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Single session PCNL efficacy for staghorn calculus: A case report

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Abstract
Staghorn calculi, comprising 5-20% of urinary stones, are often associated with urease-producing bacterial infections such as *Escherichia Coli*. *Percutaneous nephrolithotomy* (PCNL) is the preferred treatment, achieving 78-93% stone-free rates, though complications may arise, specially in comorbid patients, particularly diabetics in resource-limited South Asian contexts.

This report presents a 45-year-old diabetic woman with recurrent urolithiasis, flank pain, and Escherichia coli (*E. coli*) infection caused by a large obstructive staghorn calculus (24x35x47 millimeters, 645 Hounsfield units) with hydro-ureteronephrosis. Preoperative measures included culture-specific antibiotics (cefoperazone-sulbactam), glycemic management, and metabolic assessments revealing normal calcium, uric acid, and low vitamin D levels. Under general anesthesia, a single-session, single-tract PCNL along with Double-J (DJ) stent was performed through lower calyceal puncture, utilizing a 24 French Amplatz sheath and pneumatic lithotripsy, achieving 90-95% intraoperative stone clearance. Postoperative outcomes showed no fever, or complications without any need of blood transfusion; X ray KUB revealed complete clearance, sterile urine culture, and normal creatinine levels (0.7 milligrams per deciliter). Incidental findings of left adrenal adenoma and hepatosplenomegaly were managed conservatively.

This case demonstrates the efficacy of single-session PCNL in achieving high clearance rates and short hospitalization for high-risk diabetic patient. It emphasizes the importance of preoperative imaging for incidental findings and identifies deficiencies in diabetic stone management, advocating for multicenter trials to optimize protocols in regions with high disease burden.

Keywords: Staghorn calculus, percutaneous nephrolithotomy, obstructive uropathy, urinary tract infection

Introduction

Staghorn calculi, which are characterised as branched renal stones that occupy the renal pelvis and calyces, are globally acknowledged to constitute approximately 5-20% of urinary calculi, predominantly comprising struvite (40-60%) derived from urease-producing microorganisms such as Proteus or E. coli, as well as various forms of calcium oxalate [1, 2]. PCNL is the definitive gold standard in accordance with established gold standard per European Association of Urology (EAU)/American Urology Association (AUA) guidelines, yielding stone-free rates (SFR) of 78-93% in comparison to Shock Wave Lithotripsy (SWL) of 40-60%, with single-tract methods preferred to minimize morbidity [3, 4]. Complications, which include haemorrhage 7-23% and infection 20-30% are moderated by antibiotics and mini-PCNL innovations, safeguarding renal function effectively than open surgical methods [5, 6]. However, unknowns persist: optimal single-versus multi-session protocols in infection stones, long-term eGFR trajectories post-PCNL, and SFR benchmarks in diabetics remain unexplored, in light of the increasing incidence rate of 7-13% global urolithiasis [7]. These lacunae contribute to morbidity obstruction, which later causes pyonephrosis and End Stage Renal Disease (ESRD) in 25% of untreated necessitating prompt intervention to prevent sepsis and nephrectomy [8, 9].

In South Asia, including India, staghorn prevalence increases due to dietary factors (high oxalate/phytate), recurrent UTIs, and metabolic disorders (hypocitraturia, hypercalciuria), with urinary infection stones dominant 50-70% due to poor sanitation and delayed care [10, 11].

PCNL acceptance is strong in tertiary centers, yet resource constraints favour single-session methods; meta-analyses illustrates SFR 80-88% but higher haemorrhage (OR 1.8) in comorbid cohorts [12, 13]. Regional studies highlight diabetes (prevalent in 20-30% stone formers) escalating risks, alongside incidental hepatosplenomegaly from chronic infections, underscoring the need for complete imaging [14, 15].

The purpose of this case report is to show the efficacy of single-session PCNL for staghorn calculi in a comorbid patient, with emphasis on clearance rates and associated complications.

