Partial ureteropelvic junction obstruction managed by robotic excision and ureteropyelostomy

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Ureteropelvic junction obstruction is a fairly common diagnosis in urology. With the emergence of robotic surgery in urology, complex ureteral reconstruction of the proximal, mid, and distal ureter is being undertaken with robotic assistance with excellent results. We present the case of a 61-year-old male who presented with an atypical partial ureteropelvic junction obstruction. The etiology was suspected to be from external compression of the proximal ureter by a calcified periureteral mass. The mass was theorized to be secondary to occult ureteral perforation and extraluminal migration of a renal calculus during repeat percutaneous nephrolithotomy (PCNL)/ shock wave lithotripsy (SWL). The patient ultimately underwent surgical treatment and we describe the technique of robotic assisted laparoscopic excision of the periureteral mass and proximal ureter with ureteropyelostomy. He sustained no immediate complications and had excellent short term results from his operation.

Key Words: robotics, laparoscopy, ureter, stricture, percutaneous nephrostolithotomy, shock wave lithotripsy, pyeloplasty, ureteropelvic junction obstruction

Introduction

Minimally invasive approaches to ureteral reconstruction are increasingly being performed as an alternative to open surgery in an attempt to decrease the morbidity of the operation. The role of robotics in urology has expanded dramatically since 2000 and several series have reported on the feasibility and excellent long term outcomes of robotic pyeloplasty.[1,2] The da Vinci robotic system provides many advantages including Endowrist technology to improve dexterity and decrease tremor, better optics and magnification with stereoscopic three dimensional vision, and improved ergonomics allowing urologists to expand applications to upper urinary tract reconstruction.[3] Robotic ureterocalicostomy has been reported for the treatment of a 1.5 cm proximal ureteral stricture with a small intrarenal pelvis.[4] Robotic ureteroureterostomy has also been reported for a midureteral stricture associated with a previously impacted ureteral calculus.[5] Finally, robotic ureteral reimplantation has been reported by many authors and was first reported by Yohannes et al in 2003.[6] Robotic ureteropyelostomy in patients with a secondary ureteropelvic junction obstruction (UPJO) has also been previously described by these authors.[7] We present the unusual case of an adult man with a right proximal periureteral calcified mass and

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diminished right renal function who underwent robotic excision of the mass and proximal ureter and robotic right ureteropyelostomy with good results.

Case presentation

A 61-year-old Caucasian male with occasional right flank pain was referred to our center for ongoing management of right renal calculi. He had a prior history of right percutaneous nephrolithotomy (PCNL) and five shock wave lithotripsy (SWL) sessions and a past medical history of hypertension, hypercholesterolemia and open cholecystectomy. His serum creatinine was 1.2 mg/dl (normal 0.5 mg/dl-1.0 mg/dl). An un-infused CT scan of the abdomen and pelvis was obtained which revealed a cluster of calcifications contiguous with the ventral margin of the proximal right ureter. Right retrograde pyelography revealed mild narrowing at the level of the ureteropelvic junction (UPJ) with evidence of calcification(s). Some of these calcifications seen on the scout examination were not encompassed by the injected contrast material, suggesting the possibility of the stones being extra luminal, Figure 1a, 1b. Right ureteroscopy revealed no evidence of calculi within the right ureter or collecting system. The follow up MAG-3 renogram revealed a split differential function of 31% : 69% :: right: left kidney, with a right peak T-1/2 time of 21 minutes, a Lasix T-1/2 of 12 minutes, and a washout T-1/2 of 10 minutes. The patient elected to have his stent removed and continue a course of observation. A follow up CT urogram revealed mild right hydroureteronephrosis with a transition point at the level of proximal right ureter at the level of the periureteric calcifications. Since the ureteral contrast was not seen communicating with the calcifications a diagnosis of proximal ureteric stricture with extrinsic compression by the periureteral calcifications was entertained, Figure 1c, 1d. He was counseled on all of his options including observation, chronic stent changes, open ureteral reconstruction, or robotic ureteral reconstruction and he chose to proceed with a robotic reconstruction.

