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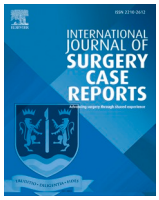

Case report

First case report of gastric outlet obstruction due to aortofemoral bypass Dacron graft erosion of the duodenum treated with neo aortoiliac system procedure

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ABSTRACT

Introduction: Gastric outlet obstruction is an uncommon complication of surgical treatment of aortoiliac occlusive disease with aortofemoral bypass. The most frequent presenting feature of duodenal erosion due to aortic synthetic graft is upper gastrointestinal bleeding, which can range from a minor "herald" bleed to exsanguinating hemorrhage.

Case presentation: A 64-year-old male patient with an aortofemoral Dacron bypass due to aortoiliac occlusive disease TASC II D with a chronic graft infection required emergency resection of the right limb of the Dacron graft two years ago. The patient developed abdominal pain, postprandial vomiting and progressive weight loss with an upper gastrointestinal endoscopy that showed Dacron graft material eroding into the fourth portion of the duodenum generating a gastric outlet obstruction without aortoenteric fistula and ulceration in the duodenal mucosa.

Clinical discussion: The treatment goals of aortoenteric fistula are to control hemorrhage, treat infection, maintain adequate distal perfusion, graft explantation and aortic reconstructions like in this case. Traditional treatment of aortoenteric fistula is graft excision and establishing an anatomic autologous or an extra-anatomic synthetic bypass. Neo aortoiliac system procedure has shown to be the most effective and safest emerging technique today.

Conclusion: Aortoenteric fistula is a life-threatening condition associated with high morbidity and mortality and it can also pose a diagnostic dilemma. There are many presentations of aortoenteric fistula including gastric outlet obstruction syndrome. The neo aortoiliac system procedure is the ideal curative surgical approach in stable patients.

1. Introduction

Aortoenteric fistula (AEF) was first described in the early 19th century by Sir Astley Cooper. AEFs are uncommon but life-threatening conditions. Prosthetic aortic grafts can develop AEF due to mechanical erosion and infection of the surrounding gastrointestinal structures [1,2]. AEF is an abnormal communication between the aorta/aortic graft and an adjacent loop of the bowel. AEF can be classified as primary or secondary based on their etiology. Primary AEFs occur when a previously untreated aneurysm erodes the adjacent bowel. Secondary AEF can occur due to open aortic synthetic graft or endovascular aneurysm stent-graft [1–3].

Infrequently, AEF may manifest with atypical nonspecific symptoms such as fever, sepsis, or unexplained abdominal pain. Gastric outlet obstruction (GOO) is an uncommon complication of aortoiliac occlusive disease surgical treatment with aortofemoral bypass [4,5]. The most frequent presenting feature of duodenal erosion due to aortic synthetic graft is upper gastrointestinal (UGI) bleeding, which can range from a minor "herald" bleed to exsanguinating hemorrhage. This condition can simulate another disease, making a definitive and timely diagnosis

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difficult, so the surgical approach can be a challenge [5]. The objective of this case is to share the first report of GOO due to duodenal erosion by aortofemoral bypass Dacron graft treated with a neo aortoiliac system (NAIS) procedure. This case is reported in line with the SCARE guidelines [6].

2. Presentation of case

A 64-year-old male patient with a history of aortofemoral Dacron bypass due to aortoiliac occlusive disease TASC II D in 2010 with a chronic graft infection required emergency resection of the right limb of the Dacron graft in 2020. The patient was admitted to our institution for prehabilitation plus antibiotic therapy and perform an elective NAIS but he developed abdominal pain, postprandial vomiting and progressive weight loss with an initial UGI endoscopy without abnormal findings. Past medical history of heavy smoking, arterial hypertension and peripheral arterial disease. On physical examination, vital signs were stable with no abdominal pain and no signs of peritoneal irritation. His labs revealed low hemoglobin level and elevated leukocyte count. The computed tomography angiogram (AngioCT) showed peri-graft fluid collection, bowel wall thickening without loss of normal planes between the aortic prosthetic graft and adjacent bowel compatible with signs of graft infection. In the secondary revision of the AngioCT images the residual right limb of the Dacron graft, the right iliac and common femoral artery had total chronic occlusion with superficial common femoral artery perfusion through right deep femoral artery and left hypogastric artery.

