Original Article

Miniperc percutaneous nephrolithotomy versus retrograde intrarenal surgery in the treatment of juxta uretero-pelvic junction upper ureteric calculi: A prospective, randomized control study

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Abstract

Introduction: Treatment of upper ureteric calculi has always remained a challenge for urologists. Treating the juxta-UPJ stones has been even more challenging. Difficulties in access, the possibility of up migration of stones, higher chances of leaving behind residual fragments, and the need for ancillary procedures like ESWL or relook URS have been a few inherent limitations in treating such stones. Offering PCNL for smaller stones was considered an overkill by many urologists. However, with the advent of miniaturized PCNL and improvisations in RIRS techniques, more and more of such stones are tackled with ease.

Objective: To compare the safety and efficacy of mini-percutaneous nephrolithotomy (Miniperc PCNL) and retrograde intrarenal surgery (RIRS) in the management of juxta pelvi-ureteric junction (PUJ) calculi, located between 1 and 2 cm from PUJ.

Materials and Methods: A prospective, randomized study was done on 100 patients with upper ureteric stones up to 2 cm in size and within 2 cm from PUJ. Patients with odd numbers were assigned Group A (Miniperc PCNL, $n = 50$) and even numbers were assigned to Group B (RIRS, $n = 50$).

Results: Stone-free rates were 92% for Group A and 72% for Group B ($P < 0.0174$). Mean operative time was significantly shorter in Group A than Group B (53.2 min vs. 68.52 min, $P < 0.001$). Hospital stay was longer for Group A (47.42 h) compared to Group B (29.36 h, $P < 0.001$). Lasing time was more with RIRS than with PCNL (10.18 min vs. 3.24 min, $P < 0.001$). The complications were more in Group A than Group B, but not significant ($P = 0.160$). Postoperative pain and time to return to normal activities were significantly better in Group B RIRS ($P < 0.001$).

Conclusions: Both Miniperc PCNL and RIRS are the effective treatments for upper ureteric stones. Miniperc PCNL has advantages in terms of shorter operative time, lesser lasing time, and better stone free rates. RIRS demonstrated reduced hospital stay, reduced postoperative pain, and quicker recovery. Miniperc PCNL showed a higher stone-free rate for treating upper ureteric stones up to 2 cm. RIRS is effective for treating stones up to 2 cm in upper ureter reducing the complications associated with Miniperc PCNL.

Keywords: Laser, percutaneous nephrolithotomy, retrograde intrarenal surgery

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INTRODUCTION

Urolithiasis is a common urological problem that has a considerable impact on health-care systems worldwide. The overall incidence of urolithiasis is on the rise.[1] Various external factors, including unhealthy eating habits, changing lifestyles, obesity, and diabetes, may have a significant impact on the overall incidence of urolithiasis.

Ureteroscopy (URS), push-back percutaneous nephrolithotomy (PCNL), and retrograde intrarenal surgery (RIRS) are the mainstay treatments for stones in the upper urinary tract. The early eighties saw PCNL replace open stone surgeries and become a standard of care. Extracorporeal lithotripsy (ESWL) was once the standard of care for smaller renal calculi.[2] This noninvasive test gathered momentum and was the treatment of choice for upper urinary tract calculi until the advent of RIRS. With an increased number of urologists performing RIRS and with recent innovations in RIRS accessories, ESWL has almost become obsolete in the treatment of upper urinary tract calculi.[3] With growing expertise and better treatment-related outcomes, more urologists and patients opt for RIRS these days.

Treatment of upper ureteric calculi has always remained a challenge for urologists. Treating the juxta-UPJ stones has been even more challenging. Difficulties in access, the possibility of up migration of stones, higher chances of leaving behind residual fragments, and the need for ancillary procedures like ESWL or relook URS have been a few inherent limitations in treating such stones. Offering PCNL for smaller stones was considered an overkill by many urologists. However, with the advent of miniaturized PCNL and improvisations in RIRS techniques, more and more of such stones are tackled with ease.

