Successful, staged management of an iliac artery to ileal urinary conduit fistula

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ABSTRACT

Fistula formation between the iliac artery and an ileal conduit is a rare pathology. A 39-year-old female patient presented with intermittent hematuria from her ileal conduit for 4 days, which progressed to massive hemorrhage on the ward. Her background includes stage 4A squamous cell carcinoma of the cervix treated with pelvic chemoradiotherapy and brachytherapy, recurrent obstructive uropathy requiring bilateral nephrostomies and bilateral ureteral stenting. Twelve months before this presentation, she had been treated for an iliac artery—ileal conduit fistula with a covered stent to the left common iliac artery. After initial fluid resuscitation, the bleeding was managed with endovascular placement of a covered stent. She subsequently underwent definitive vascular reconstruction with removal of the common iliac artery stents, an aortoiliac bypass using a vein graft, and repair of the ileal conduit electively. This case demonstrates the management of a rare clinical pathology and highlights the importance of close surveillance after endovascular procedures. (J Vasc Surg Cases Innov Tech 2023;9:101331.)

Keywords: Ileal conduit; Iliac stent; Pseudoaneurysm; Ureteral-iliac fistula

An iliac artery—ileal conduit fistula is a rare and potentially life-threatening pathology.[1] Risk factors include chronic ureteral stents, pelvic malignancy, pelvic surgery, and radiation.[2] The clinical presentation includes intermittent hematuria from urostomy, massive hemorrhage from urostomy, massive hemorrhage during ureteral stent exchange, and hypotension.[3,4] The present case describes the formation of a fistula between an ileal conduit and the left common iliac artery, secondary to recurrent ureteral stent exchanges and previous pelvic malignancy and chemoradiotherapy. The patient was managed by the vascular surgery, urology, and interventional radiology teams at a metropolitan tertiary center. She initially received an endovascular stent graft before definitive open vascular reconstruction. This case highlights the management of a rare clinical presentation and the importance of a close review of serial surveillance imaging. The patient provided written informed consent for the report of her case details and clinical images.

CASE REPORT

A 39-year-old female patient was treated for FIGO (International Federation for Gynecology and Obstetrics) stage 4A squamous cell carcinoma of the cervix with extended field chemoradiotherapy and intrauterine and interstitial brachytherapy in early 2019. She developed a vesicovaginal fistula in late 2019 and underwent laparotomy and creation of an ileal conduit. Examination of intraoperative frozen sections taken from the vesicovaginal fistula did not show evidence of malignancy; thus, a cystectomy was not performed. Repeat positron emission tomography-computed tomography (CT) scans demonstrated no obvious local or distant recurrent disease. The patient's oncologist considers her currently in remission from the carcinoma of the cervix. She has had recurrent issues with pyelonephritis and obstructive uropathy, previously requiring placement of bilateral nephrostomy tubes and ureteral stents. The initial ureteral stents were placed in December 2018. Her relevant history includes chronic kidney disease with a baseline estimated glomerular filtration rate of 50 mL/min and infective endocarditis requiring vegectomy. In February 2021, the patient was admitted under urology with frank hematuria from the ileal conduit, with CT angiography demonstrating a pseudoaneurysm of the left common iliac artery on the anterior surface as it is crossed by the mobilized left ureter that was concerning for an iliac—ureteral fistula (Fig 1). A 9-mm × 38-mm Viabahn VBX balloon-expandable covered stent graft (WL Gore & Associates) was placed across the left common iliac artery pseudoaneurysm (Fig 2). This stent was placed by interventional radiology after consultation with the vascular surgery team. Bilateral nephrostomy tubes and ureteral stents were placed for management of severe bilateral ureteral obstruction and hydronephrosis. This was complicated by a pseudomonas aeruginosa and vancomycin-resistant enterococcus bacteremia. During this admission, no plans were made for further surgical intervention with a bypass. However, no follow-up surveillance imaging of the iliac stent nor was a vascular surgery outpatient appointment organized for the patient after discharge from the hospital. The patient had multiple further admissions in 2021 for