Case Presentation

Our clinical case report elucidates a 45-year-old female with diabetes mellitus (DM) and recurrent urolithiasis who complained with left flank pain attributable to an obstructive staghorn calculus, further complicated by a urinary tract infection (UTI) caused by Escherichia coli. Figure 1 (Plain CT KUB) effectively illustrates the preoperative findings, distinctly identifying a staghorn stone measuring 24×35×47 mm (with a density of 645 HU) that occupies the renal pelvis and extends into the lower polar calyces, while also indicating the presence of moderate hydro-ureteronephrosis, along with incidental findings of left adrenal adenoma and hepatosplenomegaly. Figure 2 (Pre-Op X-ray Abdomen) presents a radiographic assessment that corroborates the radiopaque staghorn configuration and establishes the baseline renal contour prior to surgical intervention, which is critical for the meticulous planning of the surgical approach and access trajectory. The patient underwent a single-session, single-tract percutaneous nephrolithotomy (PCNL) under general anesthesia, utilizing lower calyceal puncture, a 24 Fr Amplatz sheath, and pneumatic lithotripsy, achieving an intraoperative stone clearance rate of 90-95%. Figure 3 (Post-Op X-ray with Left PCNL + DJ Stenting done) illustrates the success of the procedure, demonstrating clearance of the stone, placement of a nephrostomy tube, and a Double-J (DJ) stent in-situ, without any residual stone fragment. Preoperative optimization encompassed the administration of culture-directed antibiotics (cefoperazone-sulbactam), meticulous glycemic control, and a comprehensive metabolic evaluation (revealing normal calcium and uric acid levels, alongside low vitamin D). The postoperative course progressed without any incident; the patient required no blood transfusion, exhibited an afebrile recovery, and was discharged on day 4 with a regimen of oral antibiotics and analgesics, in addition to a planned outpatient appointment for DJ stent removal. Outcomes evaluated at the time of discharge included stable vital signs, normalized creatinine levels (0.7 mg/dL), a sterile urine culture, and documentation of clearance via X ray KUB.

