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Case report

A CASE REPORT OF MINI-PERCUTANEOUS NEPHROLITHOTOMY IN A RENAL TRANSPLANT PATIENT

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ABSTRACT

Objective: *To report the clinical experience of a case of mini-percutaneous nephrolithotomy (mini-PCNL) in a renal transplant patient.*

Case presentation: *We present the case of a 59-year-old male with a renal transplant performed 6 years earlier, who was admitted with dull pain in the left iliac fossa. Abdominal CT scan revealed multiple large stones located in the renal pelvis, upper ureter, and lower calyx, causing grade II hydronephrosis. The patient underwent mini-PCNL as the chosen intervention.*

Result: *The procedure was performed in a single session without retrograde ureteral catheterization. Complete stone clearance was achieved. The hospital stay was short, only 4 days, and no complications were recorded.*

Conclusion: *Mini-PCNL is a safe and effective option for the management of urolithiasis in renal transplant patients. This case highlights the importance of individualized surgical strategies to optimize treatment outcomes.*

Keywords: *Renal transplantation; Urolithiasis; Percutaneous nephrolithotomy; Mini-PCNL.*

I. INTRODUCTION

Renal transplantation is the optimal treatment for patients with end-stage renal disease, significantly improving quality of life and prolonging life expectancy. Today, with advances in surgical techniques and the development of new immunosuppressive drugs, the number of chronic renal failure patients undergoing renal transplantation is increasing. Therefore, post-transplant complications require more attention to improve the quality of life for transplant recipients, including urine leakage, ureteral obstruction or necrosis, urethral obstruction, vesicoureteral reflux, and urolithiasis [1].

Urolithiasis after renal transplantation is a rare condition, with an incidence ranging from 0.1% to 6.3% [2]. Most cases of urolithiasis are detected after transplantation; however, some studies suggest that stones may be transplanted along with the kidney [3-5]. In fact, due to partial denervation of the transplanted kidney, the tyical renal colic associated with stones may be missed, leading to difficulties in early clinical diagnosis, which can cause hydronephrosis and renal failure [2]. On the other hand, post-transplant patients often use immunosuppressive drugs, so infectious complications caused by urinary tract obstruction due to stones will be more severe. Thus, timely diagnosis and treatment of stones are necessary, especially in patients with a solitary kidney, to limit the impact on renal function.

The treatment methods for urolithiasis after renal transplantation are similar to those for native kidneys, including medical management, extracorporeal shockwave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL), retrograde ureteroscopy, and open surgery [1]. In this report, we present a case of a patient with urolithiasis in a

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transplanted kidney treated with mini-percutaneous nephrolithotomy (mini-PCNL).

II. CASE PRESENTATION

2.1. Case presentation

A 59-year-old male patient from Quang Nam province, Vietnam, was admitted to Hue Central Hospital with symptoms of a dull ache in the left iliac fossa for 10 days. The patient had a history of bilateral open kidney stone surgery 10 years ago, was subsequently diagnosed with end-stage renal disease, and received a renal transplant 6 years ago. The kidney was retrieved from the right side and transplanted into the left iliac fossa, with ureteral reimplantation performed using the Lich-Gregoir technique. For over a year, the patient had monthly follow-up visits to receive immunosuppressive drugs, without re-evaluation of the transplant status. At the time of examination, the patient was ordered blood tests, abdominal ultrasound, and a plain abdominal X-ray (KUB). The results showed 2 ureteral stones along with a cluster of stones in the lower calyx of the transplanted kidney, and grade II hydronephrosis of the transplanted kidney. Blood urea and creatinine tests were within normal limits. The patient underwent a 128-slice abdominal CT scan with contrast, which revealed one stone at the ureteropelvic junction and one upper ureteral stone, measuring 18x10mm and 14x5mm, respectively, causing grade II hydronephrosis of the transplanted kidney. Additionally, the CT scan also detected several lower calyx stones, the largest measuring 14x5mm (Figure 1). Urine culture and inflammatory markers were all negative. The patient was indicated for surgical intervention with mini-PCNL.