Miniperc PCNL is a modified version of traditional PCNL, primarily designed to minimize the surgical trauma associated with the procedure. It involves creating a smaller percutaneous tract (usually 14–20 French), allowing the insertion of miniaturized nephroscopes and instruments to fragment and remove stones. The smaller tract size significantly reduces bleeding risk, postoperative pain, and recovery time. Miniperc PCNL is typically indicated for patients with medium-sized kidney stones (1–2 cm). It is particularly beneficial in pediatrics and in patients with anatomical abnormalities where traditional PCNL might pose higher risks.[4] Miniperc PCNL provides a complete stone removal while minimizing damage to tissues, thereby resulting in lesser postoperative discomfort and enabling a speedy recovery.[5,6] RIRS, on the other hand, involves the use of flexible ureteroscopes that avoid external incisions and is truly a minimally invasive approach. Although the rates of stone clearance are unpredictable and depend on variable factors, RIRS is increasingly becoming the standard of care for smaller stones, <2 cm in size.[7] However, lesser stone-free rates and upmigration of stones while fragmentation, steinstrasse and urosepsis are a few notable limitations of URS for juxta UPJ stones. This prospective, randomized study compared the efficacy and outcomes of Miniperc PCNL and RIRS in treating stones located within 2 cm from UPJ and of size between 1 and 2 cm, in terms of stone-free rates, operative time, duration of hospital stays, postoperative pain, and time to return to normal activities.

MATERIALS AND METHODS

This prospective, randomized study was conducted at a tertiary care teaching institution in South India. The period of the study was from March 2023 to March 2024. About 383 ureteroscopies were done during this period. Of these, 283 patients were excluded from the study. All procedures were performed by surgeons who were doing conventional PCNL and RIRS for at least 5 years after their basic urological training. Surgeries performed by surgeons with <5 years of posttraining experience were excluded from the study. Institutional Ethical committee clearance was obtained.

Figure 1 illustrates the 100 patients under the study. All of them were randomized by simple randomization and randomly assigned to two groups. Odd numbers were assigned to Group 1 (Miniperc PCNL, n = 50) and even numbers were assigned to Group 2 (RIRS, n = 50).

All patients underwent routine preoperative blood investigations, urine culture, and plain X-ray kidney,

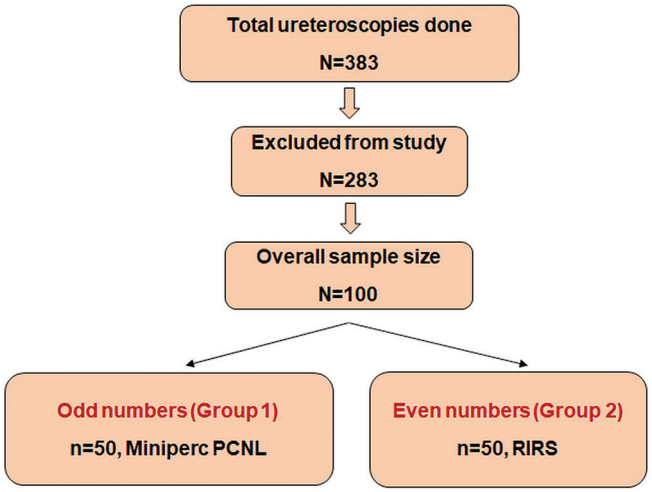

Figure 1: Consort flow chart. PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery

ureter and bladder (KUB) to assess the radiopacity and nonenhanced computed tomography (CT) (NCCT) of the KUB. Stone size was measured as the longest diameter calculated on NCCT. All patients in Group 2 underwent primary RIRS (no prior stenting). Written, informed, and valid consent was obtained from all the patients. Residual stones or stone-free rates were measured by X-ray KUB or ultrasound abdomen after 4 weeks at the time of stent removal. Any fragment larger than 4 mm was considered a residual fragment.

Technique

Miniperc percutaneous nephrolithotomy

After placing a 6 Fr ureteric catheter, under fluoroscopy guidance, a retrograde pyelogram was done to identify the exact stone location, to see if there are any anatomical abnormalities and to plan the initial puncture. A 22G initial puncture needle was used. After gaining initial access, a Miniperc PCNL was performed. The amplatz used was 16 or 18 Fr, depending on the degree of hydronephrosis and the surgeon's choice. The miniature 18 Fr nephroscope, with a viewing direction of 12° and a 6 Fr working channel was used. After the amplatz was placed, the outer sheath of the nephroscope was removed and the inner operating endoscope of 12 Fr size was used to view and fragment the stone. Holmium 100W laser (fragmentation; 0.1J/10 Hz) was used for stone clearance. A 12 or 14 Fr suction catheter was left as nephrostomy wherever indicated.