A new UGI endoscopy was performed due to UGI bleeding symptoms with hematemesis and melenas that showed Dacron graft material eroding into the fourth portion of the duodenum generating a GOO without aortoenteric fistula and ulceration in the duodenal mucosa as cause of the bleeding (Fig. 1). The patient underwent removal of the infected aortofemoral graft (Fig. 2), repair of the duodenum with debridement and primary anastomosis (Fig. 3) and abdominal aortoiliac reconstruction with NAIS procedure (Fig. 4) using the left femoral vein. Due to AngioCT findings, the left femoral vein was anastomosed to the infrarenal aorta and the right common iliac artery bifurcation to preserve the right hypogastric artery using the parachute technique with 6–0 vascular polypropylene suture and avoid the need of a femoro-femoral synthetic bypass (Fig. 5A). The left femoral vein in the intraoperative doppler was duplicated for this reason the surgical group chose it to avoid the risk of post thrombotic syndrome and phlegmasia cerulea dolens (Fig. 5B). The abdominal wall was treated using an open abdomen protocol with a Borraez bag for a second look in 48 h after the NAIS procedure due to the highest risk of anastomotic leak of the duodenal anastomosis. The proximal aortofemoral vein anastomosis of the NAIS procedure was covered using a parietal peritoneal flap to avoid contact with the duodenal anastomosis and the gastrointestinal tract structures (Fig. 5C). During the second look procedure there were no signs of anastomotic leak and the abdominal wall was closed using a small bites technique with 1–0 polydioxanone suture. Blood cultures and graft material cultures grew *Escherichia coli* and anaerobes.

The patient was treated with directed antimicrobial therapy in intensive care unit postoperative follow up of 7 day.

Fig. 1. Upper gastrointestinal endoscopy showed Dacron graft material eroding into the fourth portion of the duodenum generating a gastric outlet obstruction.

