CLINICAL CASE

Extensive ureteral injury managed with renal autotransplantation

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Abstract Ureterorenoscopy is a safe and effective procedure whose use is both diagnostic and therapeutic. The large majority of iatrogenic ureteral injuries can be resolved endoscopically with ureteral stents and diversions with nephrostomy tubes, but when the injuries are complex, such as in ureteral avulsion, they are a great challenge for the urologist. The case of a 39-year-old woman is presented that suffered ureteral avulsion after ureterolithotripsy due to left ureteral lithiasis. She then underwent renal autotransplantation with no complications. Her improving progression has been corroborated by kidney function tests. Ureteral avulsion, although rare, is a complication of ureteroscopy when performed by an inexperienced surgeon. Renal autotransplantation is valid treatment for difficult cases and is an alternative to ureteral replacement with ileum. It is also adequate treatment for those patients that wish to preserve the kidney unit.

Lesión ureteral extensa manejada con autotrasplante renal

Resumen La uretero-renoscopia es un procedimiento seguro y eficaz, con fines tanto diagnósticos como terapéuticos. La gran mayoría de las lesiones ureterales iatrogénicas se pueden resolver de manera endoscópica con stent ureteral, derivaciones con tubos de nefrostomía, sin embargo cuando las lesiones son complejas, como la avulsión ureteral, representan un verdadero reto para el urólogo. Se presenta el caso de una mujer de 39 años, que sufrió avulsión ureteral posterior a ureterolitotricia por litiasis ureteral izquierda, a la cual posteriormente se le realizó autotrasplante renal...
Introduction

With the advent of the new minimum caliber ureteroscopes, ureterorenoscopy has become a safe and effective tool for the diagnosis and treatment of ureteral lithiasis, as well as for other pathologies of the upper urinary tract. This excellent surgical tool, despite the skill of the urologist in performing this type of procedure, is not free from developing some of the following complications: edema, hematuria, perforation and ureteral stricture, urinomas, and in the worst of cases, kidney rupture and ureteral avulsion.

Extensive ureteral injuries should be treated immediately through open surgery, with renal autotransplantation as an alternative to other management, whether it be ureteral substitution with ileum or ureteral graft, because there have been reported case series with satisfactory results of up to 96%.

The aim of this article was to present a case of extensive ureteral injury due to avulsion that was secondary to ureterolithotripsy, and its definitive management with renal autotransplantation.

Case presentation

A 39-year-old woman had disease onset in November 2011 with left renal and ureteric colic. She sought medical attention with a private physician who treated her with antispasmodics and ordered an abdominal computed axial tomography (CAT) scan through which left ureteral lithiasis was diagnosed. She was referred to a private hospital and evaluated by a urologist who decided she should undergo emergency endoscopic surgery due to a stone measuring approximately 1.1 cm in the upper third of the left ureter that was causing moderate hydronephrosis (fig. 1).

Ureterolithotripsy was begun, but upon seeing a ureteral avulsion, retroperitoneal exploration and repair through uretero-ureteral anastomosis were performed and a feeding catheter plus a retroperitoneal drain were placed, because a double-J stent was not available. The patient improved and was released after 72 hours. In her home 48 hours later, she complained of having passed the feeding catheter during micturition. The patient was again seen by her attending physician, who referred her to our hospital 5 days after having passed the feeding catheter. We evaluated her for the first time in the emergency department and found her to be in good general condition, hemodynamically stable, with a hyperemic surgical wound, and a retroperitoneal drain with an 800 ml output. We ordered an excretory urogram and a full blood count and blood chemistry. The nephrogram revealed adequate bilateral contrast medium concentration, but at elimination there was left moderate hydronephrosis and only 7 cm of the proximal portion of the ureter were visible. There was

Figure 1  Abdominal tomography scan prior to endoscopic management. A) Plain tomographic image of the stone in the proximal third of the left ureter. B) Contrast-enhanced tomography scan showing left moderate hydronephrosis.
extensive ureteral injury managed with renal autotransplantation

Stricture at this level and no passage of contrast medium to the middle or distal ureter was observed (fig. 2). The results of the full blood count and blood chemistry were normal, and so it was decided to place a double-J stent through ureteroscopy, but when that failed, diversion was done through nephrostomy. One month later retrograde pyelography was carried out that revealed an extensive, approximately 17 cm lesion in the distal ureter, considered as complete ureteral loss (fig. 3). A kidney scintigram was ordered that reported a glomerular filtration rate of 82 mL/min, right kidney 59% and left kidney, 41%, respectively. The patient was evaluated together with the transplantation service and autotransplantation was decided upon due to the good function reported and the desire to conserve the kidney unit.