Retrograde intrarenal surgery

In the lithotomy position, a 9.5-Fr, 35 cms ureteral access sheath was placed. A reusable 7.5 Fr working shaft diameter Flex X2 flexible ureteroscope with 270° deflection and 3.6 Fr working channel was used in all 50 patients. All patients had primary RIRS. The stone was fragmented using the dusting technique (0.5–0.8 J/15–30 Hz). A 6Fr/26 cm DJ stent was placed after the procedure.

Inclusion criteria

Patients with normal renal function in the age group of 18–65 years with stones within 2 cm from UPJ of size between 1 and 2 cm and undergoing primary RIRS were included in our study.

Exclusion criteria

Radiolucent stones, stones of size <1 or more than 2 cm, stones located 2 cm below the UPJ, patients who crossed over from RIRS to PCNL, and ureters not admitting an access sheath were excluded. Juxta UPJ stones that were basketed, fragmented, and removed using semi-rigid ureteroscopes were also excluded. Prestented patients in the RIRS group were excluded. Patients aged <12 years, pregnant women, co-existent renal stones, coagulation abnormalities, multiple stones, anatomical abnormalities, previously treated ureteric calculi, high body mass index of >30, instances where more than 18 Fr Amplatz was used and stones that were basketed and removed without need for fragmentation were excluded from our study. Patients in whom the whole stone up migrated before fragmentation, and as a result, crossed over from RIRS to Miniperc PCNL were also excluded from the study.

Primary outcomes

1. Stone-free rate
2. Operative time (in the Miniperc PCNL group, time from the placement of a ureteric catheter to stone removal, after deducting the time taken to change the patient to a prone position)
3. Lasing time
4. Duration of hospital stay
5. Complication rates (Clavien–Dindo classification).

Secondary outcomes

1. Postoperative pain was assessed in the first 24 h using a Visual Analog Score
2. Time to return to normal activities
3. Need for the second surgery.

Statistical analysis

Data were analyzed using the SPSS software version 25.0 (IBM corp., NY, USA). The continuous variables were compared using *t*-tests, whereas categorical variables were analyzed using Chi-square tests. A result was considered to be significant if the $P < 0.05$, very significant if $P < 0.01$, and highly significant if $P < 0.001$.

RESULTS

A total of 100 patients with juxta UPJ calculi of size 1–2 cm were included in our study. Both the mini PCNL and RIRS groups had 50 patients each. Figure 2 illustrates the stone under study. Figure 2a is the coronal reconstruction CT image, showing the 1.6 cm stone in the upper ureter, about 1.5 cm from the UPJ. Figure 2b is the Plain X-ray KUB region of the same patient showing the radio-opaque stone at the second lumbar vertebral level. Figure 2c is the endoscopic view of RIRS in progress. The stone was basketed and fragmented using a Holmium Laser.

Figure 2 illustrates the location of stone that was included in our study. The radio-opaque stone that was well seen in the X-ray KUB as well was basketed using a 2.6 FR nitinol basket and fragmented/powdered using a Holmium Laser. Complete clearance was obtained, followed by a double J stent placement.

