CASE REPORT

Laparoscopic Heminephrectomy in a Horseshoe Kidney Affected by Xanthogranulomatous Pyelonephritis

Justin Sausville, MD, Judd Chason, MD, Michael Phelan, MD

ABSTRACT

Background and Objectives: Horseshoe kidney is a relatively common renal fusion anomaly. There are increasing reports of successful laparoscopic management of surgical disease in this entity. Xanthogranulomatous pyelonephritis (XGP) is an inflammatory condition of chronically obstructed and infected kidneys that is typically refractory to medical management. XGP has been regarded as a contraindication to laparoscopic surgery. Successful laparoscopic nephrectomies have been reported, albeit with high conversion and complication rates. In this report, we describe successful laparoscopic heminephrectomy for a horseshoe kidney moiety that was subsequently shown to have pathologic features of XGP.

Methods: We report the case of a woman who underwent laparoscopic heminephrectomy for XGP of a horseshoe kidney. We discuss surgical technique and patient outcome. We also performed and report on a focused review of the relevant literature.

Results: Pure laparoscopic heminephrectomy was completed by a transperitoneal approach. The patient was discharged the day after surgery.

Conclusions: Laparoscopy is a viable approach for the management of XGP in horseshoe kidneys. However, this is a challenging procedure that should be the domain of advanced laparoscopic surgeons.

Division of Urology, Department of Surgery, University of Maryland Medical Center, Baltimore, Maryland, USA (all authors).

Address reprint requests to: Justin Sausville, MD, 22 S. Greene Street, Rm NGE19, Baltimore, MD 21201, USA. E-mail: jsausville@smail.umaryland.edu

INTRODUCTION

Horseshoe kidney (HSK) is a common congenital renal abnormality with an incidence of 1 in 400.[1] Horseshoe kidneys may be associated with urologic abnormalities including obstruction, reflux, and calculi.[1] HSKs present unique challenges to the laparoscopic surgeon owing to their position, the frequency of vascular anomalies, and the isthmus of renal parenchyma connecting the 2 sides.[2]

Xanthogranulomatous pyelonephritis (XGP) is a rare disorder of chronically obstructed and infected kidneys. It does not respond to medical therapy and has typically been managed via surgical removal. However, due to its inflammatory nature, it poses additional challenges to a laparoscopic approach, causing debate as to the most prudent technique for nephrectomy.[3]

We present here a case of XGP that developed in a horseshoe kidney and was surgically removed via laparoscopic heminephrectomy. Division of the isthmus was accomplished using an Endo-GIA stapler. This case highlights some of the difficulties encountered in the minimally invasive management of both XGP and HSK.

CASE REPORT

A 48-year-old woman with a known HSK presented to the urology service after having multiple hospital admissions for febrile urinary tract infections. CT angiography of the abdomen and pelvis **(Figure 1)** revealed features of the left renal moiety that were interpreted as compatible with XGP as well as a branch calculus. ^{99}Tc-MAG3 scanning revealed 12% differential function in the left renal moiety. The patient elected to undergo laparoscopic left heminephrectomy.

The patient was placed in a 45-degree lateral position. Two 12-mm Step ports were placed along the lateral border of the rectus muscle, and two 5-mm Step ports were placed, one between the 12-mm ports and one off the tip of the left 12th rib. A transperitoneal pure laparoscopic approach was used. Dense adhesions emanated from the upper pole of the left kidney that invested the spleen and the descending colon. The Harmonic scalpel was used to free the adhesions to the spleen. The colonic adhesions were sharply divided with an ensuing 5-mm serosal tear that was intracorporeally oversewn.

Figure 1

The hilar dissection was also challenging, owing to intense local inflammation; the vessels and ureters were divided with GIA staplers using an endovascular load. The isthmus was noted to be fairly thin, and a plane was created with relative ease between the isthmus and the aorta. Two loads of staples from the 45-mm Endo-GIA stapler cartridge divided the isthmus with excellent hemostasis. The specimen was collected in an Endo-Catch bag and retrieved through a lower midline incision. Estimated blood loss was 100mL, and operative time was 307 minutes. The patient was discharged from the hospital on postoperative day 1. Pathologic evaluation of the specimen revealed xanthogranulomatous pyelonephritis.