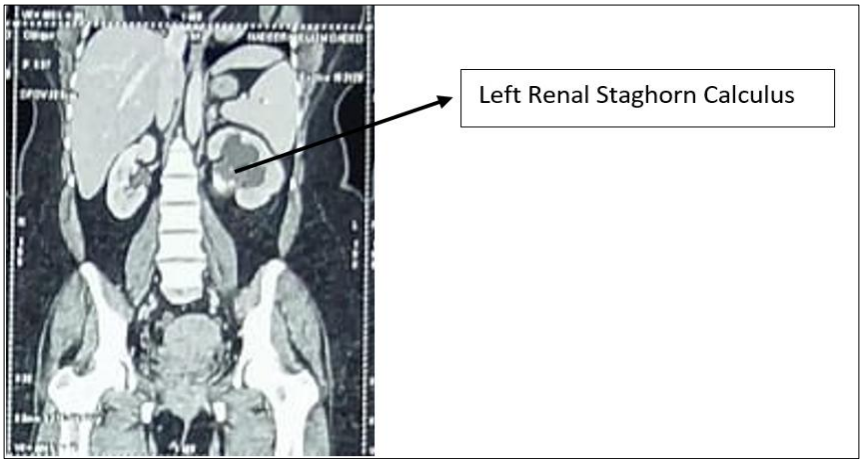


Fig 1: Plain CT KUB

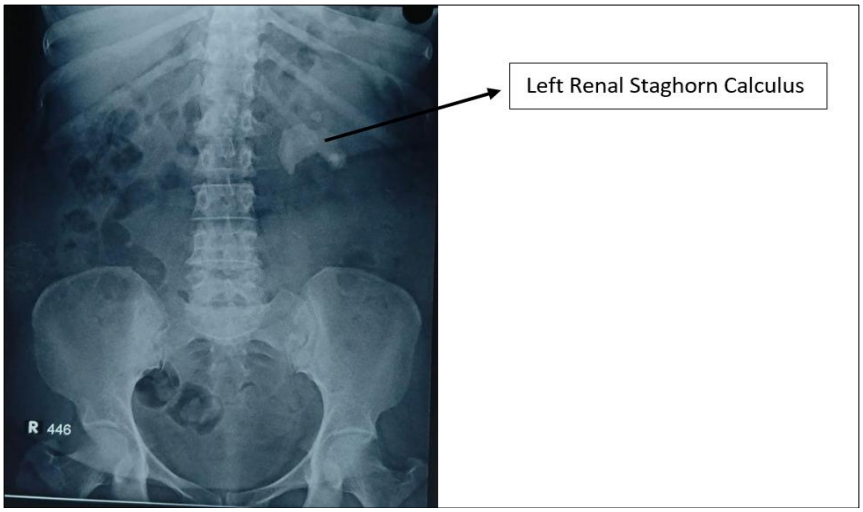


Fig 2: Pre-Op X-ray KUB

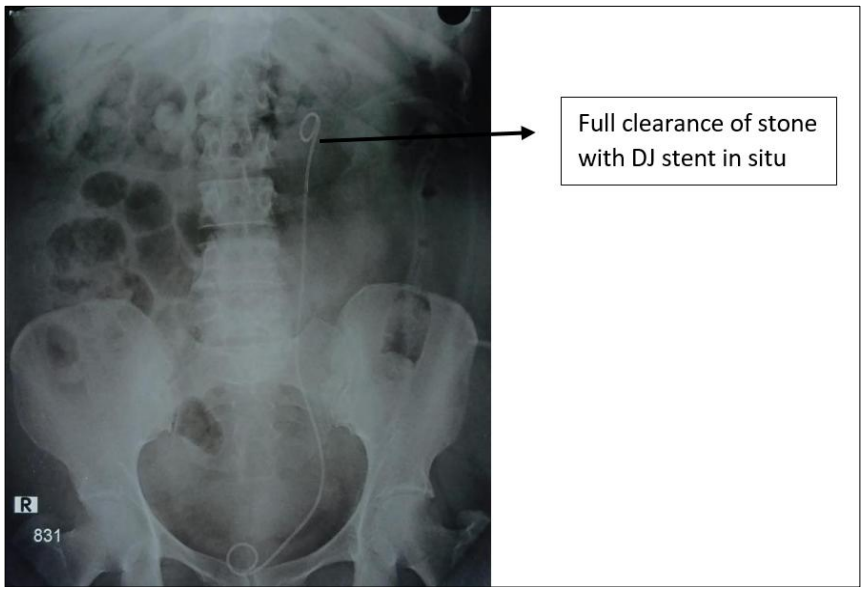


Fig 3: Post-Op X-ray KUB showing clearance of stone with left DJ stent in situ

Discussion

Staghorn calculi necessitate prompt management to prevent renal impairment and sepsis, with PCNL demonstrating superior success rates (78-93%) and cost-effectiveness compared to SWL or ureteroscopy [16, 17]. In this subject, a 90-95% clearance rate from a single-session PCNL aligns with meta-analyses indicating an overall SFR of 82-88%, supported by preoperative antibiotics targeting E. coli UTIs, a frequent factor in struvite stones [18]. The presence of diabetes increases the risk of sepsis (OR 1.91); however, no transfusion was required, consistent with modern series reporting low Clavien III+ complication rates (5-10%) [19].

Incidental CT of adrenal adenoma and hepatosplenomegaly underscore the importance of comprehensive imaging; adenomas are typically benign with over 80% washout, necessitating biochemical evaluation. Operative specifics (24 Fr sheath, pneumatic lithotripsy) adhere to established protocols, minimizing bleeding through lower calyceal access [20]. Postoperative discharge on day 4 with oral therapy indicates shortened hospital stays (3-5 days) compared to open surgery (7-10 days).

Risks such as significant hemorrhage (OR 2.73 for staghorn) were reduced through single tract and brief duration of hospital stay [21]. Long-term metabolic assessment decreases recurrence risk (up to 55% with ongoing bacteriuria). Mini-PCNL is preferred for lower morbidity in analogous situations cases.

This case illustrates successful PCNL for left obstructive staghorn calculus, achieving 90-95% stone clearance in a patient with comorbidities including diabetes mellitus and recurrent urolithiasis. Preoperative imaging identified a staghorn stone with hydro-nephrosis and incidental findings such as adrenal adenoma and hepatosplenomegaly, which were conservatively managed. [22]. The postoperative recovery was straightforward, with discharge on antibiotics and follow-up, reaffirming PCNL as the standard treatment for complex calculi.

Conclusion

This case report highlights three key clinical findings from effective single-tract PCNL for obstructive staghorn calculus in a patient with comorbidities: 90-95% stone clearance achieved in one session, resolution of E. coli urinary tract infection with targeted antibiotics, and an uncomplicated recovery with maintained renal function (creatinine 0.7 mg/dL) despite diabetes. Strengths include thorough preoperative imaging (CT-KUB revealing incidental adrenal adenoma), precise intraoperative data, and compliance with CARE guidelines, thus enhancing reproducibility. Limitations consist of the single-case design limiting generalizability, single tertiary center lack of long-term follow-up beyond one month, and absence of stone composition analysis for validation. This report adds to endourology literature by demonstrating PCNL viability under public health initiatives in resource-limited contexts, confirming high stone-free rates (78-93%) for staghorn calculi. Future research implications suggest prospective multicenter trials to compare single-versus multi-tract PCNL in diabetic populations, alongside metabolic profiling to decrease recurrence rates exceeding 50%. Such investigations will refine clinical guidelines, reducing complications such as hemorrhage and optimizing patient outcomes in high-burden areas.

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