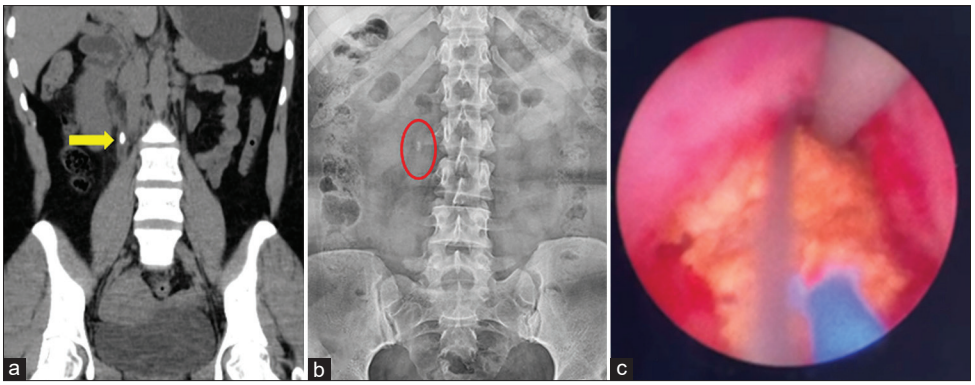

Figure 2: Juxta ureteropelvic junction stone that underwent retrograde intrarenal surgery. (a) Computed tomography scan showing the stone in the upper ureter (yellow arrow). (b) Plain X-ray kidney, ureter, and bladder showing the radio-opaque stone (red circle). (c) Endoscopic view of retrograde intrarenal surgery in progress

Table 1: Demographic profile of patients in our study (*n*=100)

Characteristics	Group 1 Miniperc PCNL (*n*=50)	Group 2 RIRS (*n*=50)	*P*
Mean age (years)	43.5	45	0.538
Sex			
Male	32	30	0.8369
Female	18	20	0.8369
Laterality			
Right	19	38	0.0002
Left	31	12	0.0002
Comorbidities			
DM	7	11	0.4356
HTN	9	4	0.2336
Both	6	1	0.1117
BMI (mean)	22.03	28.18	
Radiological characteristics			
Mean stone size (cm)	1.55	1.40	1.000
Distance of stone from UPJ			
Up to 1 cm	31	32	1.0000
1.1–2 cm	19	18	1.0000
HU	1366.96	1457.9	1.0000
Hydronephrosis			
Present	26	25	1.0000
Absent	24	25	1.0000
Radiolucency			
Radiopaque	32	40	0.1182
Radiolucent	18	10	0.1182

HU: Hounsfield units, PCNL: Percutaneous nephrolithotomy, BMI: Body mass index, DM: Diabetes mellitus, HTN: Hypertension, RIRS: Retrograde intrarenal surgery, UPJ: Ureteropelvic junction

Table 1 gives a summary of the demographic data of both groups. The mean age of the participants was 43 and 45 years in Group A and Group B, respectively. The overall male-female ratio was 1.6:1. The right side was more commonly involved than the left, with the Right: Left ratio being 1.32:1. Although the difference in laterality between the two groups was statistically significant, no clinical significance could be attributed. Furthermore, there was no statistically significant difference found between the two groups with respect to age, sex, and comorbid illnesses.

The average stone volumes in both groups were almost similar. The location of the stone from the UPJ was calculated. The distance from the UPJ was almost similar in both groups ($P > 1.000$). More than 70% of stones in both groups were radio opaque. However, the difference in radio opacity was not significantly different between the two groups ($P = 0.1182$).

Table 2 gives the details of the primary outcomes of our study. On the first postoperative day, more than 90% of patients in the PCNL group but only 72% in the RIRS group were stone-free ($P = 0.0174$). However, when patients were reviewed after 4 weeks, 48 patients in the PCNL group and 46 patients in the RIRS group had their stones completely cleared. The difference between the two groups was not significant ($P = 0.6777$). The mean operative time in the RIRS group was 68.52 min, which was at least 15 min more than the PCNL group ($P < 0.001$). The overall hospital stay was considerably longer for patients undergoing PCNL (47.42 vs. 29.36 h for Groups A and B, respectively, $P < 0.001$). The mean lasing time was considerably shorter in the PCNL group (3.24 vs. 10.18 min for Groups A and B, respectively, $P < 0001$).

Table 3 summarizes the secondary outcomes of our study. Postoperative pain, time to return to normal activity (days), and need for second surgery were measured as the secondary outcomes. Postoperative pain was measured by a Visual Analog Score. The mean pain score in the PCNL group was more than twice that of the RIRS group (5.24 vs. 2.3, $P < 0.001$). Patients who underwent RIRS resumed their normal activities more rapidly than the ones who underwent mini PCNL (3.12 days vs. 1.46 days, $P < 0.001$). Two patients in the PCNL group and 4 in the RIRS group had residual stones of more than 4 mm. All six of them had a relook URS at the time of stent removal. However, the difference between the two groups was not significant ($P = 0.6777$).

