

CASE REPORT

Open Pyelolithotomy in a Pelvic Kidney: A Case Report and Literature Review

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Received: 29 July 2026 Accepted: 13 August 2026 Published: 19 August 2026

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Abstract

Background: Pelvic kidney is a rare abnormality that occurs early during the gestation. The treatment of pelvic kidney stones is challenging and surgical procedures include extracorporeal shockwave lithotripsy, retrograde intrarenal surgery, laparoscopy-assisted percutaneous nephrolithotomy, and laparoscopic or open pyelolithotomy.

Case presentation: A 39-year-old married woman presented to the urology department with left pelvic kidney stone. She underwent open pyelolithotomy. Post-surgical follow-up was unremarkable.

Conclusion: Although open procedure is not common in current pyelolithotomy for pelvic kidney stones, it may be an option in some particular conditions.

Keywords: Open, Pyelolithotomy, Pelvic Kidney.

1. Introduction

Pelvic kidney is a rare abnormality. Its incidence has been estimated as 1 in 3000 births [1]. This abnormality occurs between the sixth and ninth weeks of gestation and is caused by the kidney's failure to migrate to its normal anatomical position [1]. Pelvic kidney can lead to some complications such as renal stones, urinary tract infections, hydronephrosis [1,2]. The management of ectopic pelvic kidney calculi is challenging and the ideal procedure is not clearly defined. Minimally invasive procedures are most commonly performed. Treatment options include extracorporeal shockwave lithotripsy (ESWL), retrograde intrarenal surgery (RIRS), percutaneous nephrolithotomy (PCNL) and laparoscopic or open pyelolithotomy [3]. Even if open surgery has become

rare, the indications for open surgery to treat renal calculi are limited to special conditions. In some cases, open surgery can still have a place. It is needed in only 0.47% to 5.4% of the cases [4]. This article, focusing on open pyelolithotomy in pelvic kidney, is one of these rare indications. This article aims to highlight a practice that seems uncommon today but still carried out in some patients.

2. Case Presentation

A 39-year-old married woman presented to the urology department with renal colic-like pain radiating down the left thigh. This pain had been progressing for 3 years and were becoming increasingly intense. It was intermittent pelvic pain localized on the left side and was becoming increasingly frequent, occurring at

Citation: YONLI Diataga Sylvestre, OUEDRAOGO Boureima, SAMA Panba, *et al.* Open Pyelolithotomy in a Pelvic Kidney: A Case Report and Literature Review. Archives of Urology. 2026; 8(2):04-07.

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least three times a month. The patient had no other known medical history.

The pain was often accompanied by a burning sensation during urination. The patient had no fever, nausea, or vomiting. On general examination, she was in good general condition. Her temperature was 36.5°C, blood pressure was 110/80 mmHg, and pulse rate was 80 beats per minute. The urological examination revealed no pain in the lumbar regions but severe pain on palpation of the left iliac fossa. Laboratory results showed a negative urine culture, serum creatinine at 85 $\mu\text{mol/l}$, white blood cell count at 6,000 cells/ mm^3 , and hemoglobin level at 13 g/dl.

Regarding imaging, a urinary tract ultrasound revealed a left pelvic kidney with a 25mm renal pelvis stone. A Computed Tomography (CT) urogram demonstrated an ectopic kidney located in the left iliac fossa. In addition, there was a large obstructive stone in the left ectopic renal pelvis measuring 23 mm with a density of 1,455 UH (Figure 1). This condition led to moderate dilation of the pyelocaliceal cavities of the ectopic left kidney, which was malrotated. The right kidney was located in the lumbar region and

showed no abnormalities. When fully distended, the bladder had a homogeneous appearance, with clear and regular contours.

Given the limited surgical procedures, an open pyelolithotomy was performed. After inducing general anesthesia, the patient was maintained in a supine position. Following a left pararectal incision, muscular and aponeurotic dissection, the peritoneum was retracted toward the midline. The kidney was thus located in the left iliac fossa. It was malrotated, and the stone was palpated in the moderately dilated renal pelvis. A pyelotomy was performed, followed by extraction of the stone using stone forceps (Figure 2). A pyelorrhaphy was then performed using 3.0 Vicryl sutures. A drain was placed into the surgical site through a single port, and the procedure was concluded. The postoperative course was uneventful. The drain was removed on the third postoperative day.