Six months later autotransplantation was performed. Nephrectomy was carried out with great difficulty because we found abundant fibrosis and friable tissue. Only 5 cm of the proximal ureter could be freed. The autotransplantation was continued through an extraperitoneal Gibson incision. The iliac vein and artery were located and anastomosed, the artery, end-to-end, and the vein, end-to-side. The ureteral reimplant was performed using the Lich-Gregoir technique with previous double-J stent placement. Total surgery duration was 7 hours with an approximate 400 mL blood loss. The patient progressed satisfactorily, presenting with uresis of 1,600 mL at 24 hours. A control renal ultrasound (US) image reported adequate vascularization of the renal graft (figs. 4 and 5).

Discussion

Ureteral lesions are classified as acute and chronic. Eighty percent of the acute lesions are intraoperative, as well as infrequent. The chronic lesions often are caused by radiation, ureterolithiasis, or by previous instrumentation. The acute lesions are infrequent due to the anatomic position of the ureters; they are protected by adjacent structures such as the psoas muscle, vertebrae, and bony pelvis. 1,2

Ureteral trauma represents only 1% of all urogenital trauma and 75% of the injuries are iatrogenic, 18% are secondary to blunt trauma, and 7% to penetrating trauma. Among the iatrogenic injuries, three quarters are of gynecologic origin and the rest are caused by general surgery and urologic surgery procedures; the lower third of the ureter is the portion that is most affected. 1,4

The iatrogenic injuries are due to various mechanisms. The most common are ligatures with suture, complete incision or section, avulsion, devascularization, or due to thermal damage from cryoaucutery. Thirty percent of these urologic iatrogenic injuries commonly occur when performing endoscopic procedures for stone pathology. 4

Avulsion refers to the discontinuity of the entire thickness of the ureteral wall, and if it is not treated adequately and urgently through open surgery, there can be serious complications ending in the loss of the kidney. Ureteral avulsion is one of the most dreaded, albeit rare, complications of ureterorenoscopy and has an incidence of 0.06-0.4%.5-7

This complication is difficult to manage. However, in order to restore the ureteral continuity, depending on the level of the injury, there are several procedures, such as: end-to-end anastomosis, transureteroureterostomy, Boari bladder lateralization, ureteral replacement with ileum, artificial ureter (Detour device), and renal autotransplantation.3,7 Treatment is essentially surgical and the technique depends on the age of the patient, the function of the affected kidney, and the level and amplitude of the ureteral defect. 8

Figure 2  Excretory urogram. A) Elimination phase at 25 minutes, left hydronephrosis with no evidence of contrast medium passage toward the distal ureter. B) At 2 hours and 30 minutes the contrast medium leak through the retroperitoneal drain continued.
Since Hardy described the technique of renal autotransplantation for the first time in 1963 as treatment for extensive ureteral lesions, and then in 1980 Novick et al. contributed their experience with renal autotransplantation for both renovascular disease, as well as ureteral lesions, it has been shown to be a safe and effective procedure. Novick et al. have reported the largest case series of autotransplantations with a total of 108 cases, 27 of which were due to extensive ureteral lesion. The renal graft results were satisfactory in 96% of the cases. Nevertheless, autotransplantation continues to be an infrequent procedure with precise indications and it is reserved for selected and complex cases such as: renovascular disease, extensive ureteral lesion, and in other exceptional indications that include kidney tumors, complex vascular problems such as stricture or bilateral renal artery aneurysms, renal vessel trauma, retroperitoneal fibrosis, or lumbar column laminectomy. 7,9

Renal autotransplantation is a good alternative in patients that have presented with significant ureteral loss, in those

**Figure 3**  A) Retrograde pyelography. The extensive lesion of the distal ureter is shown.  B) 3D reconstruction in which the contrast medium passage can be seen toward the proximal ureter, approximately 7 cm from the ureteropelvic junction.

**Figure 4**  Control Doppler ultrasound image with adequate vascularity of the renal graft.

**Figure 5**  Control coronal tomography scan of the renal autotransplantation.
that wish to conserve the kidney function of the affected side, and in the patients in whom other management options have failed. 

**Conclusions**

Ureteral avulsion, although rare, is a complication of ureteroscopy in the hands of the inexperienced surgeon. Renal autotransplantation is a valid treatment for difficult cases and an alternative to ureteral replacement with ileum and for those patients that wish to conserve the kidney unit.

In our case, renal autotransplantation was decided upon due to the fact that the available ureteral segment was short and there was no option for performing a Boari flap, a psoas hitch, or a trans-uretero-ureteral anastomosis. Despite the difficulty of the operation due to the friability and fibrosis of the tissue, the result was successful.

**Conflict of interest**

The authors state that there is no conflict of interest.

**Financial disclosure**

No financial support was received in relation to this article.

**References**