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The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

https://doi.org/10.1016/j.jvscit.2023.101331

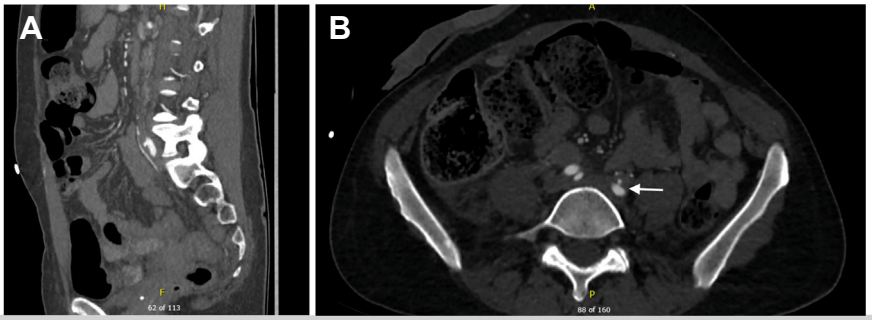

Fig 1. Initial computed tomography (CT) angiogram performed February 2021 demonstrating a left common iliac pseudoaneurysm in axial **(A)** and coronal **(B)** sections. *White arrow* indicates fistula between the ileal conduit and left iliac artery.

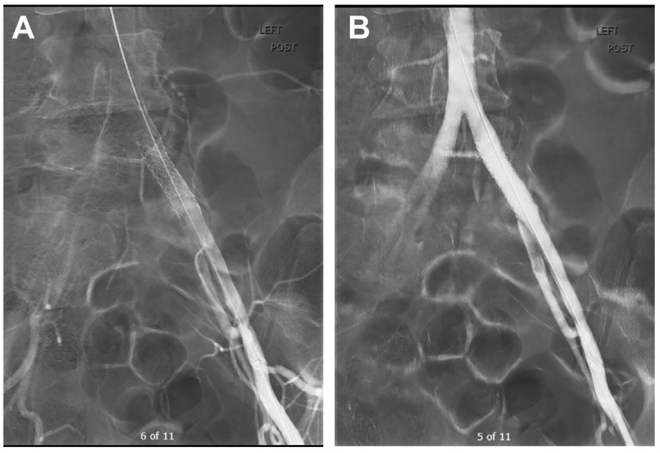

Fig 2. A,B, Initial Viabahn covered stent placed across the pseudoaneurysm in February 2021.

management of a small bowel obstruction, hematuria, and urosepsis. During these admissions, she underwent CT angiography as part of her workup, and the iliac stent was captured on these imaging studies. However, the vascular surgery team was not routinely consulted during these admissions to review these images.

In March 2022, the patient was admitted with a 4-day history of intermittent hematuria from the ileal conduit and soon after developed massive hemorrhage from the ileal conduit. A massive transfusion protocol was activated, and the patient was transferred to the interventional radiology department, where the bleeding was temporarily controlled using a 32-mm CODA balloon (Cook Inc) inflated inside the ileal conduit. The angiogram showed that the previously placed common iliac stent had migrated into the ileal conduit, forming an iliac–ileal fistula (Fig 3, *A*). An 8-mm × 39-mm Viabahn VBX stent was placed in the common iliac artery over the defect and the original stent (Fig 3, *B*). Bilateral nephrostomy tubes were inserted to treat ureteral obstruction with anuria. A further diagnostic angiogram was performed for ongoing hematuria from the ileal conduit and showed contrast extravasation into the ileal conduit from the inferior portion of the stent, and an additional covered stent was placed. This stent covered the origin of the internal iliac artery, which did not opacify before stent placement.