The patient was discharged on the fifth postoperative day. She was seen for a follow-up visit one month after the operation. She had no complaints, and the clinical examination was unremarkable.



Figure 1. Computed tomography showing left ectopic pelvic kidney with calculus (A) and dilation of the pyelocaliceal cavities (B)

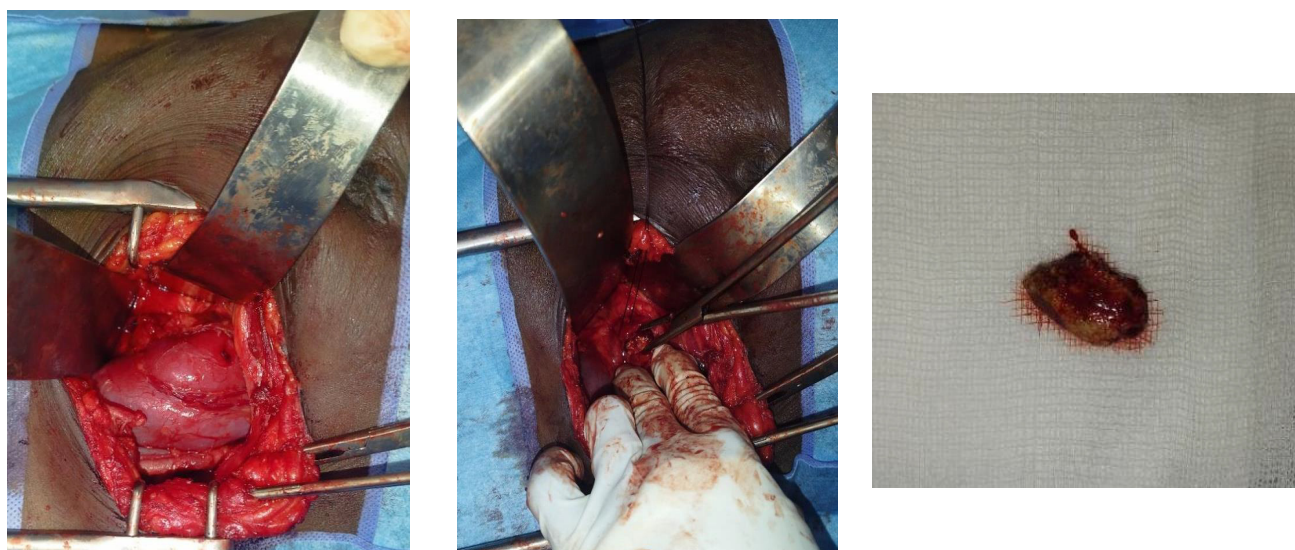


Figure 2. Pyelolithotomy surgery showing the pelvic kidney (A), stone extracting (B) and the appearance of stone after removal (C)

3. Discussion

3.1 Pelvic Kidney Peculiarities

The anatomical peculiarities of pelvic kidneys often include malrotation, where the renal pelvis faces anteriorly [5]. The vasculature of the pelvic kidney is known to be complicated and highly variable. Aberrant vascular structures can obstruct the renal calyces or upper ureter. Chronic renal obstruction can lead to recurrent urinary tract infections or urolithiasis formation. The knowledge of these anatomical variations is important when a surgery procedure is being considered in patients with pelvic kidneys [6,7]. Pelvic kidney is usually asymptomatic but can be painful when other conditions such as lithiasis or ureteropelvic junction obstruction are associated [5].

3.2 The Therapeutic Challenge

Treatment options for pelvic kidney stones include extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL), retrograde intrarenal surgery (RIRS), and laparoscopic or open surgery [8]. Of these surgical procedures, the best modality of treatment for pelvic kidney stones is still under debate [8].