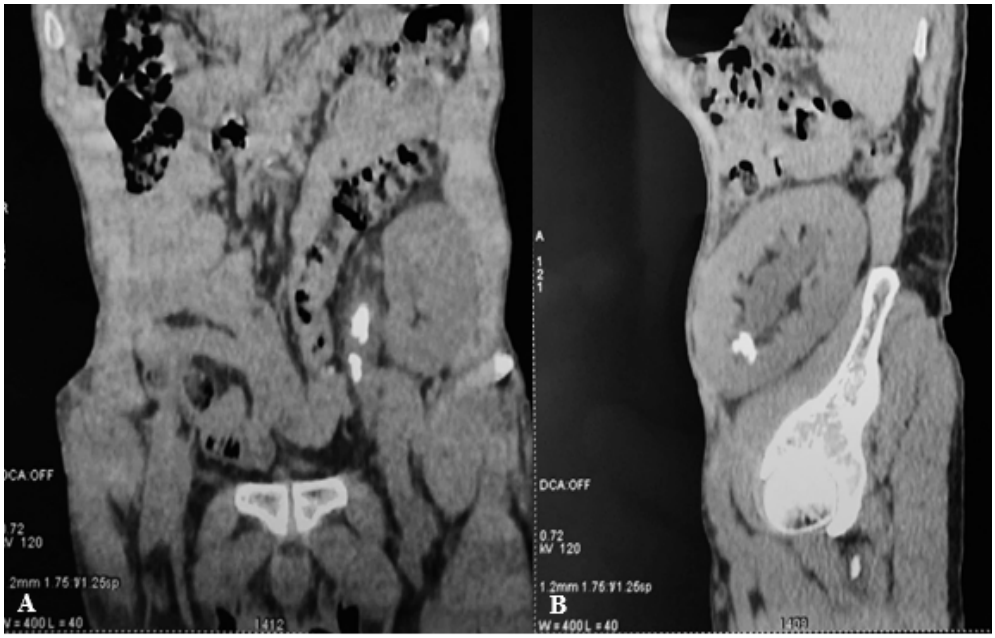

Figure 1: Preoperative non-contrast abdominal CT scan:
ureteropelvic junction stone and upper ureteral stone (A); lower calyx stone (B)

2.2. Surgical intervention

The patient received general anesthesia with endotracheal intubation. Mini-PCNL was performed in a single session in the supine position, without retrograde ureteral catheterization. We identified the puncture site under ultrasound guidance and performed percutaneous puncture of the transplanted kidney with an 18G needle. A 0.89mm guidewire was inserted through the needle into the pelvicalyceal system. The tract was dilated, and an 18Fr Amplatz sheath with two channels, one for negative pressure aspiration, was placed. Using a 12Fr, 120 semi-rigid nephroscope (Karl Storz), the upper calyx was entered, revealing one stone at the ureteropelvic junction and a cluster of stones in the lower calyx. Lithotripsy was performed using a 60W laser (3.5J; 20Hz) from Raykeen. The scope was advanced down the ureter, revealing an upper

ureteral stone, which was fragmented with the laser. A double-J ureteral stent was placed, followed by a nephrostomy tube. The operative time was approximately 2 hours. Estimated blood loss was about 30ml.

2.3. Postoperative follow-up

On the second postoperative day, the patient underwent a non-contrast abdominal CT scan which showed no residual stones (Figure 2), and the nephrostomy tube was removed. The urinary catheter was removed on the third postoperative day. The patient was discharged after four days. One month later, an abdominal X-ray showed stone clearance, and the double-J stent was removed (Figure 3). Three months postoperatively, the patient returned for follow-up with no symptoms of urinary stones; ultrasound and X-ray imaging detected no stone recurrence.