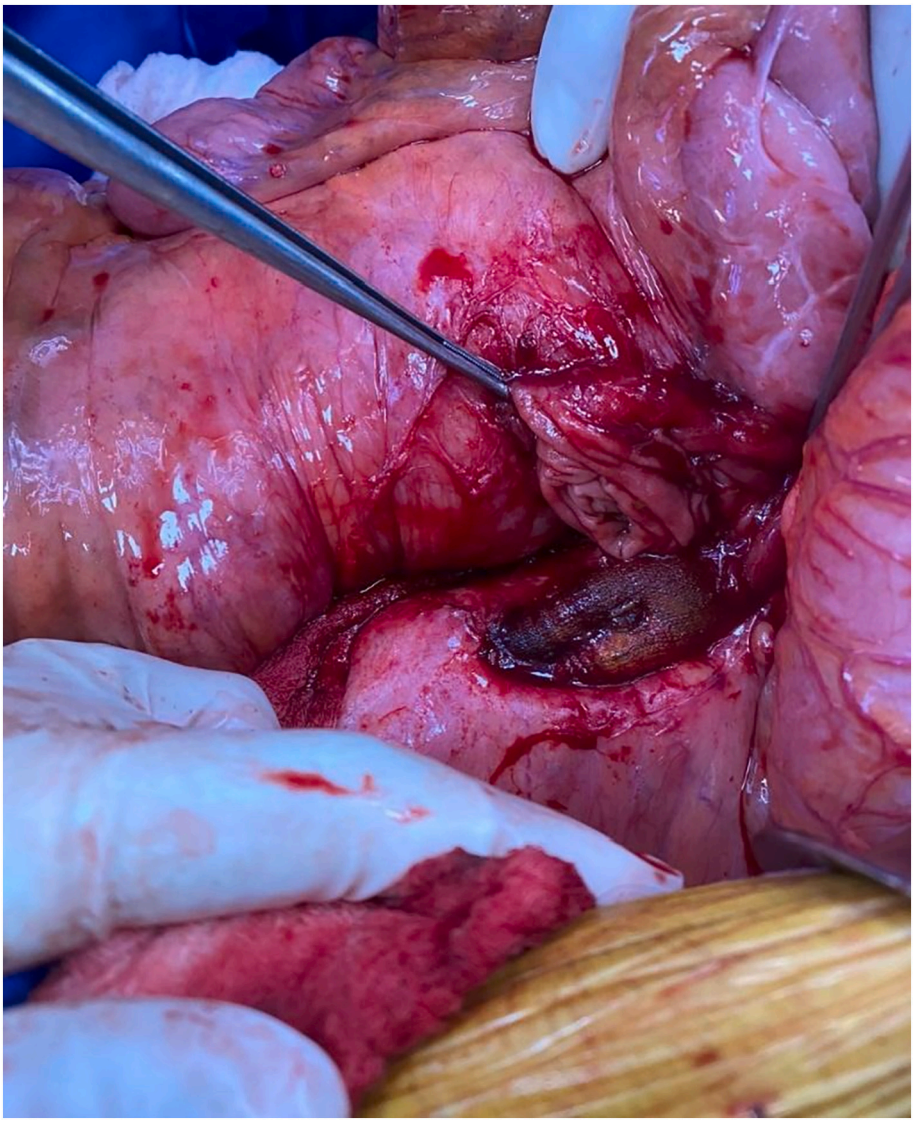

Fig. 2. Removal of the infected aortofemoral Dacron graft.

3. Discussion

Aortoduodenal fistulas are the most common type of AEFs. The pathogenesis of AEF is a combination of chronic low-grade infection of the aortic graft and repetitive pressure on the intestine from aortic pulsations that leads to bowel wall erosion and graft lumen migration. Secondary AEF incidence is 0.3 % - 1.6 %. The most common duodenal site affected is the third and fourth portions as in our case [7,8]. The most frequent presenting feature is UGI bleeding, which can range from a minor bleed to exsanguinating hemorrhage with shock and death. In this case, the erosion and migration of the Dacron graft into the fourth duodenal portion simulating a GOO syndrome. The AngioCT scan is the first-line diagnostic modality for evaluation of suspected AEF, followed by endoscopy and arteriography if it is needed as we performed in our patient [9–11].

The treatment goals of AEF are to control hemorrhage, treat infection, maintain adequate distal perfusion, graft explantation and aortic reconstructions like in this case. Traditional treatment of AEF is graft excision and establishing an anatomic autologous or an extra-anatomic synthetic bypass. Diagnostic tests and surgical evaluation need to be done expeditiously. Alternatives to this are in situ graft replacement and simple graft excision alone. Traditionally, open surgical approach is based on the removal of the aortic prosthesis, blind closure of the aorta below the renal arteries, surgical debridement of infected tissue, and extra-anatomic bypass. However, this procedure is hampered by the immediate risk for blowout of the aortic suture line and by the quite poor long-term patency of the extra-anatomical bypass. Endovascular repair is a less invasive alternative therapeutic option, particularly for the rapid control of bleeding and may serve as a bridging therapy to open repair, if the patients have sepsis and septic shock with hemodynamically instability.

The removal of an infected stent graft after endovascular aortic repair (EVAR) or when it is used as bridge to surgery can be particularly challenging due to suprarenal stent fixation and hook anchoring of the stent graft in the aortic wall. Also, the quality of the aortic wall just below the renal arteries may be compromised, not only by the infection but also by the long-term continuous radial force exerted on the aortic wall by the stent graft and the very short remaining proximal aortic neck after EVAR [12]. Curative treatment is achievable by removal of all infected prosthetic material plus surgical debridement of the infected native aortic segment, followed by a vascular reconstruction [13,14].

