Multifactorial Comparison of Flexible Ureterorenoscopy and Mini-Percutaneous Nephrolithotomy Outcomes in the Treatment of Hard Renal Pelvic Stones Measuring 1–2 cm

Authors: Kadir Karkın,[1] *Buğra Aksay,[1] Ediz Vuruşkan,[1] Hakan Erçil,[1] Adem Altunkol,[1] Zafer Gökhan Gürbüz,[1] Ergün Alma,[1] Mubarız Aydamirov[1,2]

1. SBÜ Adana City Training and Research Hospital, Türkiye
2. Başkent University Alanya Hospital, Türkiye

*Correspondence to bgraksay@gmail.com

Disclosure: The authors have declared no conflicts of interest.

Keywords: Complications, flexible ureterorenoscopy (fURS), mini-percutaneous nephrolithotomy (mini-PNL), multifactorial analysis, renal stones.

Citation: EMJ Urol. 2025;13[Suppl 2]:20-22. https://doi.org/10.33590/emjurol/LGME9014

BACKGROUND AND AIMS

This study aimed to perform a multifactorial comparison of the surgical outcomes of mini-percutaneous nephrolithotomy (mini-PNL) and flexible ureterorenoscopy (fURS) in the treatment of patients with solitary renal pelvic stones measuring 1–2 cm and having a stone density of >1,000 Hounsfield units.[1]

MATERIALS AND METHODS

The authors retrospectively analysed 79 patients who underwent either mini-PNL (n=23) or fURS (n=56) between January 2018–December 2023 at the Department of Urology, SBÜ Adana City Training and Research Hospital, Türkiye.

All patients had a solitary renal pelvic stone measuring 1–2 cm with a density exceeding 1,000 Hounsfield units, confirmed by pre-operative, non-contrast CT. Routine pre-operative preparations, including urine culture, laboratory tests, chest X-ray, and ECG, were performed.

The following parameters were evaluated:

- demographics: age, gender, BMI, and American Society of Anesthesiologists (ASA) score;
- stone characteristics: laterality, size (length, area, and volume), opacity, and density;
- operative factors: fluoroscopy time, operative time, and hospital stay;
- laboratory parameters: pre-operative and postoperative Day 1 serum creatinine, estimated glomerular filtration rate, haematocrit, and white blood cell counts; and
- clinical outcomes: stone-free rates, postoperative Day 1 and 1-month residual stone rates, post-operative Visual Analogue Scale (VAS) scores (1st, 6th, 12th, and 24th hour), and complications classified according to the Clavien-Dindo grading system.

RESULTS

Among the 79 patients, 23 underwent mini-PNL and 56 underwent fURS (Table 1). In terms of gender distribution, there were seven females and 16 males in the mini-PNL group compared to 24 females and 32 males in the fURS group (p=0.304). The mean age was 51.0±15.8 years in the mini-PNL group compared to 48.1±14.8 years in the fURS group (p=0.44). The mean BMI was significantly higher in the fURS group (27.5±4.8 kg/m^2) compared to the mini-PNL group (25.8±2.5 kg/m^2; p=0.04). In terms of stone characteristics, stone size, area, and volume were significantly larger in the mini-PNL group (p<0.05). Fluoroscopy time was significantly longer in the mini-PNL group (75.2±55.2 seconds) compared to the fURS group (12.7±7.9 seconds; p<0.001). The operative time was also significantly longer in the mini-PNL group (97.8±27.9 minutes) compared

Table 1: Comparative analysis of 1–2 cm hard pelvic stones.

Variable	Mini-PNL (n=23)	fURS (n=56)	p value
Age (years)	51.0±15.8	48.1±14.8	0.440
BMI (kg/m^2)	25.8±2.5	27.5±4.8	0.040*
Gender (F/M)	7/16	24/32	0.304
Laterality (R/L)	8/15	27/29	0.275
Stone opacity (opaque/non-opaque)	21/2	49/7	0.629
Stone size (mm)	17.4±1.7	14.5±2.9	<0.001*
Stone area (mm^2)	211.7±75.2	156.9±68.3	0.002*
Stone volume (mm^3)	2,315±1,147.7	1,338±872.7	<0.001*
Fluoroscopy time (s)	75.2±55.2	12.7±7.9	<0.001*
Operative time (min)	97.8±27.9	65.7±23.8	<0.001*
Post-op Hct (%)	36.2±8.7	39.8±5.8	0.033*
ASA score	2 (2–3)	2 (2–3)	0.422
Hospital stay (days)	3 (2–3)	1 (1–1)	<0.001*
VAS score (1 h)	3 (3–4)	1 (1–2)	<0.001*
VAS score (6 h)	2 (2–3)	1 (1–1)	<0.001*
VAS score (12 h)	2 (1–2)	0 (0–1)	<0.001*
VAS score (24 h)	1 (1–2)	0 (0–1)	<0.001*
Residual stone (%)	4 (17.4%)	5 (8.9%)	0.282

*p<0.05 is statistically significant.

ASA: American Society of Anesthesiologists; F: female; fURS: flexible ureterorenoscopy; Hct: haematocrit; L: left; M: male; Mini-PNL: mini-percutaneous nephrolithotomy; post-op: post-operative; R: right; VAS: Visual Analogue Scale.

to fURS (65.7±23.8 minutes; p<0.001). Hospital stay was significantly shorter in the fURS group (1 day) compared to the mini-PNL group (3 days; p<0.001). Post-operative VAS scores were significantly lower in the fURS group at all time points (p<0.001). Post-operative haematocrit decrease was more pronounced in the mini-PNL group (p=0.033). Stone-free rates were comparable between groups; residual stones were found in 17.4% of mini-PNL cases compared to 8.9% of fURS cases (p=0.282). No significant differences were observed in post-operative creatinine, estimated glomerular filtration rate, or white blood cell levels.

CONCLUSION

For the management of hard and solitary renal pelvic stones measuring 1–2 cm, both mini-PNL and fURS achieve comparable stone-free rates. However, fURS offers significant advantages in terms of shorter operative time, less fluoroscopy exposure, reduced post-operative pain, and a shorter hospital stay, making it a safer and less invasive alternative in appropriately selected cases.

Reference

1. Aksay B et al. Multifactorial comparison of flexible ureterorenoscopy and mini-percutaneous nephrolithotomy outcomes in the treatment of hard renal pelvic stones measuring 1–2 cm. Abstract 0138. IURES Congress, 6-9 November, 2025.