Table 2: Primary outcomes of our study

Variables	Group A Miniperc PCNL (*n*=50)	Group B RIRS (*n*=50)	*P*
Stone-free rates			
POD - 1 (*n*)	46	36	0.0174
At 1 month (*n*)	48	46	0.6777
Operative time (min) (SD)	53.2 (5.514)	68.52 (5.956)	<0.001
Hospital stay (h) (SD)	47.42 (3.586)	29.36 (4.741)	<0.001
Lasing time (min) (SD)	3.24 (1.209)	10.18 (4.26)	<0.001

SD: Standard deviation, POD: Postoperative day, PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery

Table 3: Secondary outcomes of our study

Variables	Group A (*n*=50) Miniperc PCNL	Group B (*n*=50) RIRS	*P*
Mean postoperative pain during the first 24 h Visual Analog Score (SD)	5.24 (0.431)	2.3 (0.58)	<0.001
Time to return to normal activity (days) (SD)	3.12 (0.296)	1.46 (0.402)	<0.001
Need for second surgery (*n*)	2	4	0.6777

SD: Standard deviation, PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery

Table 4: Complication rates

Clavien Dindo classification	Group A (Miniperc PCNL) (*n*=50)	Group B (RIRS) (*n*=50)	*P*
Class 1 (*n*=13)			
Complications	*n*=9	*n*=4	
Fever needing antipyretics	1	3	0.0517
Transient nephropathy	1	0	1.000
Postoperative hematuria	7	1	0.2168
Class 2 (*n*=11)			
	n=6	*n*=5	
Fever needing antibiotics	1	5	0.0152
Postoperative pain	5	0	0.0152
Class 3 and 4 (steinstrasse, urosepsis) (*n*=0)			
No complications	35	41	0.2414

PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery

Table 4 provides the details of complications after surgery. Most patients had an uneventful procedure in both groups. Only mild complications were encountered in both groups. About 30% of patients who underwent PCNL had postoperative pain, transient hematuria or fever. On the other hand, only 18% of those who underwent RIRS developed class 1 or 2 complications. Of the 6 patients who developed fever needing antibiotics, 5 of them (83.3%) had undergone RIRS (P = 0.0152). Similarly, all 5 patients (100%) who had postoperative pain limiting their mobility and needing analgesics belonged to the mini PCNL group (P = 0.0152). Although more patients in the PCNL group encountered minor complications, the difference between the groups was not significant (P = 0.160). None of the 100 patients developed any serious complications

Efficiency quotient (EQ) was calculated using the above-mentioned formula. This parameter takes into consideration, the efficacy of the primary modality of treatment under the study as well as the need for retreatment after a primary surgery. EQ for the PCNL group was higher than that of RIRS (88.88 vs. 79.31), as depicted in Table 5 indicating that PCNL offers a better stone-free status while treating juxta UPJ stones than RIRS. However, the difference in efficiency between the two groups was not statistically significant (P = 0.6777).

DISCUSSION

The advent of RIRS and miniaturized PCNL techniques has revolutionized the treatment of juxta UPJ stones of 1–2 cm in size. Various authors have established the efficiency, usefulness, and safety of the two procedures.[8-10] All these authors have included stones in the upper ureter that are impacted and well away from the UPJ as well. Our study prospectively analyzed the efficacy of these two procedures, especially for treating the upper ureteric stones within 2 cm from the UPJ. So far, in a thorough PubMed literature search, there is no similar publication that exclusively studied the upper ureteric stones located within the first 2 cm from UPJ.

Miniperc PCNL was introduced to reduce the morbidity related to tract dilatation while not compromising on the stone clearance rate.[11-13] The reduced blood loss, enhanced dexterity and manoeuvrability, reduction in the need for postoperative analgesia, reduced lasing time and retrieval of relatively larger stone fragments have been considered as the advantages of Miniperc PCNL over the RIRS.[14-16] On the other hand, RIRS has its inherent advantages. Lesser postoperative pain, early ambulation, and lesser complications are a few advantages of RIRS.