DISCUSSION

Issues raised by this case report include those pertinent to laparoscopic management of XGP and those related to minimally invasive surgery for horseshoe kidneys. Laparoscopic extirpative surgery for XGP has been controversial since its initial description by Bercowsky et al[3] who noted a high complication rate and no advantage over open surgery with regards to pain or length of hospitalization. Open surgery has been regarded as the reference standard for management of XGP; in the 41-patient series reported by Korkes et al,[4] laparoscopic nephrectomy was attempted twice and completed only once.

Interest has persisted in applying this technology to inflammatory disease. Tobias-Machado et al[5] reported 11 successful retroperitoneoscopic and 6 attempted transperitoneal laparoscopic nephrectomies for inflammatory renal disease, 2 of which were converted to open surgery. They found that hand assistance was very helpful, using it in all 6 transperitoneal nephrectomies. Kapoor et al[6] performed 10 transperitoneal laparoscopic nephrectomies for pathologically confirmed XGP, noting a significant reduction in hospital stay and requiring conversion to open surgery in 20% of cases. Although it is still technically challenging, laparoscopic nephrectomy for XGP is evolving as an option for select patients and surgeons.

Laparoscopic management of HSK is also an evolving field, with technical challenges arising from the aberrant location and vasculature of these kidneys. Multiple investigators have reported on laparoscopic heminephrectomy for both benign and malignant[7] disease. Both transperitoneal and retroperitoneal approaches have been used, and hand assistance is frequently used.[8,9] Yohannes et al[9] note that while the retroperitoneoscopic approach may provide better exposure of

the renal hila, inadvertent entry into the peritoneum may be difficult to avoid given the intimate relation between the anterior aspects of the kidneys and the posterior peritoneum. Bhayani and Andriole[10] performed a transperitoneal pure laparoscopic heminephrectomy for a horseshoe kidney with a 6-cm renal cell carcinoma (RCC). Transperitoneal laparoscopic partial nephrectomy has been used for tumors in HSKs as reported by Tsivian and colleagues,[11] who recommend the transperitoneal approach for anterior and isthmic lesions. Molina and Gill[12] reported a partial nephrectomy for a tumor in an HSK treated using a retroperitoneal laparoscopic approach.

Strategies for dividing the renal isthmus have included staplers,[9] bipolar cautery,[13,14] the Harmonic scalpel,[15] and cold shears followed by argon beam fulguration.[10] Success with heminephrectomy and partial nephrectomy in HSKs depends on achieving vascular control. The vascular supply of horseshoe kidneys is variable and has been described in great detail by Glodny and colleagues.[16] Accordingly, preoperative studies are useful in understanding the vascular anatomy of a given patient. Glodny et al[16] compared CT to conventional angiography and MRI and found that when CT was used as the gold standard, conventional angiography had a sensitivity of 0.2 for identifying renal arteries, while that of MRI was 0.22.

This case represents a combination of some of the unique challenges in the laparoscopic management of both XGP and HSK. In our hands, the transperitoneal approach was successful with minimal morbidity and short convalescence. We did not encounter any difficulty in identifying or controlling major vascular structures, and patient dissection was sufficient to free the left renal moiety from its adhesions. We found that the Endo-GIA stapler divided the isthmus effectively and with minimal additional blood loss. The operative time was quite long at 307 minutes; this was the result of significant inflammatory adhesions involving the spleen and colon. In this case, we felt that persistence with the laparoscopic technique was worthwhile given that progress was steadily being made, despite the tedious nature of the dissection. Moreover, the patient's convalescence might not have been as rapid if an open technique had been used. XGP and HSK are difficult to manage laparoscopically. However, as technique evolves, experienced laparoscopic surgeons should regard both of these entities as amenable to minimally invasive management.

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