This admission was complicated by a perforated duodenal ulcer and pseudomonas bacteremia, and a decision was made to delay definitive vascular and urologic intervention for 3 months to allow the patient to recover. In July 2022, she underwent left aortoiliac bypass using a reversed right leg great saphenous vein graft (Fig 4). No significant size mismatch was present between the great saphenous vein and the external iliac artery, and the graft was of good quality. Retroperitoneal dissection and extensive adhesiolysis of the small bowel and ileal conduit were carefully performed to avoid inadvertent enterotomy. Intraoperatively, the ileal conduit was found to have adhered to the anterior surface of the left common iliac artery. As the conduit was dissected off the common iliac artery, a large defect was found in the conduit, and the original arterial stent was extracted from within the conduit. The most recent stent grafts were on view through a 15-mm circular defect in the common iliac artery. After systemic heparinization, the infrarenal aorta was clamped, and the stents were removed from the left common iliac artery. A 10-mm stump of healthy common iliac artery was present after debridement, and this was oversewn with double-layered 4-0 Prolene suture. The vein graft was anastomosed proximally end-to-side to the infrarenal aorta above the inferior mesenteric artery with 5-0 Prolene suture. Distally, the vein graft was spatulated and anastomosed end-to-end to the left external iliac artery with 5-0 Prolene suture. The left ureter was ligated and was not reimplanted into the ileal conduit. The ileal conduit was debrided back to healthy tissue, and the defect was oversewn with 4-0 PDS suture. An omental flap was placed over the ileal conduit. Two 19F Blake drains were placed on the left side, one lateral to the sigmoid mesentery and the other next to the ileal conduit. The patient was transferred to the intensive care unit postoperatively for blood pressure support and was transferred to the vascular surgical ward at day 4 postoperatively. The surgical drains were removed after 1 week, and the serum (129 μmol/L) and drain creatinine (113 μmol/L) levels were not suggestive of a urine leak. The operative samples of the iliac stent sent for microscopic examination grew extended-spectrum beta-lactamase *Escherichia coli* and

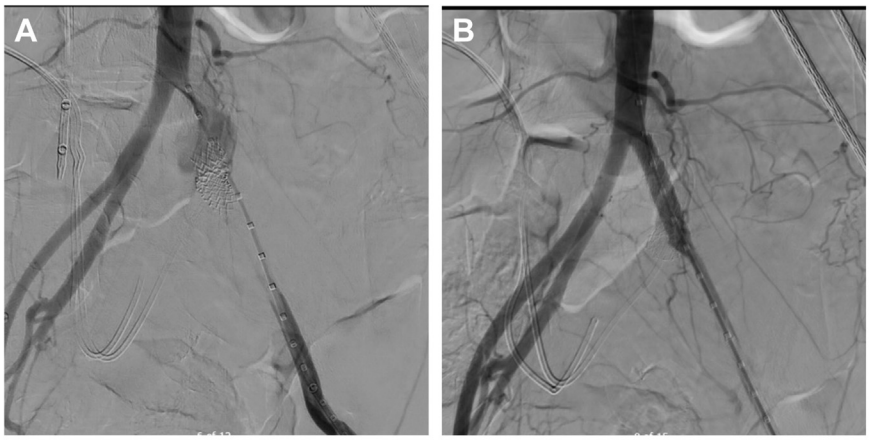

Fig 3. A, Angiogram performed in March 2022 demonstrating bleeding secondary to migration of the common iliac artery stent. **B,** Additional Viabahn covered stent placed over defect to control bleeding.

