RESIDENT'S CORNER

The use of nephrostomy tubes in optimizing surgical conditions for a patient with xanthogranulomatous pyelonephritis

Jordan L. Allen, MD, Marcus O. Erdman, BS, Joseph Y. Clark, MD Department of Urology, Penn State Milton S. Hershey Medical Center, Hershey, Pennsylvania, USA

ALLEN JL, ERDMAN MO, CLARK JY. The use of nephrostomy tubes in optimizing surgical conditions for a patient with xanthogranulomatous pyelonephritis. *Can J Urol* 2020;27(4):10342-10345.

Xanthogranulomatous pyelonephritis is a rare variant of pyelonephritis that often requires radical surgery. We report a case of a 51-year-old female patient who was

Introduction

Xanthogranulomatous pyelonephritis (XGP) is a rare, inflammatory disease of the renal parenchyma characterized by granulomatous tissue containing foam cells (lipid-laden macrophages).¹ It typically occurs in the context of urinary tract infection or obstruction and is more common in females.² *E. coli* and *Proteus mirabilis* are the most common organisms involved in the disease. XGP is a difficult disease to manage and often requires radical surgery.^{1,2} As the procedure tends to be complex, thorough preoperative planning is essential for surgical optimization. Prolonged percutaneous nephrostomy tube placement may provide a helpful management strategy to optimize surgery in XGP.

Accepted for publication June 2020

Address correspondence to Dr. Joseph Clark, Department of Urology, Penn State Milton S. Hershey Medical Center, 500 University Drive, Hershey, PA 17033 USA managed with prolonged placement of nephrostomy tubes prior to surgery. This case illustrates the importance of surgical optimization of a poor operative candidate and the use of nephrostomy tubes as a temporizing management strategy.

Key Words: pyelonephritis, xanthogranulomatous, nephrostomy, percutaneous

Case report

A 51-year-old woman with a history of hypertension presented as a transfer from an outside hospital with fever, leukocytosis, tachycardia, and flank pain. A computed tomography (CT) scan revealed an enlarged left kidney, measuring up to 13.7 cm, with a 1.7 cm left staghorn calculus obstructing the left ureteropelvic junction, Figure 1. Laboratory findings showed leukocyte count of $22.9 \cdot 10^9$ /L, hemoglobin of 6.8 g/dL, hematocrit of 22%, creatinine of 0.87 mg/dL, albumin of 2.9 g/dL, pre-albumin of < 3 mg/dL, CRP of > 27 mg/L, and ESR was > 120 mm/hr. The patient was a current smoker with a 36 pack-year smoking history. She reported an unintentional weight loss of approximately 23 kg in the past year yet remained obese with a body mass index (BMI) at presentation of 33.2 kg/m². The preliminary diagnosis of XGP was made based on the clinical, laboratory, and radiographical findings.

The patient was admitted to urology service with anticipation of intravenous antibiotics and decompression of the left kidney. Two percutaneous nephrostomy tubes were placed in the left kidney by interventional radiology,



Figure 1. CT abdomen/pelvis showing left XGP at time of patient's presentation **(A)** axial, **(B)** coronal.

Figure 2, and drained 200 mL of dense, purulent fluid. Nephrostomy specimens and voided urine cultures yielded *Proteus mirabilis* and *E. coli* which were treated appropriately with IV ampicillin and gentamicin based on culture susceptibilities.

A registered dietitian determined that the patient met criteria for malnutrition of chronic disease based on her ongoing weight loss and decline in oral intake. The patient's nutritional status was determined to be increasing her risk of complications, and she was counseled on proper nutrition and strategies for additional protein intake. She was also counseled on smoking cessation. Due to the possibility of the perinephric inflammation causing involvement of surrounding tissues, general surgery was consulted to evaluate the patient and confirm their availability



Figure 2. Management of XGP kidney with placement of nephrostomy tubes; **(A)** interventional radiology nephrostogram following placement; post-nephrostomy tube CT scan **(B)** axial **(C)** sagittal.

during the planned nephrectomy. She was discharged on hospital day 6 with ciprofloxacin and plans for outpatient follow up for eventual left nephrectomy after improvement of her nutritional status. To prepare for a possible splenectomy, she received *Haemophilus influenzae* type b (Hib), pneumococcal conjugate (PCV13), pneumococcal polysaccharide (PPSV23), meningococcal conjugate (MCV4), and serogroup B meningococcal (MenB) vaccines as an outpatient.