NAIS for the surgical treatment of abdominal aortic infection was first described by Clagett et al. in 1993. During this procedure, the infected synthetic graft is removed and replaced with a graft constructed

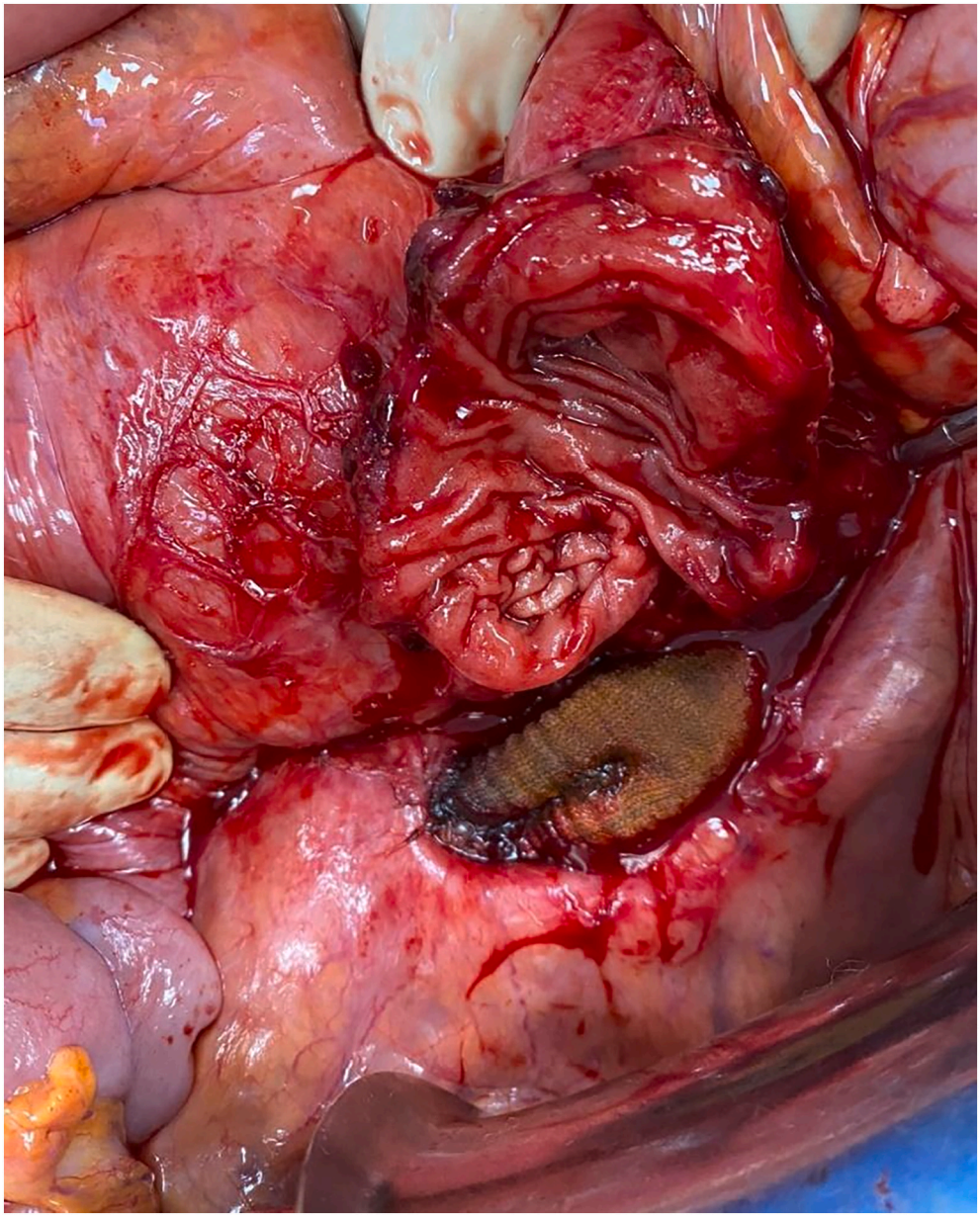

Fig. 3. Repair of the duodenum with debridement and primary anastomosis.

from autologous vein material, harvested from the femoral and popliteal veins [15,16]. This technique has been proposed as a more robust surgical alternative with promising short- and long-term follow-up outcomes, also usable in the setting of a primary aortic infection like in this case in a hemodynamically stable patient.

