



## Original Article

## Comparative Study of Retrograde Intrarenal Surgery and Mini-Percutaneous Nephrolithotomy among Renal Stone Patients

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## ABSTRACT

Mini-Percutaneous Nephrolithotomy (Mini-PCNL) and Retrograde intra-renal surgery (RIRS), can be carried out in a single stage or numerous phases depending on the burden, size, and/or location of the stone. **Objective:** To check the efficacy of Mini-Percutaneous Nephrolithotomy and Retrograde intra-renal surgery on adult patients with a renal stones. **Methods:** A total of 101 patients were included who underwent RIRS (n=51) or mini-PCNL (n=50) at Doctors Hospital Jail Chowk in Gujrat, Pakistan in 2021. Retrospective observations were made on 101 individuals who received RIRS or mini-PCNL. **Results:** The mean hospital stay time was significantly lower in RIRS group *i.e.*,  $01.81 \pm 0.59$  days as compared to mini-PCNL group (p value <0.001). The operation time was  $63.72 \pm 14.94$  minutes for mini-PCNL and  $72.65 \pm 15.83$  minutes for RIRS group. The stone clearance rate was 92% in mini-PCNL group and 82.35% in RIRS group. **Conclusions:** In conclusion, we found that both mini-PCNL and RIRS are safe and effective ways to treat renal calculi. RIRS is a non-invasive, practical therapeutic option with reduced hospitalizations times, morbidity, and complication rates for these individuals.

## INTRODUCTION

In the present, kidney stones with a lower pole can be removed with extracorporeal shock wave lithotripsy (ESWL). However, treatment with ESWL is often ineffective for lower-pole (LP) stones and other kidney stones in dependent regions. [1, 2]. Open surgery for big stones has been substituted with percutaneous nephrolithotomy (PCNL), a procedure that was developed in the 1970s [3]. As experience has increased and morbidity has decreased, it is increasingly employed for even medium-sized stones in the lower pole. Helal *et al.* revealed the "mini-perc"

technique's initial development for young patients [4]. A "mini-perc," as described by Jackman *et al.* [5, 6], is a PCNL performed through a sheath that is too small to accommodate a conventional rigid nephroscope. Retrograde intrarenal surgery (RIRS), a different approach for treating LP stones, can be carried out in a single stage or over several phases depending on the weight, size, and/or location of the stone [7]. As an outpatient operation, RIRS can reduce the hazards of percutaneous renal surgery, including hemorrhage, pleural and visceral damage, and

urine leak. RIRS may be carried out in a single or numerous stages depending on the burden and position of the stones, is a helpful alternative in these individuals. In cases that were previously handled with ESWL or PCNL, RIRS is now being used in a rising number of centers, including our own. On the other hand, no prior study has directly evaluated the proven consequences of the PCNL and RIRS in this patient population [8-10]. PCNL offers substantially greater stone-free rates than ESWL and requires less auxiliary procedures. This tendency is further supported by the advent of miniature PCNL (mini-perc), which is regarded to be to a lesser extent invasive than conventional PCNL because to the smaller equipment. Due to the juvenile kidney's small size and mobility, its friable renal parenchyma, and its small size, PCNL may still cause complications in children even with variations such the "mini-perc." [11]. This study reported the efficacy of mini-PCNL and RIRS on adult patients with a larger sample size. Related aspects like hospital stay length, expense, problems, and results were also assessed.

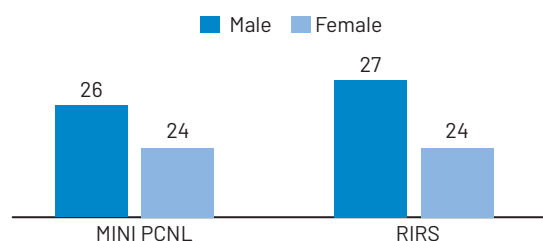
## METHODS

A total of 101 patients were included who undertook RIRS (n=51) or mini-PCNL (n=50) at Doctors Hospital Jail Chowk in Gujrat, Pakistan in 2021. Retrospective observations were made on 101 individuals who received RIRS or mini-PCNL. Patients laboratory tests were done including X-rays, CBCs, Urinalysis, intravenous urography, ultrasonography, computerized tomography (CT), and coagulation testing, before to the treatment. The two largest diameters (mm) recorded on CT sections were multiplied to determine the size of the stone. The surgery method used was based on the patient's anatomy, their preference, and the surgeon's judgement. Patients were put in the lithotomy position on an endoscopic table equipped with fluoroscopic imaging while under general anesthesia. Every procedure was carried out under video and fluoroscopic supervision. A hydrophilic safety guidewire is then inserted into the body through the ureter while being guided by ultrasound and fluoroscopic imaging during ureterorenoscopy. After evaluating and dilating the ureter with a semi-rigid ureteroscope (model and size), it is removed, and a flexible ureteroscope (model and size) is inserted via a guidewire or ureteral access sheath. Stone is dispersed into small pieces upon advancement of the laser fiber (model and kind), which is then suctioned out. All procedures for the mini-PCNL technique were carried out while the patient was unconscious. A 14 or 16-F catheter was used to drain the bladder after a 05 to 06-F ureteral catheter was inserted. A rigid ureteroscope is also used to enlarge the nephrostomy. Stone is fractured with a HoYag laser and then removed by suction. A 14 Fr nephrostomy catheter is

frequently kept in place after the treatment to ensure outward urine flow and is removed within 48 hours. For statistical analysis, data was entered and analyzed using SPSS v22.0. The mean  $\pm$  SD for each quantitative measure was reported, and the frequency and percentages for each qualitative variable. The Chi-square test was employed to compare the two patient groups. To determine whether there was a significant difference in operative time, hospital stay, and stone size between groups, an independent sample t test was used. p-value less than 0.05 was regarded as significant.

