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Robotic-assisted laparoscopic pyelolithotomy with intracorporeal pyeloscopy in a horseshoe kidney

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ABSTRACT

Horseshoe kidneys are one of the most common congenital genitourinary malformations and can increase the complexity of common urologic procedures, especially nephrolithiasis. We present a patient who underwent robotic-assisted laparoscopic pyelolithotomy with intracorporeal pyeloscopy and stone basketing to treat a left lower pole stone burden located in a horseshoe kidney. This procedure provided benefits of expanded maneuverability, dexterity, and stability, which resulted in successful elimination of stone burden on post-operative imaging. We believe that robotic-assisted laparoscopic pyelolithotomy with intracorporeal pyeloscopy should be considered as a treatment option in similar cases of complicated nephrolithiasis due to complex renal anatomy.

1. Introduction

Horseshoe kidneys are one of the most common congenital genitourinary malformations and can increase the complexity of common urologic procedures.[1] This congenital malformation leads to high insertion of the ureters into the renal pelvis, increasing the risk of stone formation.[2] In this context, the advantages of robotic-assisted surgery include expanded maneuverability, dexterity, and stability, which can prove beneficial in such cases as complex kidney stone removal due to aberrant anatomy.[3] The literature suggests that robotic pyelolithotomy is a safe option for the removal of large renal stones in patients that display anatomy with concurrent ureteropelvic junction obstruction.[4] Therefore, robotic-assisted laparoscopic pyelolithotomy can be considered an acceptable and appropriate technique for the safe and effective removal of a large stone burden from a horseshoe kidney. In this article, we present a patient who underwent robotic-assisted laparoscopic pyelolithotomy with intracorporeal pyeloscopy and stone basketing to treat a stone burden located in the left lower pole of a horseshoe kidney.

2. Case report

The patient is a 45-year-old female who presented to the Emergency Center with severe left-sided abdominal pain. She had a past medical history significant for hypertension, depression, fibromyalgia, and horseshoe kidney. Shown in Fig. 1, Computed Tomography (CT) findings revealed a 3.5–4.0 cm left lower pole stone burden with a previously placed left ureteral stent.

Due to prior failed ESWL treatments and failed passage of the stone, the patient was referred to the Interventional Radiology team who attempted to place a percutaneous nephrostomy tube but were unsuccessful due to the patient's body habitus and unique anatomy. Following a thorough discussion to include the risks and benefits of different treatment options the patient was advised and counseled regarding the recommendation for Robotic Assisted Laparoscopic Pyelolithotomy and Intracorporeal Pyeloscopy for definitive therapy with the highest chance of successful stone-free removal. The use of a flexible cystoscope and stone basketing device would be used to facilitate the patient's complete stone removal.

The procedure was initiated by performing a cystoscopic retrograde ureteropyelogram following the removal of the previously placed indwelling ureteral stent to outline the left collecting system and confirm a high ureteral insertion. Following fluoroscopic imaging outlining anatomy, a 4.8F VL ureteral stent was placed in a retrograde fashion. In addition, a 4F Fogarty catheter was placed adjacent to the ureteral stent for ease in identifying the ureteropelvic junction. A transurethral catheter was inserted to facilitate drainage.

Following the cystoscopic portion of the procedure, the patient was repositioned in a right lateral decubitus position and re-draped in

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Fig. 1. Computed Tomography scan of horseshoe kidney with noted left sided nephrolithiasis.

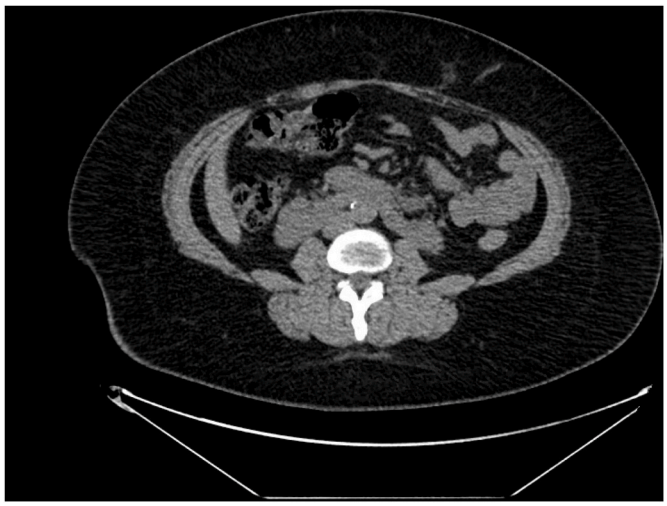

Fig. 2. Computed Tomography scan of horseshoe kidney at 6 months post-stent removal showing no residual calculi or hydronephrosis.