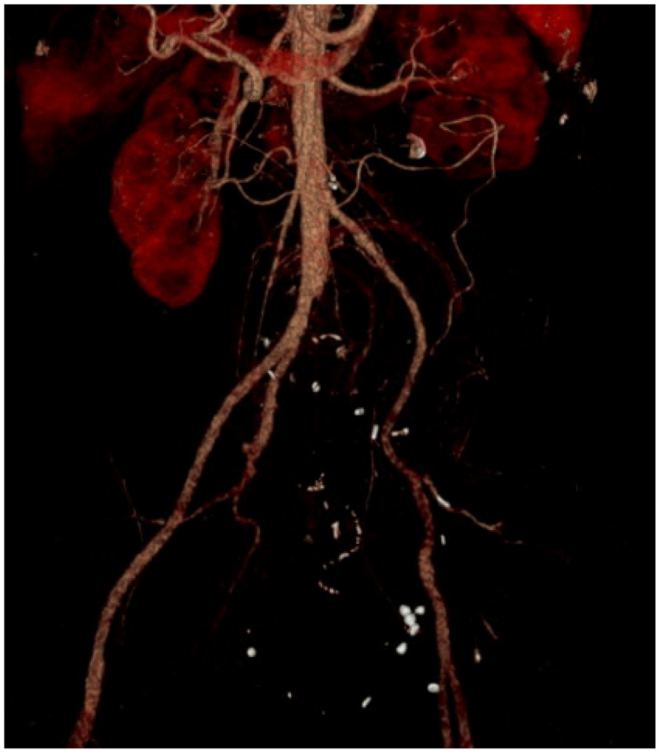

Fig 4. Reconstruction of postoperative computed tomography scan in July 2022 after aortoiliac bypass demonstrating a patent vein bypass from the infrarenal aorta to the left external iliac artery.

Candida dubliniensis, which was treated with ertapenem and fluconazole for 6 weeks. As a part of the preoperative planning, a DMSA (dimercaptosuccinic acid) scan was performed, which showed 46% function for the left kidney and 54% function for the right kidney, without evidence of tissue loss or scarring. A decision was made not to proceed with a left nephrectomy, and bilateral nephrostomy tubes were left in place to decompress the ileal conduit, preserve renal function, and delay the time to dialysis. The patient has been successfully managed as an outpatient since discharge from the hospital in July 2022. She was reviewed in the vascular surgery outpatient clinic in September 2022. She is clinically well and does not report any lower limb claudication. Further follow-up is planned in 6 months with regular duplex ultrasound imaging of the bypass. A recent arterial duplex ultrasound in May 2023 demonstrated a patent aortoiliac bypass. From a urologic perspective, the patient underwent nephrography via the right nephrostomy tube in September 2022. The findings confirmed a patent ileal conduit with no obstruction, allowing the right nephrostomy tube to be removed. The patient remains dependent on the left nephrostomy tube for which she undergoes routine nephrostomy exchanges every 6 weeks. She completed her 6-week course of intravenous antibiotics and is currently not taking antibiotics. The patient does not have a history of peripheral arterial disease and has had previous issues with duodenal ulceration and gastrointestinal bleeding. Thus, she is not receiving antiplatelet therapy for her bypass graft.

DISCUSSION

Ureteroarterial fistulas are defined as a pathologic connection between a ureter and an artery.[1] This is a rare and potentially life-threatening condition.[1] Ileal conduit—arterial fistulas are even rarer, with only seven case reports in the literature to date.[5] Ureteroarterial fistulas can be classified as primary (15%) and secondary (85%).[4] Primary ureteroarterial fistulas occur in the presence of an arterial condition such an aneurysm, a vascular malformation, or the presence of aberrant arterial vessels.[6] Secondary ureteroarterial fistulas develop as a result of previous pelvic surgery, pelvic radiation, chronic ureteral stenting, or vascular intervention.[7] Other risk factors for the development of a secondary ureteroarterial fistula include pelvic malignancy, chemotherapy, and urinary diversion procedures.[2] The underlying etiology can be related to weakening of the ureteral and arterial walls secondary to inflammation