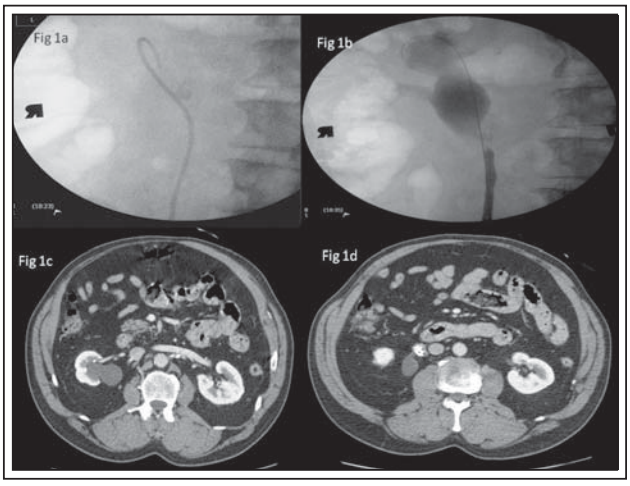

Figure 1a. Scout image of the right flank showing a ureteral stent in place with a faintly radiopaque collection of densities medial to the proximal portion of the stent.
Figure 1b. Right retrograde pyelogram showing narrowing at the right UPJ. Contrast does not appear to completely encompass the calcifications suggesting that some of the calcifications may be extraluminal.
Figure 1c, 1d. CT urogram showing a cluster of calcifications 1.6 cm x 1.2 cm at the right UPJ causing mild right hydronephrosis. The cluster is intimately associated with the urothelium but no contrast enters the cluster of calcifications.

Robotic assisted laparoscopic surgical technique (excision and ureteropyelostomy)

Port placement

The patient was operated under general anesthesia and prophylactic antibiotics, in the 60° left modified lateral decubitus position with the right side elevated and the table flexed. Pneumoperitoneum was achieved using the Veress needle and a 12 mm trocar was inserted superolateral to the umbilicus. The camera was inserted and on inspection of the abdomen there were dense adhesions in the right upper quadrant in the area of his prior open cholecystectomy. The 8 mm robotic ports were placed 4 cm and 2 cm above and below the umbilicus respectively in the midclavicular line. A 5 mm assistant port was placed 6 cm above the umbilicus in the midline. Pure laparoscopy was then performed to take down some of the adhesions using the laparoscopic scissors and electrocautery. Subsequently two additional 5 mm assistant ports were placed with one just lateral to the umbilicus and another more inferiorly in the midline.

Adhesiolysis, ureterolysis, excision of periureteral mass, stenting and ureteropyelostomy

After docking the robot, the colon was reflected medially and additional adhesions were taken down. The dissection was continued down to the inferior vena cava (IVC) up to the point where the right gonadal vein was identified as it drained into the IVC. The right gonadal vein was mobilized and divided between Hem-o-Lock clips. After dissecting down to the psoas muscle the ureter was defined and followed more

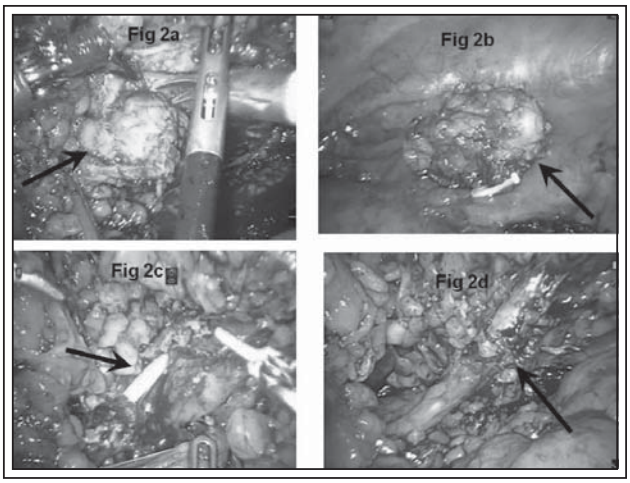

Figure 2a. Intraoperative picture of right periureteral mass seen densely adherent to surrounding soft tissue and other structures.
Figure 2b. Intraoperative picture of right periureteral mass after resection en bloc.
Figure 2c. Intraoperative picture of the initiation of the anastomosis which is performed after placement of an antegrade ureteral stent.
Figure 2d. Intraoperative picture of the completed anastomosis.