The technique is superior to others in several forms. First, no new synthetic material is introduced, which minimizes the risk of recurrent infection. Second, the procedure overcomes the risk of blowout associated with a blind suture closure of the aorta in an infected surgical field. Third, secondary occlusion of the reconstruction is rare due to a high arterial volume flow and a low risk of graft thrombosis. Also, the harvesting of the femoral and popliteal veins is commonly well tolerated provided venous flow in the great saphenous vein and the deep femoral vein is not compromised as in this case. Although, 12 % of the patients that underwent a NAIS procedure will need a fasciotomy in a large long-term follow-up. Some authors as Nordanstig et al. [18] recommends a hybrid approach to perform the NAIS procedure, using aortic balloon occlusion of the supra-mesenteric aorta and temporary endovascular shunting of renal and visceral arteries during parts of the procedure but in this case we do not use this surgical strategy because the infrarenal aortic neck was long and had a healthy aortic wall, avoiding the need of suprarenal aorta endovascular clamping and limiting the risk of renal and visceral ischemia [17,18].

Nordanstig et al. [18] reported twelve consecutive patients treated with NAIS procedure. Nine were treated for a secondary aortic prosthesis infection (tube graft $n = 3$, bifurcated graft $n = 4$, EVAR stent graft $n = 1$, and fenestrated EVAR [FEVAR] stent graft n = 1), while 3 patients underwent NAIS repair due to an emergent primary mycotic aortoiliac aneurysm like in our case of AEF; 10 of 12 patients survived 30 days. Three patients were operated on acutely, and 9 patients had elective or subacute NAIS surgery. Two of three patients operated acutely died within 30 days, whereas no 30-day or 1-year mortality was observed in patients undergoing elective or subacute surgery. The median time from primary reconstruction to the NAIS procedure was 11 months (range: 0–20 months). Stent grafts ($n = 5/12$) were in 4 cases explanted using endovascular balloon clamping. Of the explanted endografts, 2 patients presented with a secondary graft infection after EVAR/FEVAR, while 3 patients had been emergently treated with endovascular cuffs as a