Sixteen weeks after initial presentation, our patient presented for a preoperative evaluation in clinic. Laboratory findings showed a leukocyte count of $10.61 \cdot 10^{9}$ /L, hemoglobin of 11.7 g/dL, hematocrit of 37.7%, creatinine of 0.93 mg/dL, and albumin of 4.1 g/dL. CT showed a further decrease in left kidney size, Figure 3. To prepare for possible bowel resection, she was instructed to complete a bowel preparation with clear liquids only and 300 mL magnesium citrate the day prior to surgery.

Left nephrectomy was performed 17 weeks after her initial presentation. As expected, the left kidney was indurated and fixed in position with the perinephric inflammation involving surrounding tissues. Intense inflammation prevented easy identification and mobilization of the descending colon and splenic



Figure 3. Kidney size at time of presentation **(A)** sagittal **(B)** coronal compared to kidney size following 16 weeks of nephrostomy tube placement and antibiotics **(C)** sagittal **(D)** coronal.

flexure so general surgery was called to assist. A portion of the mesocolon was densely adherent to the anterior surface of the kidney and a mesocolic defect was created, but fortunately, no significant mesocolic vessels were damaged. In addition, the tail of the pancreas was densely adherent to the superior pole of the kidney. Careful dissection successfully reflected the pancreas cephalad, and no active leak of pancreatic juice was noted. No splenectomy was performed as the spleen was adequately mobilized and spared. Eventually, the left kidney was freed of all adhesions and the entire kidney was removed. A 19-French round Blake drain was left in the nephrectomy bed at the inferior pancreatic border to monitor for pancreatic enzyme leak.

Following the nephrectomy, the kidney was bivalved and showed purulent material with scattered stones. Blake drain amylase levels were initially mildly elevated but downtrended appropriately so the drain was removed on postoperative day 3. Serum creatinine peaked to her new baseline of 1.0 mg/dL prior to discharge. She progressed to a normal diet after return of normal bowel function and was discharged on postoperative day 4 without any additional antibiotics.

She was seen in postoperative follow up at 1 week and 6 months with no significant complications to date. She was evaluated with a kidney stone risk panel to identify modifiable risk factors for urolithiasis in her now solitary, right kidney and has had no recurrent kidney stones to date. She reports no further urinary tract infections and her serum creatinine was measured as 1.3 mg/dL at 6 month follow up.

Discussion

The clinical history, physical examination, and laboratory investigations are essential in differentiating XGP from other space-occupying lesions of the kidney. Although the definitive diagnosis of XGP often requires histopathological examination, modern CT imaging, in the setting of urinary tract infection, renal calculi, fever, flank pain, and leukocytosis, can be used to reliably diagnose XGP preoperatively, despite rare exceptions.³ While monitoring the patient with XGP for signs of sepsis or clinical worsening, which may warrant emergent nephrectomy, nephrostomy drainage may be performed to begin optimizing surgical conditions.

In the context of renal obstruction, as frequently seen in XGP, nephrostomy tubes allow for drainage of urine and infectious material to minimize spillage into the surgical field. A recent case study of an XGP horseshoe kidney reported drainage of over 3000 mL of pyonephrosis via two percutaneous nephrostomy tubes. After 5 months, the infection was controlled, the patient's nutritional status had improved, and resection was performed without any intraoperative or postoperative complications.⁴ Laberge et al reported the successful non-surgical management of a focal XGP kidney after adequate nephrostomy drainage and antibiotic treatment.⁵

Nephrostomy tubes also have utility in diagnosis and surgical planning by allowing for preoperative cultures to be obtained in an effort to ensure the administration of organism-specific perioperative antibiotics. In addition, nephrostograms can be performed diagnostically via nephrostomy tubes to demonstrate obstruction or fistula formation.⁶

Nephrostomy tubes may facilitate the shrinkage of an infected kidney over time, allowing for an easier resection. As estimated by ellipsoid approximations, our patient's kidney volume decreased from 495 cm³ to 133 cm³ as a result of her nephrostomy tubes and antibiotics. Management with prolonged nephrostomy tube placement and antibiotics may be an effective strategy for decreasing the size of an infected XGP kidney, and shrinking the kidney will make a difficult nephrectomy procedure more manageable.