Stone-free status is the most objective way of assessing the efficacy of any surgical procedure. In our study, both PCNL and RIRS have shown a higher stone-free status, although with PCNL, it was slightly more. De *et al*., in their meta-analysis observed that RIRS achieved a higher stone-free status.[17] However, many other authors have studied and compared the role of these two procedures in the treatment of renal stones. Sabnis *et al*. recorded high stone-free rates in both procedures (100 and 85.8%) for PCNL and RIRS groups, respectively.[18] Mayank *et al*. reported a higher stone-free rate with PCNL (90 vs. 85%).[19] In our study, the PCNL group recorded 96% stone-free status. The complication rates were minimal and nearly the same in all studies. The slightly higher number of complications observed in our study in the

PCNL group was due to a transient mild hematuria that resolved in 24 h. Those five patients in the RIRS group needing antibiotics suggested that urinary tract infection is higher in the RIRS group ($P = 0.0152$). RIRS is known to result in high pressure within a closed system, resulting in the dissemination of the urinary tract infection. Similarly, postoperative pain seen in five patients may be due to a puncture of the kidney, perinephric fluid extravasation, or hematoma.

Table 6 gives a comparison of our study with similar studies in the past. The need for repeat surgery was observed in many studies. Mayank *et al.* observed a 10% retreatment rate (8/80).[19] In our study, only 6% needed a relook URS at the time of stent removal, with 4 from RIRS and 2 from the PCNL group needing clearance of residual fragments ($P = 0.6777$). Postoperative complications were studied according to the Clavein–Dindo classification. Almost all studies had a small percentage of patients developing either Class 1 or Class 2 complications in both the PCNL and RIRS groups ($P = 0.2414$). Most studies did not look into the time to return to normal activity and lasing time. In our study, the time to return to normal activity was significantly shorter in RIRS than PCNL group (1.46 days vs. 3.12 days, $P < 0.001$). The lasing time was also significantly shorter in the PCNL than RIRS group (3.24 vs. 10.18 min, $P < 0.001$).

EQ is an objective parameter that determines the stone-free rate concerning the type of treatment offered. EQ was calculated using the formula, as originally proposed by Alić J *et al.*[21] It helps us to compare the efficacy of two or more modalities of treatment for a particular stone by taking into consideration the repeat procedures and auxiliary procedures needed to clear the stone completely. Many authors in the past have studied the EQ after RIRS. Jiang *et al.*, in their meta-analysis on the treatment of renal stones, observed that the overall EQ was higher with PCNL than with RIRS.[22] Ours was the first study ever to calculate the EQ for the treatment of juxta UPJ upper ureteric calculi.

Various authors have compared the EQ of RIRS with that of ESWL and PCNL. Table 7 compares the EQ across

Table 5: Efficiency quotient

EQ	Miniperc PCNL group	RIRS group	*P*
$\frac{\text{Percentageof stone - free status} \times 100}{[100 + \text{percentage of retreatment} + \text{percentage of auxiliary procedures}]}$	88.88	79.31	0.6777

EQ: Efficiency quotient, PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery

Table 6: Comparison with other contemporary studies

Characteristics	Knoll *et al*., 2011[20]		Sabnis *et al*., 2012[18]		Jain *et al*., 2021[19]		Our study, 2024		
	Miniperc PCNL	RIRS	Miniperc PCNL	RIRS	Miniperc PCNL	RIRS	Miniperc PCNL	RIRS	*P*
Sample size	25	21	32	32	40	40	50	50	-
Mean age (years)	56	53	44.5	49.3	35.6	40.6	43.5	45	0.538
Sex (male:female)	15:10	9:12	19:13	25:7	25:15	32:8	32:18	30:20	0.8369
Stone size (cm)	1.8	1.9	1.52	1.42	1.24	1.29	1.55	1.4	1.000
Mean operative time (min)	59	106	40.81	50.63	51.58	69.75	53.2	68.52	<0.001
Mean hospital stay (days)	4.6	6.3	2.07	1.94	2.85	2.45	1.98	1.22	<0.001
Stone-free rates (POD 1) (%)	96	71.5			77.5	45	92	72	0.0174
Stone-free rates (after 4 weeks)	100	85.8	100%	96.9%	90	85	96	92	0.677
Complications	3	4	1	3	9	16	15	9	0.2414
Need for second surgery (*n*)	-	-	0	1	3	5	2	4	0.6777
Time to return to normal activity (days)	-	-	-	-	-	-	3.12	1.46	<0.001
Lasing time (min)	-	-	-	-	-	-	3.24	10.18	<0.001
EQ	-	-	-	-	-	-	88.88	79.30	0.6777

