

# Total retroperitoneal approach to aortic reconstruction: A novel technique for aorto-enteric fistulae and graft infections

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## Abstract

Aorto-enteric fistulae pose a challenging negative outcome of aortic intervention. Treatment involves graft excision, and recently, more enthusiasm has met in situ revascularization over extra-anatomic bypass. This has been traditionally performed through the transperitoneal approach via a midline abdominal incision. We propose an exclusively total retroperitoneal technique in managing this complication with regard to both the vascular and alimentary tract technical aspects of the procedure. This involves exclusion and bypass of the affected segment followed by en-mass resection of the affected segment with the duodenum, and finally, bowel anastomosis. We present a case of an aorto-enteric fistulae illustrating classical radiological findings treated via a flank incision and retroperitoneal technique after a temporizing endovascular stent placement at an outside institution. Peri-operative course was uneventful. The retroperitoneal approach has been shown to be equivalent to its transperitoneal counterpart in many aspects of treating aortic disease. It has also been shown to be superior in others, including but not limited to, faster return of bowel function, decreased respiratory complications, less blood loss and shorter length of stay in the intensive care unit (ICU) and hospital. We recommend adding this approach to every vascular surgeons operative armamentarium when it comes to managing aorto-enteric fistulae. This might be especially helpful in avoiding re-operative planes, thus minimizing blood loss and iatrogenic bowel injury, better aortic exposure, and adequate access to the duodenum.

## Keywords

Surgical technique, retroperitoneal approach, open aortic surgery, graft infection, aorto-enteric fistula, aorto-duodenal fistula

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## Introduction

Aorto-enteric fistulae (AEF) are potentially lethal iatrogenic complications following open aortic reconstruction, occasionally, after endovascular aortic intervention, and rarely in a patient without a surgical history but with another intra-abdominal pathology. Treatment is focused on excision of the infected graft and revascularization with either an extra-anatomic bypass or in situ reconstruction.<sup>1,2</sup> This has been performed through the traditional transperitoneal midline incision; however, we propose a new approach through a retroperitoneal flank incision that has its own advantages over the traditional technique. We present a case of an AEF managed solely through the left retroperitoneal approach indicating the technical factors and their associated advantages. A literature review was performed comparing both approaches in relation to different disease processes and associated outcomes.

## Case and surgical technique

A 62-year-old male with a history of open transperitoneal abdominal aortic aneurysm repair with a bifurcated prosthesis 7 years prior to presentation was referred for the management of an infected aortic graft. 2 years prior to this, he was diagnosed with an AEF at another facility after an episode of upper gastrointestinal (GI) hemorrhage, was deemed high

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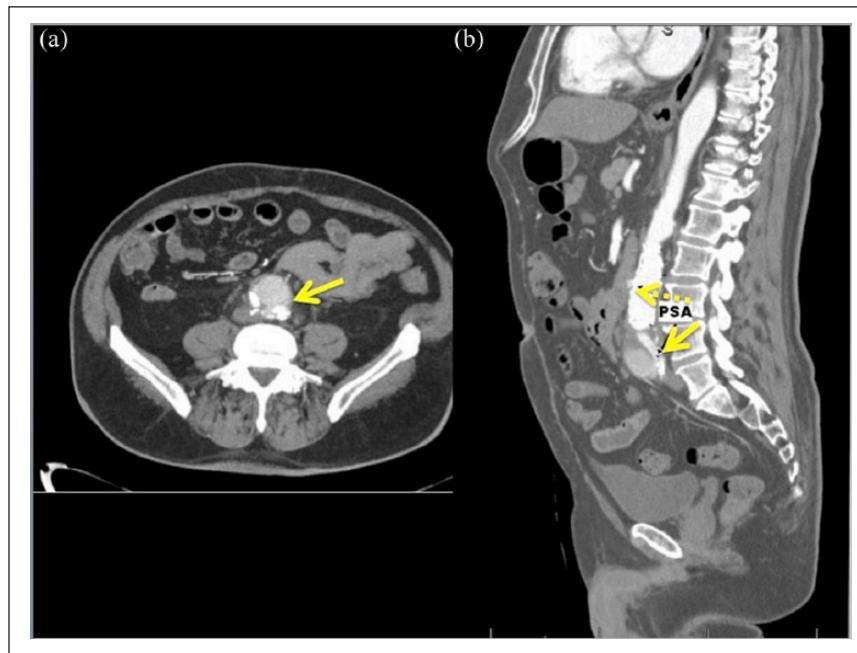
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**Figure 1.** (a) Left common iliac artery anastomotic pseudoaneurysm and (b) pseudoaneurysms (PSA) of the left common iliac (bold arrow) and at the level of the proximal anastomosis (dashed arrow) where the AEF was covered by a stent graft. Note the loss of the fat plane between the duodenum and the aorta.