proximally until the periureteral calcified mass was identified and seen to be intimately associated with the proximal ureter, Figures 2a, 2b. The calcified mass and proximal ureter were meticulously dissected free from surrounding structure and subsequently excised en bloc. The distal ureter was mobilized along with the renal pelvis, spatulated, and stented (antegrade manner) with an 8.2 x 26 double-J ureteral stent. A water tight ureteropyelostomy was performed by placing 5-0 Monocryl sutures in a running fashion, Figure 2c, 2d. Periureteral and perirenal fat was replaced over the anastomosis and secured with additional 5-0 Monocryl sutures. The specimen was retrieved via an Endocatch bag and a closed suction Jackson Pratt drain was inserted to drain the right pericolic gutter.

Results

The perioperative course and the hospital stay of the patient were uneventful. The operating room time, estimated blood loss and hospital stay were 120 minutes (inclusive of a console time of 90 minutes), 50 ml and 2 days respectively. The histopathology of the mass was negative for carcinoma but revealed soft tissue with chronic inflammation, fat necrosis, and calcification, Figure 3.

Figure 3. Gross photograph of the right periureteral mass bisected.

Discussion

The present report was a case of atypical partial UPJ obstruction (proximal ureteral stricture) that had occurred due to an extrinsic periureteral calcified mass. The etiopathogenesis of this periureteral mass was not clear but it can be speculated. It is probable that a pelvic/ureteral calculus may have migrated into an extraluminal position precipitated by repeated sessions of ESWL/PCNL performed at another centre. It is possible that due to periureteritis and periureteral hematoma this stone may have become partially incarcerated into the wall of the proximal ureter and developed into a retroperitoneal abscess/periureteral granuloma or an antibioma with dense adhesions leading to partial atypical UPJ obstruction. Iatrogenic rupture of the ureter following SWL has been reported in the literature.[8] The symptoms of this may have been masked as the majority of patients treated by SWL are routinely prescribed analgesics and antibiotics. Experimental animal models, have demonstrated that repeated sessions of SWL may lead to chronic histological changes with deposition of calcium and hemosiderin.[9] Thus we can speculate that in the present case, possible post SWL/PCNL occult perforation of the proximal ureter may have occurred though we could not substantiate this. It is possible that due to this, a small stone fragment may have become incarcerated in the ureteral wall, acquired a partially extraluminal location, prompting repeat

sessions of SWL resulting in the chronic histological changes seen in the present case. Stone granuloma(s) have been described and are known to occur as a delayed complication of ureteroscopy.[10]

Ureteral perforation and calculi iatrogenically placed into the wall of the ureter are significant risk factors for the development of ureteral strictures. A submucosal stone can often be managed with laser excision followed by ureteral stent placement; however, if this fails, then reconstruction is often necessary with resection of the affected segment of ureter. A stone that has been manipulated outside the ureter has often been referred to as the "lost stone" and is usually thought to be harmless. However, the process that allowed the stone to gain access to the retroperitoneum such as perforation of the ureter may induce stricture formation or even retroperitoneal abscess formation. In this event, the "lost stone" is not so harmless and may require resection of the ureter and stone with reconstruction.[9]

Classically atypical UPJO have been successfully treated laparoscopically by calicovesicostomy, pyelovesicostomy and ureteropyelostomy.[11] Robotic ureteropyelostomy is an excellent minimally invasive surgical alternative for the repair/salvage of almost all types of UPJO. After negotiating the initial learning curve of the robotic assisted surgery, technically difficult reconstructive procedures can also be initiated and successfully performed with the use of robotic assistance. Kavoussi and Peters reported the first laparoscopic pyeloplasty in 1993.[12] The first series of robotic proximal ureteral reconstruction/pyeloplasty was reported by Getman et al in 2002.[13] These authors described the efficacy, technique, and short term outcomes of robotic pyeloplasty in nine patients with UPJO. Later Gupta et al also described the efficacy and feasibility of the robot-assisted technique of transmesocolic laparoscopic pyeloplasty including the placement of a ureteral catheter in an antegrade fashion.[14]