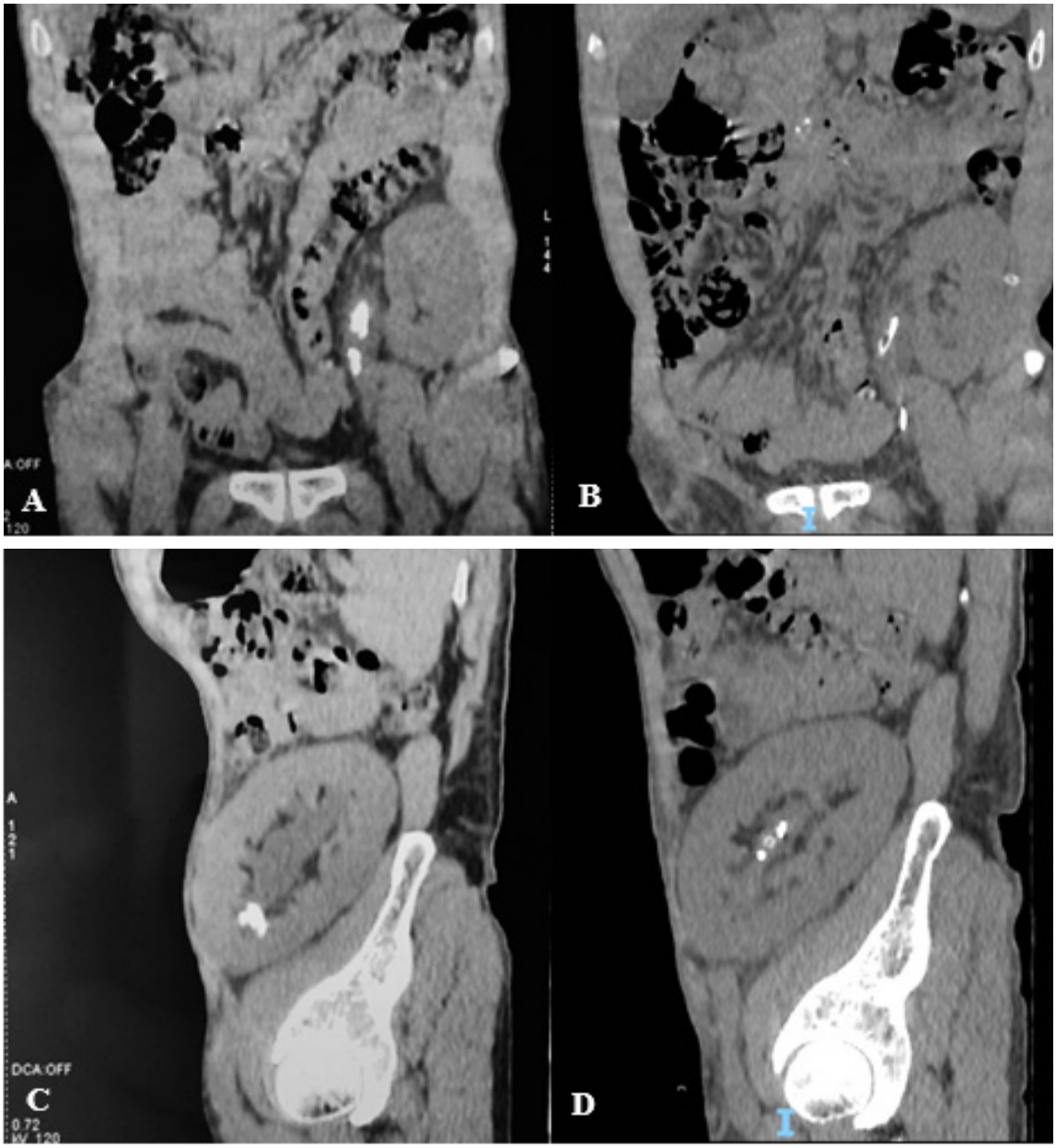

Figure 2: Non-contrast abdominal CT scan before (A, C) and after (C, D) surgery showing the transplanted kidney is stone-free

Figure 3: Plain abdominal X-ray (KUB) 1-month post-surgery, before removal of the double-J stent

III. DISCUSSION

Renal colic is a typical symptom of urolithiasis. Due to the renal transplantation surgery, which can damage the nerves of the kidney and ureter, the typical symptoms of stones may be masked, leading to delayed diagnosis [3, 4]. In our case, the patient was admitted with a dull ache in the left iliac fossa; ultrasound was ordered and revealed stones in the transplanted kidney. The multiple stones in multiple locations and grade II hydronephrosis indicated that the stones had existed in the transplanted kidney for a long time; however, they had not yet affected renal function.

Surgical methods for treating kidney stones include open surgery, ESWL, PCNL, and retrograde ureteroscopy [6]. For stones in transplanted kidneys, a retrospective study of 553 patients showed that antegrade intervention methods, including ureteroscopy, PCNL, and open surgery, have higher stone-free rates. Furthermore, the author recommends prioritizing PCNL and open surgery for large stones (17-25mm) [7]. Open surgery for kidney stones is the traditional method, but it has many limitations, such as risk of infection, postoperative pain, and prolonged recovery time... To overcome these drawbacks, minimally invasive methods have been standardized and have gradually replaced conventional open surgery in most urolithiasis patients in general and renal transplant patients in particular [8].

PCNL is recommended as the choice for large kidney stones (>2 cm) and for 1-2 cm kidney stones where ESWL has failed or is contraindicated. The postoperative stone-free rate is about 76-98%. However, PCNL still has limitations due to the inexperience of surgeons and potential complications, such as blood loss, injury to adjacent organs, venous air embolism, and infection [9]. Therefore, a smaller-sized endoscope (14-20 Fr) used to create a small percutaneous tract is employed, known as mini-PCNL [10, 11]. The transplanted kidney is the patient's only functioning kidney, so maximal preservation of renal parenchyma is the top priority.