risk for an open surgical procedure, and was treated endovascularly with a covered stent graft and long-term antibiotics. At presentation, patient has been feeling worse with chronic malaise, high-grade fevers, and episodic hypotension. Computed tomography (CT) scan revealed evidence of an AEF with loss of fat planes, soft tissue thickening, and a pseudoaneurysm between the aorta and duodenum, and another pseudoaneurysm distally at the left common iliac artery (LCIA) anastomosis (see Figure 1(a) and (b)).

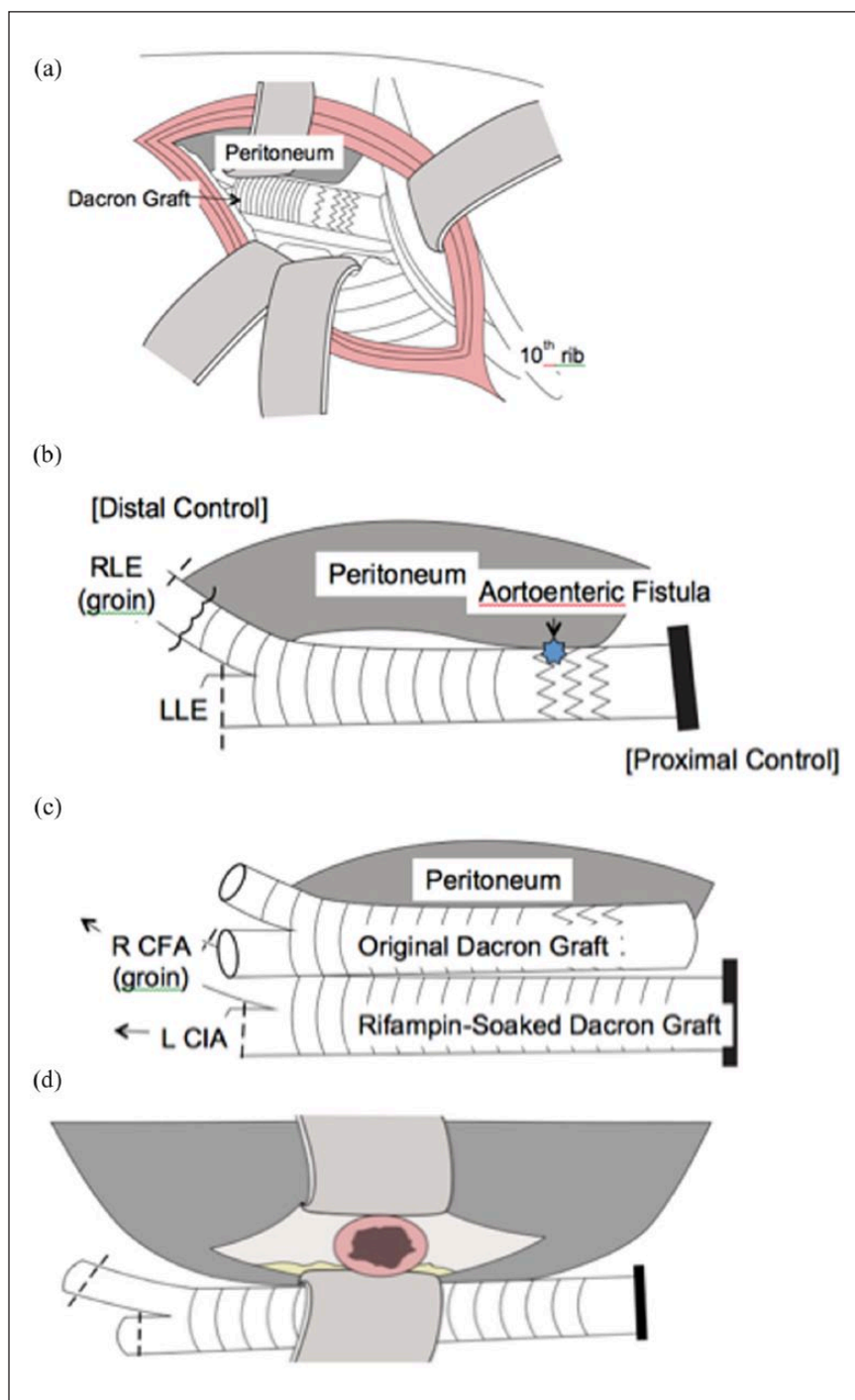
The patient underwent excision of his infected Dacron graft along with the more recently placed endograft and reconstructed using a rifampin-soaked Dacron graft (see Table 1 for operative steps). This was performed through a left retroperitoneal incision (see Figure 2(a)). The operative area did not have significant purulence. The original graft/endograft was excluded and bypassed prior to its resection. This was performed through a clean non-infected plane. Supra-renal clamping was necessary to perform the proximal anastomosis (see Figure 2(b)). Distal anastomoses were to the LCIA and right common femoral artery via a right groin exposure (see Figure 2(c)). This was done to address the pseudoaneurysm of the LCIA. After revascularization, the graft was excised en-bloc with the third or fourth portion of the duodenum and its associated fistula. This was done by opening the peritoneum cranio-caudally and stapling either side of the fistulous bowel to avoid contamination (see Figures 2(d) and 3). An end-to-end duodeno-jejunal stapled triangulated anastomosis was performed and drains placed. Omentum