XGP may be difficult to manage surgically due to tissue architectural changes associated with the disease process. The inflammatory and infectious nature of the disease may result in the involvement of surrounding tissues and even fistula and abscess formation. Cases of XGP fistula formation, including reno-colic and pyeloduodenal, have been reported in the literature.^{5,6} Extrarenal involvement must be considered in order to properly prepare for surgery. Consequently, it may be necessary to consult general surgery and assemble a team of consultants prior to the procedure. The multidisciplinary team must coordinate the patient's surgery date and prepare to handle any extrarenal complications discovered intraoperatively. The surgical team for XGP must anticipate a difficult surgery because, compared to chronic pyelonephritis (CP), XGP has been shown to be associated with higher rates of postoperative complications. In a study of 45 CP patients and 11 XGP patients, postoperative complication rates were 22% and 36%, respectively.⁷

Preoperatively, it may be unclear whether a patient's extensive perinephric inflammation will require splenectomy. To prepare for this possibility, vaccinations can be administered to protect patients from certain encapsulated organisms. Septicemia is a dangerous complication for asplenic patients, so it is recommended that they receive vaccines for pneumococci, Hib, meningococci, and influenza virus.⁸ While the disease

is temporized with nephrostomy tubes, a patient is able to receive these vaccinations in an effort to prevent infection if a splenectomy is necessary.

In addition to the technical difficulty of the surgery, XGP management may be complicated by its comorbid patient population, who often present as poor surgical candidates. If the patient is stabilized with nephrostomy tubes and appropriate antibiotics, surgery can be delayed to allow for nutritional and general health optimization. Poor nutritional status, commonly determined by a low albumin measurement, has been shown to be an independent risk factor (RR = 5.68) for developing surgical site infection.⁹ If the patient presents with hypoalbuminemia, nephrostomy tubes may provide an effective temporizing measure to allow for optimization of nutrition status. If patients are able to follow up for nephrectomy after improvement of nutrition status, the likelihood of postoperative complications may be reduced.

Unfortunately, our patient continued to smoke until the date of surgery, but the risk of postoperative complications could have been further reduced by smoking cessation. A meta-analysis of the effect of preoperative smoking cessation on postoperative complications found a relative risk reduction of 41% with increasing benefit for each additional week of cessation leading up to surgery.¹⁰ Delaying nephrectomy by utilizing nephrostomy tubes allows for a longer period of time for smoking cessation and thus may decrease the likelihood of postoperative complications.

XGP is a rare disease, but the diagnosis should be considered in patients with renal masses, especially in the context of infection with obstruction and renal calculi and no known malignancy. If a patient is a high-risk surgical candidate based on modifiable risk factors, prolonged nephrostomy tube placement with periodic changes may be beneficial in the preoperative management. This strategy may be effective for avoiding complications by allowing time to drain and shrink the kidney, improve the patient's nutritional status, consult a team of surgeons, provide necessary vaccinations, and otherwise optimize the patient for surgery.

References

- Zorzos I, Moutzouris V, Petraki C, Katsou G. Xanthogranulomatous pyelonephritis - The "great imitator" justifies its name. *Scand J Urol Nephrol* 2002;36(1):74-76.
- 4. Fernandez A, Sherer B, Stoller ML. Laparoscopic heminephrectomy of chronically obstructed horseshoe kidney moiety with staghorn calculus, massive pyonephrosis, and xanthogranulomatous pyelonephritis. *J Endourol Case Rep* 2018;4(1):39-41.
- Laberge M, Kulkarni GS, Sreeharsha B. Pyeloduodenal fistula complicating xanthogranulomatous pyelonephritis. *Int Urol Nephrol* 2018;50(6):1071-1073.
- 6. Ghoz HM, Williams M, Perepletchikov A, James N, Babeir AA. An unusual presentation of xanthogranulomatous pyelonephritis: Psoas abscess with reno-colic fistula. *Oxf Med Case Reports* 2016;2016(7):150-153.
- Afgan F, Mumtaz S, Ather MH. Preoperative diagnosis of xanthogranulomatous pyelonephritis. Urol J 2007;4(3):169-173.
- Rubin LG, Schaffner W. Care of the asplenic patient. N Engl J Med 2014;371(4):349-356.
- Hennessey DB, Burke JP, Ni-Dhonochu T, Shields C, Winter DC, Mealy K. Preoperative hypoalbuminemia is an independent risk factor for the development of surgical site infection following gastrointestinal surgery: a multi-institutional study. *Ann Surg* 2010;252(2):325-329.
- 10. Mills E, Eyawo O, Lockhart I, Kelly S, Wu P, Ebbert JO. Smoking cessation reduces postoperative complications: A systematic review and meta-analysis. *Am J Med* 2011;124(2):144-154.

^{1.} Korkes F, Favoretto RL, Bróglio M, Silva CA, Castro MG, Perez MDC. Xanthogranulomatous pyelonephritis: clinical experience with 41 cases. *Urology* 2008;71(2):178-180.

Addison B, Zargar H, Lilic N, Merrilees D, Rice M. Analysis of 35 cases of xanthogranulomatous pyelonephritis. *ANZ J Surg* 2015;85(3):150-153.