ANNALS OF MEDICAL AND CLINICAL CASES

An Initial Single-Center Experience with Transrenal Antegrade Ureteral Occlusion to Support Mini Percutaneous Nephrolithotomy

Soifa Williams
Department of Urology, Australia

***Corresponding Author:**
Soifa Williams
Department of Urology, Australia

Received Date: 10 Dec 2025
Accepted Date: 29 Dec 2025
Published Date: 09 Jan 2026

Citation: Soifa Willias, An Initial Single-Center Experience with Transrenal Antegrade Ureteral Occlusion to Support Mini Percutaneous Nephrolithotomy. AMCC; 2025; 1: 1-3

1. Abstract

1.1. Objective: To investigate the efficacy and safety of antegrade ureteral occlusion during mini percutaneous nephrolithotomy (mPCNL).

1.2. Methods: We retrospectively analyzed patients who underwent mPCNL at our center between December 2021 and December 2023. Patients were divided into two groups based on intraoperative use of an antegrade ureteral occluder: an occlusion-assisted mPCNL group and a standard mPCNL group. Outcomes including operative time, intraoperative blood loss, renal pelvic pressure, postoperative stone migration, length of hospital stay, first-stage stone-free rate, need for secondary procedures, and postoperative complications were compared.

1.3. Results: There were no significant differences between groups in operative duration, intraoperative blood loss, renal pelvic pressure, length of hospitalization, first-stage stone-free rate, or overall complication rate. However, postoperative stone migration occurred significantly less frequently in the occlusion-assisted group. Although the overall rate of secondary procedures was lower in the occlusion-assisted group, this difference was not statistically significant. Notably, the requirement for secondary ureteroscopic interventions due to ureteral obstruction was significantly reduced in patients who underwent occlusion-assisted mPCNL.

1.4. Conclusion: Antegrade ureteral occlusion during mPCNL effectively reduces stone migration and residual fragments during lithotripsy and may decrease the need for secondary surgical interventions. The technique appears safe and comparable to standard mPCNL. Further large-scale prospective studies are warranted.

2. Introduction

Percutaneous nephrolithotomy (PCNL) is the preferred treatment for large renal stones and staghorn calculi. Compared with retrograde intrarenal surgery, PCNL provides superior stone clearance. With advances in endoscopic equipment and surgical techniques, mini-PCNL (mPCNL) has achieved comparable stone-free outcomes with reduced surgical trauma and fewer perioperative complications.

Despite these advantages, distal migration of stone fragments into the ureter remains a challenge during mPCNL. Such migration may cause ureteral obstruction, postoperative discomfort, and the need for additional interventions, increasing both patient morbidity and healthcare costs. While ureteral occlusion devices are widely used during ureteroscopic lithotripsy to prevent stone migration, their role in PCNL—particularly via an antegrade approach—has not been well studied.

3. Patients and Methods

3.1. Study Design and Patient Selection

This retrospective study included patients with renal calculi who underwent PCNL between December 2021 and December 2023. Patients were assigned to either an occlusion-assisted mPCNL group or a standard mPCNL group based on whether an antegrade ureteral occluder was used intraoperatively.

Eligible patients were adults aged 18–70 years with renal stones measuring 2.0–4.0 cm, normal renal function, and mild or no hydronephrosis. Patients with renal insufficiency, recent urinary tract infection, congenital urinary anomalies, or prior PCNL or ureteral reconstruction were excluded.

3.2. Surgical Procedure

All patients underwent standardized preoperative imaging, including ultrasound, KUB radiography, and thin-slice CT. Procedures were performed under general anesthesia by the same experienced surgeon.

A ureteral catheter was placed retrogradely to facilitate collecting system dilation. Percutaneous renal access was obtained under ultrasound guidance, followed by tract dilation and placement of an access sheath. Lithotripsy was performed using holmium:YAG laser or pneumatic lithotripsy, and stone fragments were removed under continuous irrigation. A double-J stent and nephrostomy tube were placed postoperatively.

3.3. Antegrade Ureteral Occlusion

After identification of the ureteropelvic junction, a blocking

ANNALS OF MEDICAL AND CLINICAL CASES

catheter was inserted antegradely through the percutaneous tract and deployed to prevent distal stone migration. The occluder could be temporarily withdrawn if repositioning of the access sheath was required.

3.4. Renal Pelvic Pressure Monitoring

Renal pelvic pressure was measured using a catheter inserted through the percutaneous tract. Continuous irrigation was maintained at a constant rate, and pressure was recorded at predefined time points during lithotripsy. Mean pressure values were used for analysis.

3.5. Outcome Assessment

Stone characteristics, perioperative variables, and postoperative outcomes were recorded. Stone clearance was evaluated one month after surgery following ureteral stent removal. First-stage stone-free status was defined as the absence of residual stones or asymptomatic fragments smaller than 4 mm without evidence of obstruction or infection.

4. Statistical Analysis

Statistical analysis was performed using SPSS software. Continuous variables were expressed as medians with interquartile ranges, and categorical variables as frequencies and percentages. A P value < 0.05 was considered statistically significant.