**Table 1.** Operative steps.

1. Left flank incision—ninth intercostal space
2. Retroperitoneal aortic dissection proximal to prior operative/infected site
3. Proximal control—supra-renal
4. Simultaneous right femoral dissection and exposure for distal anastomosis
5. Without entering the infected field, the previous graft is excluded and bypassed (distal targets were left common iliac and right femoral arteries)
6. New graft is covered and infected field is entered (infra-renal aorta)
7. Old graft is exposed and the peritoneum opened
8. Resection of the old graft en-mass with the adherent duodenum to avoid spillage
9. An end-to-end duodeno-jejunostomy anastomosis is performed through the same exposure
10. An omental pedicle is placed between the new graft and the bowel anastomosis
11. Closure of the peritoneum
12. Closure of the flank in layers

was then interposed between the bowel and the new aortic graft. The peritoneum was closed, and the flank incision was closed in layers in the usual fashion.

The patient had an uneventful peri-operative course. He was extubated the following morning. Bowel function returned on post-op day (POD) 2, and he was discharged home on POD 7.

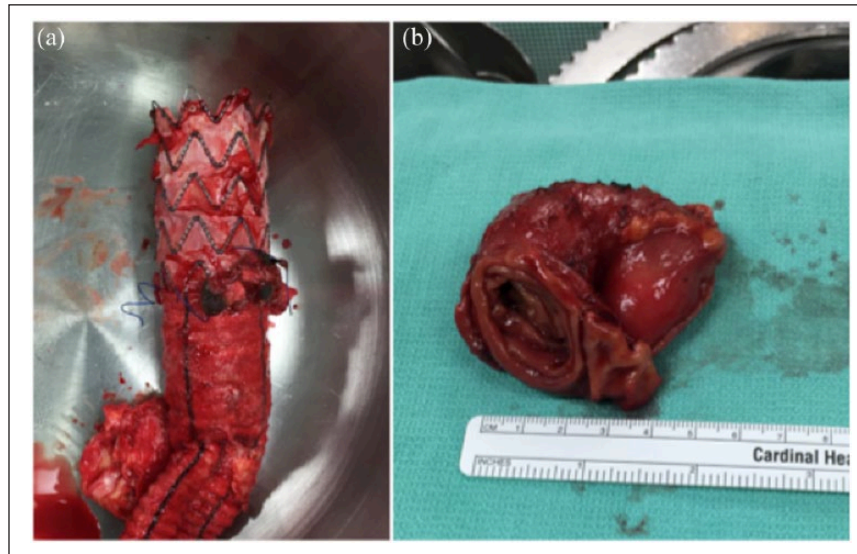


**Figure 2.** (a) Left flank retroperitoneal incision inferior to the 10th rib with retractors in place and wide exposure of the aorta. (b) Illustration depicting the AEF, proximal control (supra-renal), and distal control (left CIA and right CFA). (c) Excluded and bypassed old graft. Proximal anastomosis to infra-renal aorta and distally to Rt CFA and Lt CIA. (d) Retroperitoneal view after opening the peritoneum and excising the old graft and fistulous bowel.

