative techniques have been developed to help cover aortic stumps, including a jejunal patch,[13] coverage with prevertebral fascia,[14] and reinforcement with fibrin glue,[15] but long-term follow-up is lacking, and there is concern about continued infection when using bowel or tissue from this area.

From review of the literature, use of a segment of autogenous fascia-peritoneum as a pledget has not previously been reported. However, Grillo and Wilkins[16] first developed the concept of using autogenous mesenchymal tissue as support for anastomoses when they used a pleural wrap to bolster perforated esophagus repairs. Each of our three patients had a difficult remnant juxtarenal aortic stump to close, and use of fascia as a pledget enabled us to close the stump without compromising renal artery flow or necessitating renal artery bypass. Although innovative ways to use this material can be conceived for suprarenal aneurysms, we did not find this necessary in any of our patients. In such case, extra-anatomic renal artery revascularization before stump closure is strongly recommended. There are two advantages to use of the fascial-peritoneal layer to reinforce a closed aortic stump: it has inherent strength from its composition, and it has no infection. Fascia is composed of collagen, and embryologically both the peritoneum and fascia are derived from cells similar to the endothelial and adventitial layers of blood vessels. The harvest technique is simple, inasmuch as we used a segment of the posterior rectus sheath, which reduces the likelihood of hernia developing. Although each anastomosis was closed with a running circumferential layer of peritoneum-fascia, smaller segments can be used as individual pledgets for interrupted closure.

In conclusion, the posterior rectus fascia-peritoneal layer is intrinsically strong and can serve as a reliable and durable source of autogenous tissue to pledget and reinforce aortic anastomoses. Further experimental work is being done to test its use in other applications in the peripheral circulation.

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