standard fashion. A Veress needle with an opening pressure of <10 mmHg was used to gain access following successful creation of pneumoperitoneum. The robotic trocars were inserted in a similar fashion as in a robotic-assisted laparoscopic nephrectomy. A total of 5 ports (4: 8mm and 1: 12mm) were used. The DaVinci was docked with the use of a camera placed at 30-degrees in the middle trochar, and the use of fenestrated bipolar (left arm), monopolar scissor (right arm), and pro grasp (3rd Arm).

The left descending colon was taken down at the white line of Toldt and reflected medially until the kidney was identifiable. The kidney was dissected at the inferior portion and identified the left ureter following visualization of the previously placed ureteral stent. Upon identifying the renal pelvis and inflated Fogarty catheter balloon, sharp dissection was made through the renal pelvis. A safe dissection was made into the renal pelvis and a few calculi were identified, grasped, and removed. The camera was unable to progress further into the collecting system, so the flexible cystoscope was inserted through the trocar instead. The remainder of the kidney stones were visualized and removed with the use of a stone basket. A thorough pyeloscopy using fluid for visualization confirmed no residual stones.

The robotic arms were reinserted, and the renal pelvis was closed with a 3-0 V-lock suture in a running fashion. The Fogarty balloon catheter was removed leaving the previously placed ureteral stent in place, and a 10 French JP drain was placed around the kidney. The robot was undocked, instruments and ports removed, and the 12 mm port closed with a Carter-Thompson type device with 1-0 Vicryl suture. The remaining 8 mm ports incisions were closed with 4-0 Monocryl in a subcuticular fashion, and 0.5% Marcaine and Dermabond were applied to reduce post-operative pain and facilitate skin healing, respectively.

The procedure resulted in the successful treatment of this patient without any significant complications, and the thorough pyeloscopy confirmed no residual stones. The composition of the stone was 25% Calcium Oxalate Dihydrate, 50% Calcium Oxalate Monohydrate, and 25% Carbonate Apatite. Shown in Fig. 2, a CT at the 6-month post-stent removal confirms no residual calculi or hydronephrosis in the horseshoe kidney.

3. Discussion

The development of alternative approaches and innovative methods is indicated in the successful treatment of heavy stone burdens.[2] Considering the increasing application of robotic-assisted techniques in urologic procedures, along with their associated benefits in complex stone removal, robot-assisted laparoscopic pyelolithotomy provided an effective method to treat this particularly complex patient.[3–5] Further, the minimally invasive nature of the robotic laparoscopic pyelolithotomy reduces the risk of postoperative complications.[2] Nephrolithiasis can be a common occurrence associated with congenital renal malformations, such as horseshoe kidneys, and the associated aberrant anatomy can complicate surgical interventions.

Robotic-assisted laparoscopic pyelolithotomy with intracorporeal pyeloscopy resulted in the successful treatment of this patient without any significant complications. This reaffirms the situational benefit that this procedure can provide in the treatment of complex endourologic pathology. Cases with complicating factors such as anomalous kidneys, stenosis of the ureteropelvic junction, and large stone burden should consider robot-assisted laparoscopic pyelolithotomy as a safe and effective treatment option.

4. Conclusion

Our study provides valuable information on a useful treatment option for rare circumstances that can complicate kidney stone treatment. As a result of the positive outcomes of this surgery, we believe that robotic-assisted laparoscopic pyelolithotomy with intracorporeal pyeloscopy should be considered as a treatment option in related cases.

5. Patient's consent

The patient provided consent for use of CT imaging and data in this case report.

Declaration of conflict statement

There are no conflicts of interest in this study.

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Contributions

Jaime Camacho, James T Cammack, and Allen Medway advised in the writing of the case report. Jake Sellers and Asher George wrote the case report. Jake Sellers, Asher George, Jaime Camacho, James T Cammack, and Allen Medway all participated in editing the case report

after the initial draft and approved the final copy.

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