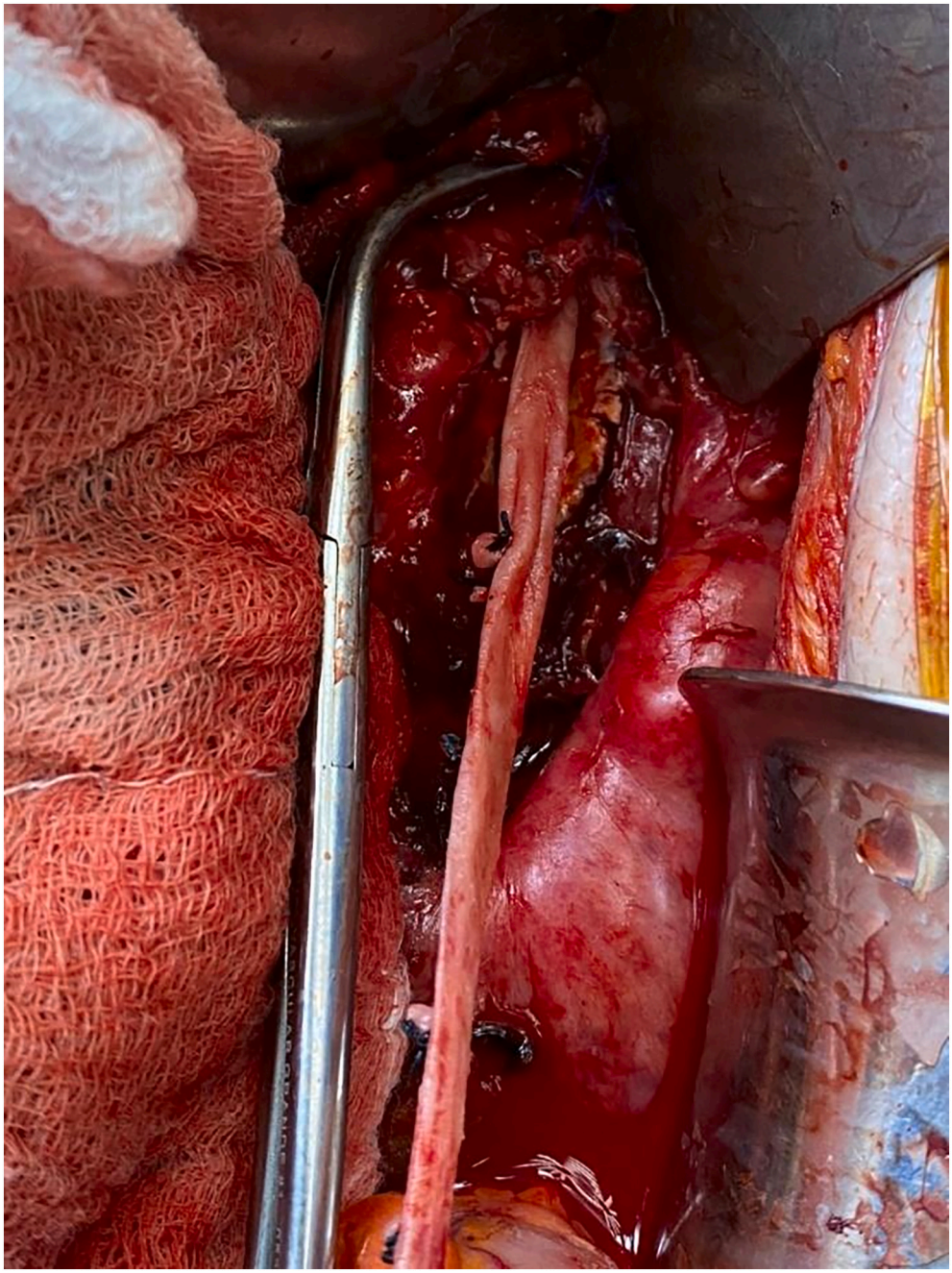

Fig. 4. Abdominal aortoiliac reconstruction with neo aortoiliac system (NAIS) procedure.

"bridge-to-surgery" procedure due to AEF. Patients who received a "bridge-to-surgery" regimen were treated with the NAIS procedure within 8 weeks (median 27 days, range: 27–60) after receiving emergency stent grafting [18].

Candida albicans was one of the two most common organisms found in aortic graft infections in two large retrospective series of AEF but in our case, there were no positive cultures for fungic graft infection. During our search, we did not find any case report of secondary AEF presenting with gastric outlet obstruction and treated with a NAIS procedure and this makes this case unique. The presence of gastric outlet obstruction syndrome and previous aortic synthetic graft must obligate the vascular surgeon in charge to rule out aortoduodenal fistula and help in the early diagnosis of this life-threatening condition [1,18,19]. Finally, the patient understood his condition and was satisfied with the approach taken and effort made by the medical team.

4. Conclusion

Aortoenteric fistula is a life-threatening condition associated with high morbidity and mortality and it can also pose a diagnostic dilemma. There are many presentations of aortoenteric fistula including gastric outlet obstruction syndrome. The neo aortoiliac system procedure is the ideal curative surgical approach in stable patients. Prompt diagnosis and early surgical intervention are the cornerstones to low the mortality of this special group of patients.

