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CASE REPORT

Renal Autotransplantation for Complete Ureteral Avulsion Following Dilation and Curettage: A Rare Iatrogenic Complication

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Background: Renal autotransplantation is a rare yet effective surgical strategy for managing complex ureteral injuries when conventional reconstructive options are not viable. We report an exceptional case of complete ureteral avulsion following a dilation and curettage (D&C) procedure, successfully treated with renal autotransplantation. This represents the first documented case of renal autotransplantation in Yemen, highlighting a successful organ-preserving approach in a resource-limited setting.

Case Presentation: A 34-year-old female developed life-threatening complications following a D&C performed for retained products of conception. The procedure was complicated by uterine perforation and a complete avulsion of the left ureter, which was identified intraoperatively during emergent laparotomy. Initial management included pyelostomy, which failed, necessitating nephrostomy. Because to the absence of a viable ureteral stump, renal autotransplantation was performed. The kidney was reimplanted into the right iliac fossa, and urinary continuity was restored via a Boari flap. The patient had an uneventful postoperative course and demonstrated preserved renal function at two-month follow-up.

Conclusion: Complete ureteral avulsion is an exceedingly rare complication of D&C, often linked with uterine perforation. In cases where standard ureteral reconstruction is not feasible, renal autotransplantation provides a definitive, nephron-sparing solution. Early identification and referral to experienced centers are essential to optimizing outcomes.

Keywords: renal autotransplantation, ureteral avulsion, iatrogenic ureteral injury, dilation and curettage, Boari flap

Introduction

Dilation and curettage is a widely utilized gynecological procedure for both diagnostic and therapeutic purposes, including the management of abnormal uterine bleeding, incomplete abortion, and retained products of conception. While generally regarded as safe, D&C carries a risk of significant complications, particularly when performed in the context of altered pelvic anatomy or with limited intraoperative visualization. Among these complications, uterine perforation is the most frequently encountered serious adverse event, with reported incidence rates of approximately 0.3% in premenopausal women and up to 2.6% in postmenopausal women undergoing D&C for non-obstetric indications. The risk is further elevated in pregnancy-related procedures, especially during management of postpartum hemorrhage or retained placental tissue, where perforation rates may reach as high as 5%.[1,2]

Although uterine perforation itself may be clinically silent or self-limited, it can occasionally lead to injuries of adjacent pelvic organs, including the bowel, bladder, and ureters. Ureteral injury during D&C is exceptionally rare, with only a few cases documented in the literature.[3–7] The ureters are particularly vulnerable during procedures complicated by lateral uterine perforation, especially in the presence of distorted pelvic anatomy due to previous surgeries, pelvic

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adhesions, or large fibroids. Ureteral avulsion, the most severe form of ureteral trauma, is characterized by complete detachment of the ureter and necessitates complex surgical reconstruction.[3,4]

Conventional options for ureteral reconstruction include ureteroneocystostomy, ureteroureterostomy, and ileal ureteral substitution. However, in cases of extensive ureteral loss or complete avulsion where these techniques are not feasible, renal autotransplantation may serve as a definitive, nephron-sparing alternative. This technique involves nephrectomy followed by orthotopic or heterotopic reimplantation of the kidney with vascular and urinary tract reconstruction.[8,9]

In this report, we present a rare case of complete ureteral avulsion following a D&C procedure, successfully managed with renal autotransplantation the first such case reported from our country. The case highlights the importance of early recognition and referral for advanced reconstructive options in the management of complex iatrogenic urological injuries.

Case Report

A 30-year-old Yemeni woman, gravida 2 para 1, with a body mass index (BMI) of 17.4 kg/m^2, presented with a missed miscarriage at 18 weeks' gestation. She underwent multiple unsuccessful D&C procedures for evacuation of retained fetal tissue. The final attempt was performed under general anesthesia in the operating theatre but was complicated by excessive vaginal bleeding and failure to remove the retained fetal head. The patient became hemodynamically unstable with pallor and a hemoglobin level of 6.9 g/dL, prompting an emergency exploratory laparotomy.

Intraoperatively, approximately 1 liter of hemoperitoneum was evacuated. A large perforation on the left lateral aspect of the uterus was identified. Further exploration revealed complete avulsion of the left ureter at the The pelvi-ureteric junction (PUJ). Given the extent of injury, a temporary nephrostomy tube was placed for urinary diversion and preservation of renal function. The patient was stabilized and discharged in good condition on postoperative day 10 with plans for delayed reconstructive intervention.

Four months later, the patient was referred to our center for definitive management. Preoperative laboratory testing revealed a serum creatinine level of 1.0 mg/dL and estimated glomerular filtration rate (eGFR) of 88 mL/min/1.73 m^2, confirming preserved left renal function despite urinary diversion.