For large stones distributed in multiple locations, we decided to use the mini-PCNL method to balance stone removal efficacy with minimal invasiveness. However, this technique still presents significant challenges to overcome. First, the anatomy of the transplanted kidney differs greatly from a native kidney because its position is changed after transplantation, making it difficult to determine the optimal access tract. According to Kim et al., the avascular line is a safe puncture site in PCNL to reduce the risk of renal vascular injury [12]. However, in this case, the kidney was retrieved from the right side and transplanted into the left iliac fossa, causing the avascular line, normally located on the posterior surface, to shift to the anterior surface (Figure 4). This change inadvertently provided an advantage, as anterior puncture significantly reduces the risk of vascular injury and limits bleeding during and after surgery. Second, because the ureteral orifice is located near the bladder dome, placing a retrograde ureteral catheter is almost impossible. On the other hand, the transplanted kidney had grade II hydronephrosis, which facilitated accurate puncture. A study by B. Eryildirim et al. showed that it is not necessary to place a retrograde ureteral catheter in patients with grade II hydronephrosis or higher [13]. Therefore, we opted to perform a single-session mini-PCNL. Additionally, the puncture angle relative to the skin

plane was too large, making irrigation and stone extraction difficult. To overcome this limitation, we chose to use a dual-channel sheath, in which the negative pressure aspiration channel effectively assisted in easier stone removal. Finally, the risk of postoperative infection is always present and even increased because the patient must use long-term immunosuppressive drugs, which significantly reduces natural resistance. To limit this complication, we strictly adhered to aseptic principles throughout the surgery, using prophylactic antibiotics before and continuing them postoperatively. Postoperatively, the patient showed no signs of infection and was discharged after 4 days of observation.

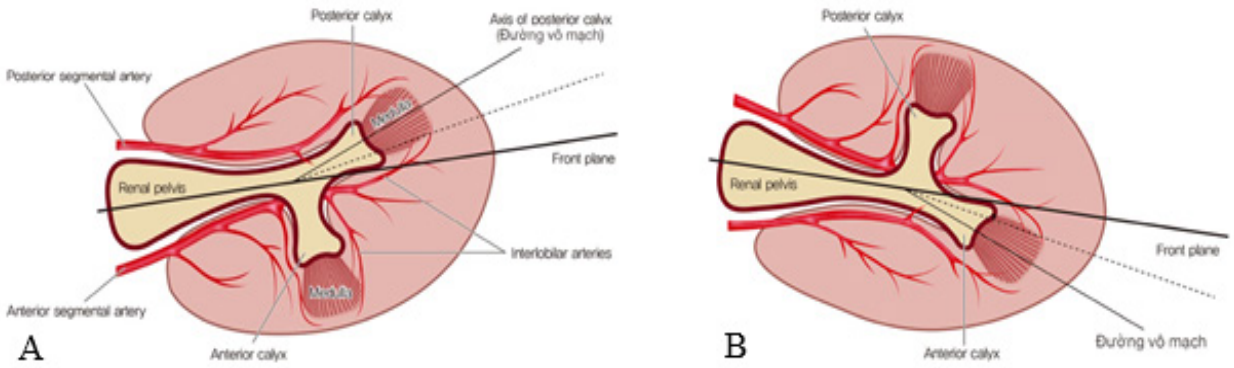

Figure 4: Avascular line in a normal kidney (A) [12] and a transplanted kidney (B)

Compared to PCNL in a native kidney, ultrasound-guided puncture of a transplanted kidney is often simpler because the transplanted kidney lies just beneath the anterolateral abdominal wall muscles. The skin-to-kidney distance is shorter, tract dilation is more convenient, and the kidney hardly moves with respiration. Based on these factors, we chose to puncture the upper calyx to facilitate access to the ureter and manipulation in the lower calyx.

Percutaneous nephrolithotomy in transplant patients was first performed in 1982 [14]. From our initial clinical experience, combined with data from the literature, mini-PCNL is a feasible and promising option for transplant patients with kidney stones or upper ureteral stones causing urinary tract obstruction.

IV. CONCLUSION

Mini-PCNL is a safe and effective option for the management of urolithiasis in renal transplant patients. This case highlights the importance of individualized treatment strategies in optimizing outcomes.

Competing interests

The authors declare no competing interests

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