Abbreviations

AEF	aortoenteric fistula
AngioCT	computed tomography angiogram
EVAR	endovascular aortic repair

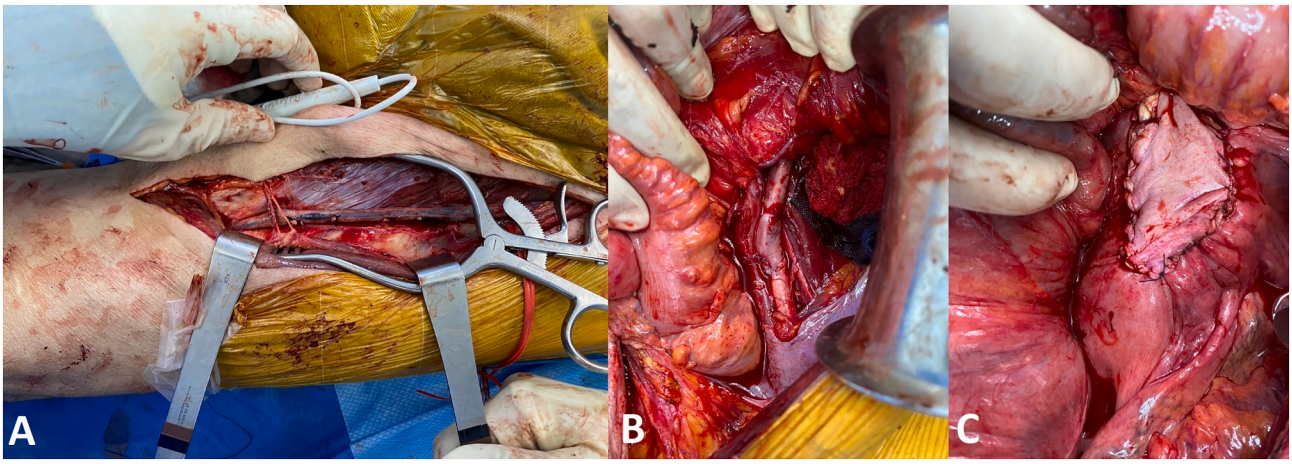

Fig. 5. A. The left femoral vein was anastomosed to the infrarenal aorta and the right common iliac artery bifurcation to preserve the right hypogastric artery. B. The left femoral vein in the intraoperative doppler was duplicated. C. The proximal aortofemoral vein anastomosis of the NAIS procedure was covered using a parietal peritoneal flap to avoid contact with the duodenal anastomosis and the gastrointestinal tract structures.

FEVAR	endovascular aortic repair fenestrated
GOO	gastric outlet obstruction
NAIS	neo aortoiliac system
UGI	upper gastrointestinal

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Hospital exempts ethics approval for reported cases

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Author contribution

All authors equally contributed to the analysis and writing of the manuscript.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request

Guarantor

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Registration of research studies

N/a.

Declaration of competing interest

None.