On examination, her vital signs were within normal limits: blood pressure 100–110/90–100 mmHg and heart rate 80–90 bpm. Abdominal examination was unremarkable, and there was no tenderness or distention. Laboratory investigations, including renal function tests and complete blood count, were within normal ranges.

Contrast-enhanced computed tomography urography demonstrated a normal right kidney and a hydronephrotic left kidney (Grade 2), with a consolidated renal pelvis and no identifiable left ureter distal to the PUJ. The nephrostomy tube was seen in place. Multidisciplinary consultation between urologists and vascular surgeons concluded that renal autotransplantation was the most appropriate reconstructive approach due to the complete absence of a viable ureteral segment.

Surgical intervention was performed in two stages. Through a left anterior subcostal incision, the left kidney was mobilized. The Gerota's fascia was opened, and the renal hilum was carefully dissected. Intraoperatively, no distal ureteral segment was identified. The renal artery and vein were meticulously isolated and transected, and the kidney was explanted. It was immediately flushed and perfused ex vivo with cold heparinized saline (Figure 1a).

Simultaneously, a right-sided supra-inguinal reversed J-shaped incision was made to access the iliac vessels in the retroperitoneal space. The external iliac artery and vein were exposed and prepared for anastomosis. The renal vein and artery were anastomosed end-to-side to the external iliac vein and artery, respectively. After remove clamping, immediate restoration of perfusion and urine output was observed (Figure 1b). Total cold ischemia time was 12 minutes, and vascular anastomosis time was 10 minutes.

Given the distance between the renal pelvis and urinary bladder, a Boari flap was fashioned from the anterolateral wall of the bladder to bridge the gap. A 2×4 cm flap was tabularized over a 12 Fr double-J stent and anastomosed to the renal pelvis (Figure 1c). The bladder defect was closed primarily. Drains were placed, and all incisions were closed in layers.

Postoperative recovery was uneventful. Color Doppler ultrasound on postoperative day 1 revealed a well-perfused renal graft with normal corticomedullary differentiation, patent renal vessels, and a resistive index of 0.67. The surgical

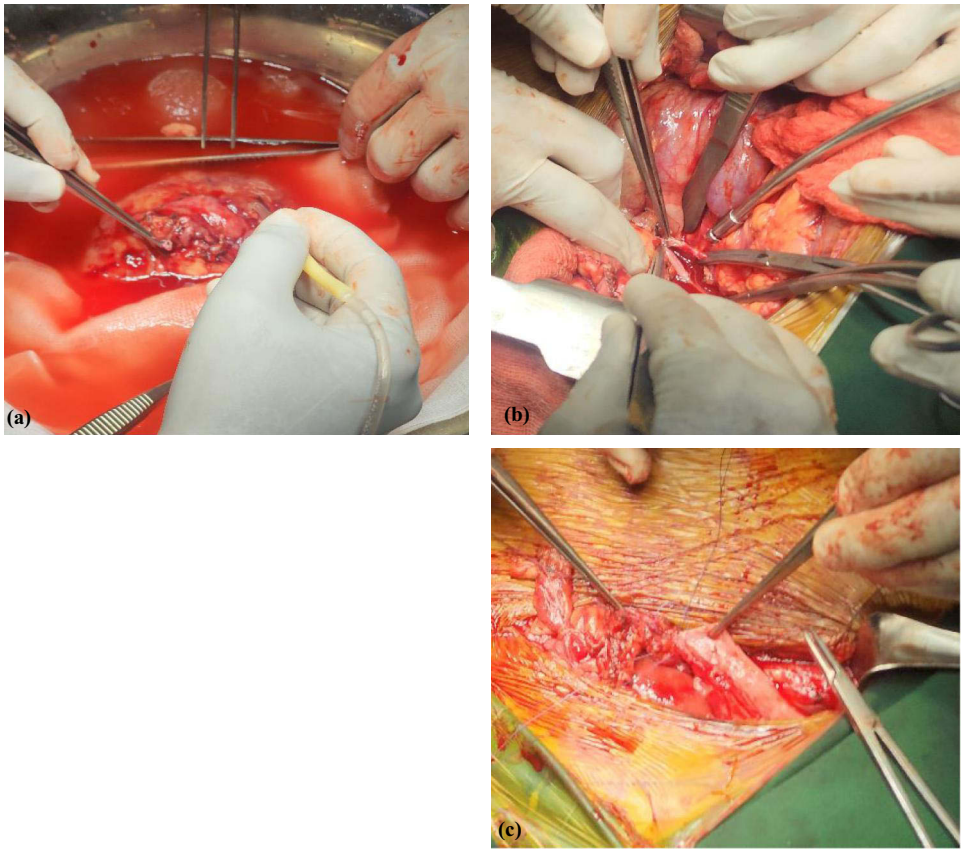

Figure 1 (**a**) Intraoperative image showing the explanted left kidney following nephrectomy and perfusion with cold heparinized saline solution prior to autotransplantation. (**b**) Restoration of blood flow in the transplanted kidney immediately after vascular anastomosis to the external iliac artery and vein in the right iliac fossa. (**c**) Construction of the Boari flap from the anterior bladder wall, formed into a tube to bridge the gap between the renal pelvis and urinary bladder.

drain was removed on postoperative day 3, the Foley catheter on day 7, and antibiotics were discontinued on day 5. The patient was discharged on day 7 after a brief stay in the intensive care unit.