5. Results

A total of 84 patients were included, evenly divided between the two groups. Baseline demographic characteristics, stone features, renal function, and comorbidities were comparable between groups. Postoperative stone migration was significantly less frequent in the occlusion-assisted group. Operative time, primary stone-free rate, and overall need for secondary procedures were similar between groups. However, secondary ureteroscopic intervention due to stone-related ureteral obstruction occurred significantly less often in the occlusion-assisted group.

Mean renal pelvic pressure was slightly higher in the occlusion-assisted group but did not differ significantly. No differences were observed in postoperative hemoglobin decline, complication rates, or length of hospital stay.

6. Discussion

Mini-PCNL is an effective and minimally invasive option for treating renal and upper ureteral stones. Stone migration into the ureter remains an important cause of postoperative obstruction and secondary intervention.

This study demonstrates that antegrade ureteral occlusion during mPCNL significantly reduces stone migration and the need for secondary ureteroscopic procedures without increasing operative risk or complications. Importantly, renal pelvic pressure remained within safe limits, likely due to partial drainage permitted by the occluder design.

Successful application of this technique requires careful intraoperative coordination, particularly during access sheath manipulation. Proper identification of the ureteropelvic junction and verification of occluder function are essential to prevent displacement and maintain effectiveness.

7. Limitations

The retrospective design, small sample size, and single-center nature of this study limit the generalizability of the findings. Selection bias cannot be completely excluded, and long-term outcomes were not evaluated. Larger randomized controlled trials are needed to confirm these results.

8. Conclusion

Antegrade ureteral occlusion during mPCNL is a safe and effective adjunct that significantly reduces stone migration and the need for secondary surgical intervention. This technique represents a promising modification of standard mPCNL and warrants further investigation.

References

1. Sakly A, Zakhama W, Mnasser A, et al. Mini PCNL versus standard PCNL in the treatment of renal stones ≥20 mm: safety and advantages. Eur Urol. 2021; 79: S401.
2. Thapa BB, Niranjan V. Mini PCNL over standard PCNL: what makes it better? Surg J (N Y). 2020; 6(1): e19-e23.
3. Zhang L, Wu Y, Xu K, et al. Compare the clinical application of ureteroscopic occluder and stone retrieval basket during holmium laser treatment for upper ureteral calculi. Urol J. 2020; 17(5): 469-473.
4. Lee HH, Yang H, Martin-Tuite P, et al. Determinants of ureteral obstruction after percutaneous nephrolithotomy. Urolithiasis. 2022; 50(6): 759-764.
5. Wosnitzer M, Rothberg M, Katsumi H, et al. Efficacy of novel coaxial occlusion device to prevent stone migration during percutaneous nephrolithotomy (PCNL). J Urol. 2010; 183(4S).
6. Asvadi NH, Arellano RS. Transrenal antegrade ureteral occlusion: clinical assessment of indications, technique and outcomes. J Urol. 2015; 194(5): 1428-32.
7. Yang Z, Song L, Xie D, et al. The new generation mini-PCNL system—monitoring and controlling of renal pelvic pressure by suctioning device for efficient and safe PCNL in managing renal staghorn calculi. Urol Int. 2016; 97(1): 61-6.
8. Yi X, Li X, Peng K, et al. Stone occlusion device with drainage function is effective in ureteral calculi treatment: a preliminary report. Urol Int. 2023; 107(6): 578-582.
9. Landman J, Venkatesh R, Ragab M, et al. Comparison of intrarenal pressure and irrigant flow during percutaneous nephroscopy with an indwelling ureteral catheter, ureteral occlusion balloon, and ureteral access sheath. Urology. 2002; 60(4): 584-7
10. Sarkissian C, Paz A, Zigman O, et al. Safety and efficacy of

a novel ureteral occlusion device. Urology. 2012; 80(1): 32-7.

11. Kafka I, Rogers M, Ayyash O, et al. The use of an occlusion balloon device and PCNL outcomes: single center experience. J Urol. 2016; 195(4S).
12. Knoll T, Daels F, Desai J, et al. Percutaneous nephrolithotomy: technique. World J Urol. 2017; 35(9): 1361-1368.
13. Nerli RB, Kadeli V, Deole S, et al. Postpercutaneous nephrolithotomy ureteropelvic junction obstruction. J Endourol Case Rep. 2020; 6(1): 13-15.
14. Georgescu D, Multescu D, Geavlete B, et al. Prevention and management of PCNL complications. Eur Urol Suppl. 2019; 18(2): e2393.
15. Zeng G, Cai C, Duan X, et al. Mini percutaneous nephrolithotomy is a noninferior modality to standard percutaneous nephrolithotomy for the management of 20-40 mm renal calculi: a multicenter randomized controlled trial. Eur Urol. 2020; 79(1): 114-121.
16. Ghani KR, Andonian S, Bultitude M, et al. Percutaneous nephrolithotomy: update, trends, and future directions. Eur Urol. 2016; 70(2): 382-96.