Extracorporeal shock wave lithotripsy is a therapeutic method that can be used for treatment of calculi in anomalous kidneys [9]. ESWL for pelvic kidney stones is the least invasive approach but is associated with a lower stone-free rate compared to ESWL in normal kidneys [8]. The results remain unsatisfactory, especially for larger stones (>2cm) [9]. Stone-free rate is not constant. For better results, repeated ESWL sessions are often necessary, or ESWL may need to be combined with additional treatments [3]. In our patient, the stone was more than 2 cm with a high density (1455 HU). ESWL was not the ideal treatment in this condition.

Percutaneous nephrolithotomy is regarded as the gold standard for the treatment of large renal stones as a rule. It presents some advantages related to its high stone-free rates, often exceeding 85% in standard cases [10]. But in particular conditions such as pelvic kidney pyelolithotomy, its application become very challenging. The presence of intestinal loops surrounding the pelvic kidney and other anatomical specific aspects further complicate percutaneous access [1]. These anatomical complexities of pelvic kidneys can reduce the efficacy. Additionally, PCNL is associated with significant complications, such as bleeding, infection, injury to surrounding organs including major blood vessels [1,11].

Retrograde intrarenal surgery (RIRS) or ureterorenoscopy RIRS is a surgical technique that can be used to treat pelvic kidney stones. There are two main challenges. First, abnormal anatomy in the pelvic kidney can pose a significant obstacle that may lead to a failed procedure. Short and tortuous ureters can make it difficult to access the renal pelvis. Second, the angles required for flexible ureteroscopy are often suboptimal, hindering effective stone fragmentation and removal [6]. This leads to the understanding that difficulties in locating and accessing renal stones are always expected when treating abnormal kidneys with this method [12]. Additionally, this procedure is not yet available in all medical centers, especially in secondary hospitals. It is still relevant to be implemented in some developing countries [13].

Laparoscopic pyelolithotomy (LP): Laparoscopy is a preferable approach for large renal stones with an excellent stone-free rate, especially when it requires a single session [5]. Laparoscopic pyelolithotomy is effective modality for treating renal stones in ectopic pelvic kidney. It would be an ideal approach for extracting large stone with laterally or anteriorly directed renal pelvis as seen in our case [14]. LP may be done where SWL and PCNL are not possible [10]. But its availability is also limited in some countries.

Robotic-assisted laparoscopic pyelolithotomy: Given the advantages of robot-assisted laparoscopic surgery, this technology has been applied to stone surgery. Husny et al. demonstrate in their study that robotic-assisted pyelolithotomy is a safe and effective method for managing pelvic kidney stones, achieving a 100% stone-free rate [15]. The American Urological Association guidelines suggest robotic surgery as a first-line treatment for complex kidney stones or when concurrent upper urinary tract reconstruction is needed [8]. However, this technology is currently available only in major hospitals.

Open surgery Open surgery is often used when all other options failed when treating renal calculi [12]. Laparoscopic pyelolithotomy is cosmetically superior to open pyelolithotomy [11]. But beyond these considerations, open surgery remains a treatment that is still relevant today. It may be a safe option, with a high stone clearance rate in cases of an abnormal kidney and a significant stone burden [16]. In our case the stone measured more than 2cm. The other surgical methods, especially laparoscopic surgery, are more costly than the open procedure [11]. Concerning operation time, open surgery may be an advantageous procedure. Singal R. et al in a comparative study,

found that the mean operative time was significantly higher in the laparoscopic pyelolithotomy group as compared to open pyelolithotomy group [11]. In our case, given the challenges associated with SWL, PCNL, and RIRS procedures on the one hand, and the unavailability of laparoscopic procedures on the other, we decided to perform open surgery.

4. Conclusion

Open surgery for the treatment of renal pelvis stones is becoming less and less common nowadays. In cases of renal pelvis stones in pelvic kidneys, commonly used surgical methods may have access difficulties due to the anatomy of the ureter. Other more suitable options, such as laparoscopic procedures, are often inaccessible to secondary hospitals. This may justify the use of open surgery under certain conditions.

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