Performing a successful robotic assisted ureteropyelostomy may be technically more demanding than a robotic pyeloplasty and this may require certain modifications such as placing a third 5 mm assistant port to facilitate retraction, thereby aiding the surgeon's dissection. Also, additional mobilization of the proximal ureter and renal pelvis were necessary to allow for a tension free anastomosis.

In conclusion, we report a unique case of an atypical partial UPJO with diminished renal function. The etiology of the atypical partial UPJO is suspected to be due to external compression caused by a calcified periureteral mass, following a possible occult ureteral perforation (resulting in transmigration of stone debris outside the ureter) during a prior PCNL/SWL. This subsequently gave the impression on axial imaging of a proximal ureteral calculus which was subsequently treated multiple times with SWL. This in turn resulted in a periureteral inflammatory, calcified, fibrotic mass ultimately treated with robotic excision of the mass and adjacent ureter and ureteropyelostomy. □

References

1. Mufarrij PW, Woods M, Shah OD et al. Robotic dismembered pyeloplasty: a 6-year, multiinstitutional experience. *J Urol* 2008;180(4):1391-1396.
2. Schwentner C, Pelzer A, Neururer R et al. Robotic Anderson-Hynes pyeloplasty: 5-year experience of one centre. *BJU Int* 2007;100:880-885.
3. Hyams ES, Mufarrij PW, Stifelman MD. Robotic renal and upper tract reconstruction. *Curr Opin Urol* 2008;18:557-563.
4. Korets R, Hyams ES, Shah OD, Stifelman MD. Robotic assisted laparoscopic ureterocalicostomy. *Urology* 2007;70:366-369.
5. Mufarrij PW, Shah OD, Berger AD, Stifelman MD. Robotic reconstruction of the upper urinary tract. *J Urol* 2007;178:2002-2005.
6. Yohannes P, Chiou RK, Pelinkovic D. Pure robot-assisted laparoscopic ureteral reimplantation for ureteral stricture disease: case report. *J Endourol* 2003;17:891-893.
7. Hemal AK, Mishra S, Mukharjee S, Suryavanshi M. Robot-assisted laparoscopic pyeloplasty in patients of ureteropelvic junction obstruction with previously failed open surgical repair. *Int J Urol* 2008;15(8):744-746.
8. Rodríguez Alonso A, Suárez Pascual G, González Blanco A, Bonelli Martín C, Lorenzo Franco J, Cuerpo Pérez MA et al. Iatrogenic rupture of the ureter following extracorporeal shock wave lithotripsy. *Actas Urol Esp* 2004;28(7):530-534.
9. Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA. Campbell-Walsh: Urology, Surgical management of upper urinary tract calculi. 9th edition: Philadelphia, PA; 2007; volume 2; pp. 1431-1507.
10. Doddamani D, Kumar R, Hemal AK. Stone granuloma--not to be forgotten as a delayed complication of ureteroscopy. *Urol Int* 2002;68(2):129-131.
11. Kumar S, Pandya S, Acharya N, Agarwal M, Mandal AK, Singh SK. Laparoscopic management of atypical ureteropelvic junction obstruction: alternative and simple techniques for complex situations. *Urol Int* 2008;81(1):87-93.
12. Kavoussi LR, Peters CA. Laparoscopic pyeloplasty. *J Urol* 1993;150(6):1891-1894.
13. Gettman MT, Neururer R, Bartsch G, Peschel R. Anderson-Hynes dismembered pyeloplasty performed using the da Vinci robotic system. *Urology* 2002;60(3):509-513.
14. Gupta NP, Mukherjee S, Nayyar R, Hemal AK, Kumar R. Transmesocolic robot-assisted pyeloplasty: single center experience. *J Endourol* 2009;23(6):945-948.