At the two-month follow-up, intravenous pyelography confirmed bilateral renal function. The autotransplanted kidney showed prompt drainage into the bladder via a short reconstructed ureteral segment (Boari flap). Routine blood tests remained within normal parameters. The patient was scheduled for removal of the ureteric stent at three months post-transplantation. Follow-up care included biweekly renal function monitoring and blood pressure assessments. At the time of submission, she remained clinically stable with preserved renal function (serum creatinine 0.9 mg/dL, eGFR 92 mL/min/1.73 m^2), and no evidence of obstruction or infection. Long-term imaging follow-up, including renal ultrasound and/or CT urography, was planned at six months to assess graft patency, renal drainage, and anatomical integrity.

Discussion

Ureteral injuries during gynecological procedures are uncommon but can have serious consequences if not promptly recognized and managed. The ureter is particularly vulnerable during procedures such as hysterectomy, oophorectomy, and D&C, especially in cases involving uterine perforation, distorted pelvic anatomy, or multiple surgical attempts. Iatrogenic ureteral injury during D&C is exceedingly rare, with only isolated case reports documented in the literature.[6,7]

In the present case, multiple failed D&C attempts led to uterine perforation and complete avulsion of the left ureter at the PUJ. The injury went unrecognized until exploratory laparotomy for hemorrhagic shock revealed the extent of damage. Early placement of a nephrostomy tube was critical for urinary diversion, preservation of renal function, and stabilization prior to definitive reconstruction.

Management of complete ureteral avulsion depends on the location and length of the defect, renal function, and availability of viable ureteral tissue. In cases where the ureteral loss is extensive, options include ileal ureteral

substitution, ureterocalicostomy, transureteroureterostomy, or renal autotransplantation.[3,4] Renal autotransplantation is typically reserved for complex or proximal ureteral injuries not amenable to other forms of reconstruction. It offers the advantage of relocating the kidney to the iliac fossa, where the shortened distance to the bladder allows for easier urinary drainage via ureteroneocystostomy or Boari flap.[8,10]

In this case, imaging revealed complete ureteral loss, with no distal remnant. The left kidney was functioning and salvageable, warranting renal autotransplantation. Cold perfusion during bench surgery minimized ischemic injury, and end-to-side vascular anastomosis to the external iliac vessels allowed for reliable revascularization. The use of a Boari flap enabled tension-free urinary tract reconstruction.

While renal autotransplantation has been previously reported as a solution for complex ureteral injuries, this case provides several unique contributions to the existing literature.[11] First, it represents the first documented case of its kind in Yemen, highlighting the feasibility of performing highly complex reconstructive urological procedures in a resource-limited setting. Second, the case emphasizes the importance of multidisciplinary coordination between urology, vascular surgery, and anesthesia, which was essential to achieving a favorable outcome.

Compared to similar cases reported in the literature (Neo et al,[8] Tugmen et al,[12] Kaymak et al,[9] Consigliere et al[13]), the present case involved a complete PUJ avulsion following a gynecologic procedure—a rare etiology—and required the use of a Boari flap due to complete ureteral loss. This contrasts with other cases where distal ureter remnants allowed for primary ureteroneocystostomy. Additionally, our technique of cold perfusion, prompt anastomosis, and early functional recovery supports previously documented high success rates of renal autotransplantation when performed at experienced centers.

To our knowledge, this is the first reported case of renal autotransplantation following complete ureteral avulsion in Yemen. This case highlights the importance of early recognition of ureteral injury, timely nephrostomy placement, multidisciplinary collaboration, and the role of renal autotransplantation as a definitive salvage procedure.

Conclusion

This case highlights the importance of considering renal autotransplantation as a definitive, organ-preserving surgical option in managing complex ureteral injuries, particularly when extensive ureteral loss precludes conventional reconstructive techniques. In experienced centers with multidisciplinary collaboration, renal autotransplantation offers excellent functional outcomes and should be considered in select patients, especially those with preserved renal function and no alternative options for urinary tract reconstruction. Early recognition of iatrogenic ureteral injury, prompt urinary diversion, and timely referral are critical to optimizing long-term outcomes.

Data Sharing Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Statement

Institutional approval was not required for publication of this single case report according to the guidelines of Taiz University Faculty of Medicine, as the patient provided written informed consent.

Informed Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically

reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflicts of interest related to this study.

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