## Discussion

Without expeditious diagnosis and management, AEF are uniformly fatal. The treatment algorithm depends on the hemodynamic status of the patient. Hemodynamic instability secondary to sepsis has to be treated with resuscitation and

antibiotics before attempting surgery. On the other hand, if the patient is unstable secondary to hemorrhage, then management priority is shifted to surgical control of the bleeding. Recently, there has been a shift to an endovascular approach in excluding the fistula to temporize the situation and gain



**Figure 3.** Excised old Dacron graft with the endovascularly deployed stent graft within it (left) and third and fourth segment of the duodenum with fistula.

adequate time to allow further surgical planning. Although some studies have suggested, for high-risk patients, endovascular therapy alone, with or without antibiotic impregnated endografts, along with long-term systemic antibiotics has provided some promising results. These ultimately face the same fate in the long term.<sup>3-5</sup> The current standard of care involves removal of the infected prosthetic material, resection/repair of the affected enteric segment, and revascularization of the distal segment. This is either done as an extra-anatomic bypass or as an in situ reconstruction using native vein, cryopreserved homograft, or antibiotic soaked prosthetic graft. Omitting revascularization is an option in select patients with chronically occluded grafts placed for occlusive disease and with currently adequate collateralization to the lower extremities.<sup>1,2</sup>

Historically, the standard of care was graft explantation and reconstruction with an extra-anatomic bypass, most commonly an axillary-bifemoral bypass. However, current data have shown the safety and efficacy of in situ reconstruction with comparable short-term and long-term outcomes.<sup>6</sup> In situ reconstruction has a better patency, avoids the dreaded complication of a stump blowout, has a decreased rate of ascending renal artery thrombosis, and maintains colonic perfusion through the inferior mesenteric artery (IMA) if required.<sup>1,2</sup> Traditionally, this has been done through a midline incision and the transperitoneal approach. We described an alternative approach through a left-sided retroperitoneal incision to excise the infected graft and perform an in situ revascularization with a Rifampin-soaked Dacron graft as a single stage operation.

The retroperitoneal approach is safe and feasible in the setting of an infected aortic graft. It avoids the re-operative planes and adhesions and therefore results in less blood loss. Avoidance of enteric contents, bowel manipulation, and

possible intestinal desiccation have been postulated to reduce the length of post-operative ileus and earlier tolerance of an enteral diet.<sup>7</sup> There is a lower incidence of pulmonary complications and a shorter intensive care unit (ICU) and overall hospital stay. It also allows a wider exposure of the aorta further facilitating proximal control above the infected field without the need for a thoracotomy for proximal control.<sup>8</sup>

The retroperitoneal technique does provide adequate exposure to the enteric segment of interest, the third and fourth portion of the duodenum, as illustrated in our case. And although most general surgeons are not familiar with this approach, they were able to perform the duodenal resection and a primary stapled anastomosis with ease and minimal contamination. Key objectives should include omental interposition and avoidance of primary closure of the duodenal fistula as the sole duodenal intervention.<sup>9</sup>

Another variation of the traditional technique is the placement of the rifampin-soaked graft prior to excision of the previous graft. It involves obtaining proximal control outside the infected field and tunneling in a clean plane. This has been done to avoid contamination from enteric spillage, work in a non-infected plane, and reduce clamp time and eventual total ischemia time. Darling et al. described a similar technique for retroperitoneal proximal control/anastomosis and tunneling in a clean plane; however, another incision through the midline was performed for transperitoneal graft excision and enteric repair.<sup>10</sup> Additionally, exclusion and bypass has been shown to be safe and efficacious in treating aneurysmal disease and this could be applied to infected grafts that were initially placed for aortic aneurysms to address the long-term risk of aneurysmal rupture from their primary disease. Furthermore, this method rapidly restores blood flow to the lower extremities, thus reducing total ischemia time.<sup>11</sup>

## Conclusion

The retroperitoneal approach has been shown to be equivalent to its transperitoneal counterpart in many aspects of treating aortic disease. It has also been shown to be superior in others, including but not limited to, faster return of bowel function, decreased respiratory complications, less blood loss and shorter length of stay in the ICU and hospital.<sup>12</sup> We recommend adding this approach to every vascular surgeons operative armamentarium when it comes to managing AEF. This might be especially helpful in avoiding re-operative planes, thus minimizing blood loss and iatrogenic bowel injury, better aortic exposure, and adequate access to the duodenum.

## Declaration of conflicting interests

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## Informed Consent

Written consent was obtained from the patient to publish the findings of this clinical case while complying with HIPAA law.

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