EQ: Efficiency quotient, POD: Postoperative day, PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery

Table 7: Comparison of efficiency quotient across various studies and modalities of treatment

Study	Stone details	EQ			*P*
		RIRS	ESWL	Mini PCNL	
Lee *et al*., 2006[9]	1–2 cm, lower calyceal calculi	0.63	0.61	-	
Pan *et al*., 2013[23]	2–3 cm, renal calculi	52.3	-	90.4	
Gu *et al*., 2013[10]	Large proximal ureteric calculi up to L4 vertebra	50.0	-	83.0	
Kumar *et al*., 2015[24]	1–2 cm, lower calyceal stone	84.2	68.1	91.5	0.01
Shi *et al*., 2018[25]	More than 2 cm, renal calculi	53.2	-	78	
Our study, 2024	Proximal ureteric calculi of 1–2 cm sized, within 2 cm from UPJ	79.31	-	88.38	0.6777

EQ: Efficiency quotient, PCNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery, UPJ: Ureteropelvic junction, ESWL: Extracorporeal lithotripsy

various studies and modalities of treatment. In our study, although the EQ in Miniperc PCNL was superior to that in RIRS, the difference in EQ between the two procedures was not statistically significant ($P = 0.6777$).

Another aspect that has to be taken into consideration in treating such stones in developing nations is cost-effectiveness. Various studies have observed that the cost of RIRS is so prohibitive that Miniperc PCNL scores over RIRS when the overall expenses are taken into consideration. In general, Miniperc is considered to be more cost-effective than RIRS. In a study on 271 patients with renal stones of 1–2 cm in size, Mahmood *et al.* observed that mini PCNL was more cost-effective than RIRS.[26] They claimed that the running costs, maintenance expenses, disposables, and accessories make RIRS more expensive than PCNL. Furthermore, the slightly higher retreatment rates with RIRS might add to the expenses, although that aspect was not looked into, in their study. On the other hand, Wymer *et al.* used a Markov model structure and included expenses for a 3-year follow-up period.[27] Their study concluded that if the incremental cost-effectiveness ratio and incremental net monetary benefit were taken into consideration, the overall expenses for a RIRS in a 1–2 cm renal stone would be nearly 50% less than the index patient who underwent mini PCNL.[27]

Juxta-UPJ upper ureteric stones are a common but complicated and multi-faceted condition that we come across in urological practice. The etiology is multi-factorial and treatments are varied. In our study, we looked into the spectrum that these stones present with and also compared the efficacy and effectiveness of the various treatment modalities (mini PCNL and RIRS) in treating such stones.

Strengths and limitations of the study

Our study has many "firsts" to its credit. This is the first-ever study that looked into the treatment options for juxta UPJ stones, although many other studies have earlier evaluated various other stone locations. Ours is the first study on juxta UPJ stones that looked at time to return to normal activity, lasing time, and EQ. The added strengths are that all procedures are done by senior consultants with at least 5 years of experience in both PCNL and RIRS. The prospective and randomized study added further to its strength.

Our study has a few inherent limitations. The sample size could have been larger to get more meaningful data and conclusions. Postoperative screening with an ultrasound abdomen or Plain X-ray KUB to assess stone clearance was another limitation. CT screening would have been a more reliable tool. The higher postoperative pain score on Day 1 in the PCNL group may be related to skin incision/puncture and not necessarily a procedure-related morbidity. Overall patient satisfaction is another parameter that would give more weightage to the treatment outcomes.

CONCLUSIONS

Both mini perc-PCNL and RIRS are effective methods for treating upper ureteric stones that are up to 2 cm in size. Each one has its own merits and limitations. RIRS reduces complications associated with mini perc-PCNL. RIRS offers advantages in terms of operative time, hospital stay, and recovery. Miniperc PCNL achieves a higher stone-free rate. Individualized treatment plans are essential for optimizing patient outcomes.

Ethical approval

Approval for this study was obtained from the Institutional Review Board.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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