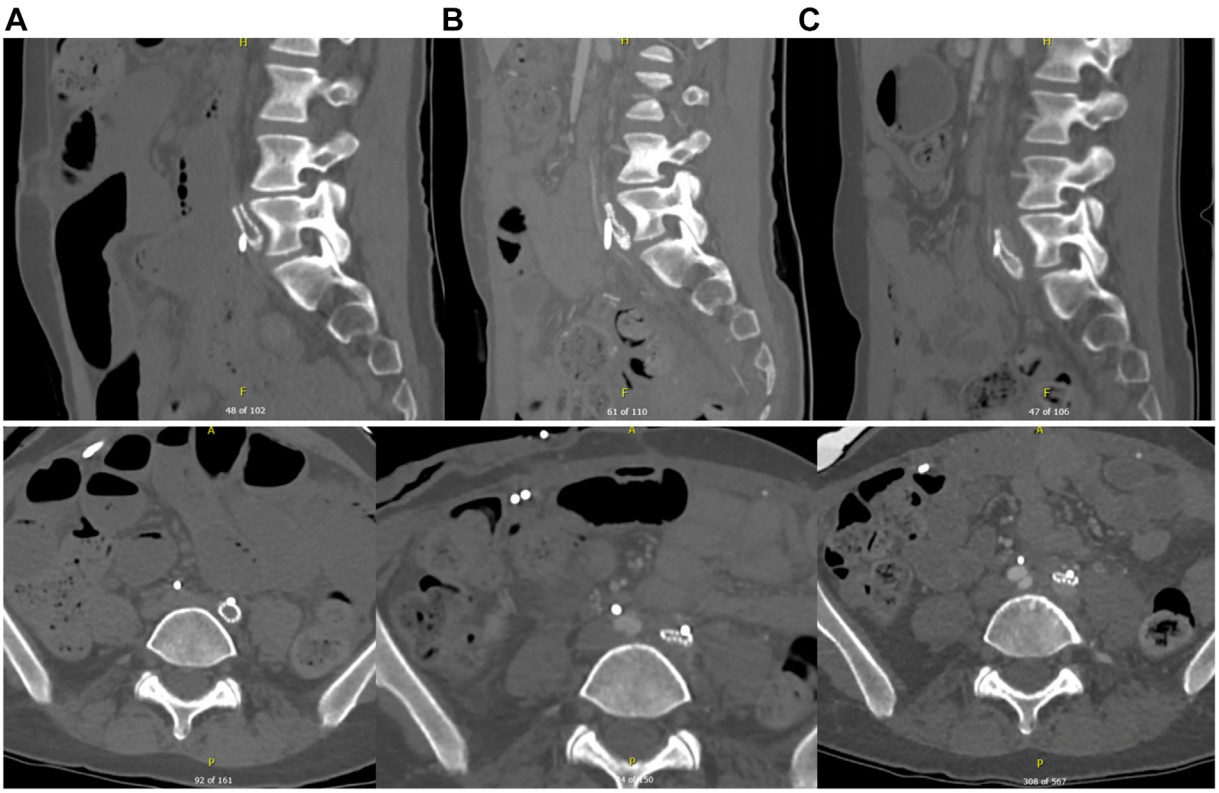

Fig 5. Progressive migration of the left common iliac stent in the axial and sagittal planes noted on retrospective review of imaging studies. Imaging was performed in May 2021 **(A)**, August 2021 **(B)**, and March 2022 **(C)**.

and radiation.[4] The ureter is usually free to move over the iliac vessels; however, in the setting of chronic stenting, radiation, and previous surgery, the ureter can becomes scarred and adherent to the arterial wall.[1] Mechanical forces from pulsation of the artery against the adherent ureter also contribute to fistula formation.[7] Fistula formation between the ileal conduit and iliac artery is a rare condition. It can develop when the conduit overlies the iliac artery owing to exposure to similar risk factors.[7] A combination of factors contributed to fistula formation in our patient, including recurrent obstructive uropathy and infection requiring repeated ureteral stent exchanges, previous pelvic surgery and radiation, and endovascular intervention. Ureteroarterial fistulas develop where the ureter crosses the distal common iliac artery.[4] They can develop between the ureter and proximal external or internal iliac arteries.[4] In patients with urinary diversion procedures such as an ileal conduit, the fistula develops at the level of the common iliac artery or distal aorta.[4]