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References

[1] R. Vegunta, R. Vegunta, Sridharan G. Kutti, Secondary aortoduodenal fistula presenting as gastrointestinal bleeding and fungemia, Cureus. 11 (9) (2019), e5575.
[2] M. Zaki, W. Tawfick, M. Alawy, M. ElKassaby, N. Hynes, S. Sultan, Secondary aortoduodenal fistula following endovascular repair of inflammatory abdominal aortic aneurysm due to Streptococcus anginosus infection: a case report and literature review, Int. J. Surg. Case Rep. 5 (2014) 710–713.
[3] T. Simon, E. Feller, Diverse presentation of secondary aortoenteric fistulae, Case Rep. Med. 2011 (2011), 406730.
[4] Y. Tshomba, A. Kahlberg, E.M. Marone, F. Setacci, D. Logaldo, R. Chiesa, Aortoenteric fistula as a late complication of thrombolysis and bare metal stenting for perioperative occlusion of aortofemoral bypass, J. Vasc. Surg. 44 (2006) 408–411.
[5] M. Hashimoto, H. Goto, D. Akamatsu, T. Shimizu, K. Tsuchida, K. Kawamura, et al., Long-term outcomes of surgical treatment with in situ graft reconstruction for secondary aorto-enteric fistula, Ann. Vasc. Dis. 9 (3) (2016) 173–179.
[6] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, SCARE Group, he SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.
[7] G. Geraci, F. Pisello, F. Li Volsi, T. Facella, L. Platia, G. Modica, et al., Secondary aortoduodenal fistula, World J. Gastroenterol. 14 (3) (2008) 484–486.
[8] N. Saratzis, A. Saratzis, N. Melas, K. Ktenidis, D. Kiskinis, Aortoduodenal fistulas after endovascular stent-graft repair of abdominal aortic aneurysms: single-center experience and review of the literature, J. Endovasc. Ther. 15 (4) (2008) 441–448.
[9] M. Ueno, Y. Iguro, T. Nagata, R. Sakata, Aortoenteric fistula after endovascular stent grafting for an abdominal aortic aneurysm: report of a case, Surg. Today 36 (6) (2006) 546–548.
[10] S.J. Busuttil, J. Goldstone, Diagnosis and management of aortoenteric fistulas, Semin. Vasc. Surg. 14 (4) (2001) 302–311.
[11] E. Bastounis, E. Papalambros, V. Mermingas, C. Maltezos, T. Diamantis, P. Balas, Secondary aortoduodenal fistulae, J. Cardiovasc. Surg. 38 (5) (1997) 457–464.
[12] C. Chenu, B. Marcheix, C. Barcelo, H. Rousseau, Aorto-enteric fistula after endovascular abdominal aortic aneurysm repair: case report and review, Eur. J. Vasc. Endovasc. Surg. 37 (4) (2009) 401–406.
[13] G. Geraci, F. Pisello, F. Li Volsi, T. Facella, L. Platia, G. Modica, et al., Secondary aortoduodenal fistula, World J. Gastroenterol. 14 (2008) 484–486.
[14] F. Simo Alari, E. Molina Gonzalez, I. Gutierrez, A. Ahamdanech-Idrissi, Secondary aortoduodenal fistula and the unrecognised herald bleed, BMJ Case Rep. 2017 (2017), https://doi.org/10.1136/bcr-2017-220186.
[15] W. Doscher, K.V. Krishnasastry, S.L. Deckoff, Fungal graft infections: case report and review of the literature, J. Vasc. Surg. 6 (1987) 398–402.
[16] M. Batt, E. Jean-Baptiste, S. O'Connor, B. Saint-Lebes, P. Feugier, P. Patra, et al., Early and late results of contemporary management of 37 secondary aortoenteric fistulae, Eur. J. Vasc. Endovasc. Surg. 41 (2011) 748–757, https://doi.org/10.1016/j.ejvs.2011.02.020.

[17] A. Kahlberg, E. Rinaldi, G. Piffaretti, F. Speziale, S. Trimarchi, S. Bonardelli, et al., Results from the multicenter study on aortoenteric fistulization after stent grafting of the abdominal aorta (MAEFISTO), J. Vasc. Surg. 64 (2016) 313–320.
[18] J. Nordanstig, K. Törngren, K. Smidfelt, H. Roos, M. Langenskiöld, Deep femoral vein reconstruction of the abdominal aorta and adaptation of the neo-aortoiliac system bypass technique in an endovascular era, Vasc. Endovasc. Surg. 53 (1) (2019) 28–34.
[19] W.R. Wilson, T.C. Bower, M.A. Creager, S. Amin-Hanjani, P.T. O'Gara, P. B. Lockhart, et al., Vascular graft infections, mycotic aneurysms, and endovascular infections: a scientific statement from the American Heart Association, Circulation 134 (2016) 412–460.