The clinical presentation includes intermittent hematuria or massive hematuria via urostomy, massive hematuria during stent exchange, hypotension, or transfusion requirements.[3,4] A delay in the diagnosis and definitive management can occur due to a lack of awareness and clinical suspicion of this pathology. CT angiography demonstrating contrast extravasation, pseudoaneurysm formation, or an arterial abnormality near the ureter are highly suggestive of an ureteroarterial fistula.[3] Ureteroarterial fistulas can be seen on angiography with findings ranging from a subtle intimal defect to contrast extravasation.[4]

Both open surgical repair and endovascular management of ureteroarterial fistulas have been described.[6] A systematic review by Darcy[6] showed that currently endovascular treatment is favored over traditional open surgery. Surgical management involves repair of the artery by direct repair, patch repair, or an interposition graft.[7] If arterial reconstruction is not possible, ligation of the iliac artery and formation of a femorofemoral bypass to allow for perfusion to the lower limb is required.[7] Repair of the ureteral defect can be performed directly or by placing a nephrostomy tube.[7] These patients often have had prior pelvic surgery and radiation, making open surgical repair difficult and associated with an increased risk of complications.[7] Endovascular management options include ligation with coils or placement of a covered stent graft. Ligation of the common or external iliac artery requires subsequent formation of a femorofemoral bypass to maintain lower limb

perfusion.[6] Currently, the favored treatment option is placement of a covered stent graft over the arterial defect to exclude the fistula and preserve perfusion to the lower limb.[6] The literature does note the risk of stent graft infection with this approach; however, long-term data quantifying this risk are not yet available.[6]

Ileal conduit—iliac artery fistulas have been successfully managed both endovascularly and surgically. The available reports describe successful management with placement of a covered stent graft over the arterial defect to exclude the fistula from the circulation,[8] although long-term follow-up and complications have not yet been reported. Other studies describe management with a hybrid approach involving endovascular coil ligation of the common iliac artery and formation for a femorofemoral bypass graft.[5]

In the present case, the management is unique to that previously described in the literature. Our approach was to stabilize the patient with placement of a covered stent graft as a bridge to definitive open surgical repair. Ligation of the common iliac artery and formation of a femorofemoral bypass were considered. Given the patient's recurrent infections, bypass using the saphenous vein avoided the use of a prosthetic graft and the need for long-term suppressive antibiotic therapy. Venous grafts are recognized conduits for use in the setting of arterial infection.[9] They have been found to have good long-term patency and are more resistant to infection compared with prosthetic grafts.[10] Because our patient is relatively young and in remission of her stage 4A cancer of the cervix, an aortoiliac bypass was chosen as a durable long-term graft. A size discrepancy between a target vessel and conduit is an important consideration when selecting a venous graft. In the present patient, the great saphenous vein was of good quality and no significant size discrepancy was present with the external iliac artery. The femoral vein would have been used alternatively if a major size discrepancy was apparent.

This case highlights a rare complication in a patient with several risk factors for development of an ileal conduit—iliac artery fistula. A retrospective review of CT angiography imaging performed between May 2021 and March 2022 was done during the March 2022 admission. The review showed progressive migration of the common iliac artery stent toward, and eventually into, the ileal conduit (Fig 5). This illustrates the importance of follow-up and surveillance imaging after endovascular procedures to detect complications early.

CONCLUSIONS

Formation of a fistula between the iliac artery and an ileal conduit is a rare pathology and can present with massive hemorrhage from the ileal conduit. This case report describes the presentation and management of an iliac—ileal fistula, with endovascular and open vascular reconstruction.

DISCLOSURES

None.

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Submitted Mar 15, 2023; accepted Sep 5, 2023.