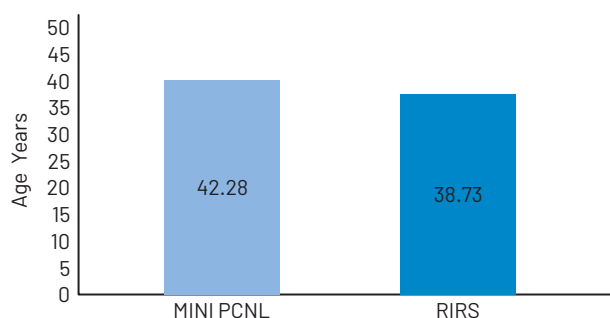
## RESULTS

Amon total 101 patients in two groups, 50 were in mini-PCNL while 51 were in RIRS. Most of the patients were male in both groups. In mini-PCNL 26 were male and 24 were female, while in RIRS 27 were male and 24 were female (figure 1).



**Figure 1:** Gender wise distribution of patients

Figure 2 show the mean age of participants in groups that were not significantly different. The mean age of participants in mini-PCNL were  $42.28 \pm 13.06$  while mean age of participants in RIRS group were  $38.73 \pm 13.08$ .



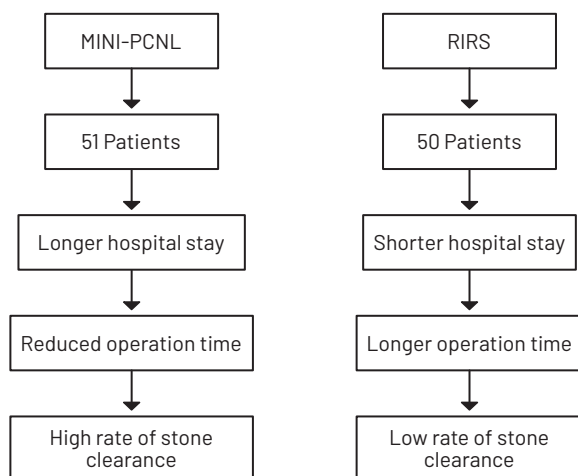
**Figure 2:** Mean age of patients in both techniques

Table 1 showed the comparison between mini-PCNL and RIRS among patients. The mean hospital stay time was low in RIRS group  $01.81 \pm 0.59$  days as compared to mini-PCNL group and significant by using independent sample T test (p value  $< 0.001$ ). The operation time was  $63.72 \pm 14.94$  minutes for mini-PCNL and  $72.65 \pm 15.83$  minutes for RIRS group. The stone clearance rate was 92% in mini-PCNL group and 82.35% in RIRS group.

	Mini-PCNL mean $\pm$ SD	RIRS mean $\pm$ SD	p-value
Hospital stay (days)	02.63 $\pm$ 0.86	01.81 $\pm$ 0.59	< 0.001*
Operation time (minutes)	63.72 $\pm$ 14.94	72.65 $\pm$ 15.83	< 0.005*
Stone clearance n(%)	45(92.0%)	42(82.35)	> 0.005*
Complications n(%)			
Hospital stay (days)	02.63 $\pm$ 0.86	01.81 $\pm$ 0.59	< 0.001*
Operation time (minutes)	63.72 $\pm$ 14.94	72.65 $\pm$ 15.83	< 0.005*
Stone clearance n(%)	45(92.0%)	42(82.35)	> 0.005*

**Table 1:** Comparison of mini-PCNL and RIRS techniques

Figure 3 represents the overall summary of both the employed techniques. It was found that mini-PCNL had greater potential than RIRS in terms of stone clearing and operating time. However, RIRS performed better in terms of reducing the hospital stay with mild complications in both the procedures.



**Figure 3:** Overall comparison of both the techniques.

## DISCUSSION

For small to medium-sized renal stones, ESWL was the favored first treatment. Despite this, the ESWL limits cause a decrease in the stone-free rate. Thus, lower-pole stones up to 1.5 cm have been given consideration for ESWL. But in recent years, the majority of urologists have chosen to favor PCNL or RIRS for the management of LP stones. Although ESWL is proposed for small kidney stones (less than 10 to 15 mm), there is some disagreement over the optimal course of action for LP stones less than 15 mm [12-14]. In this investigation, the removal of stone was accomplished using both the mini-PCNL and RIRS procedures. In this study, the mini-PCNL group's stone clearance rate was 92%, whereas the RIRS group's was 82.35%. A previous study found that after several sessions, the overall success rate of RIRS ranged from 77% to 93% for intrarenal calculi larger than 2 cm. Stone-free rates following the second sessions were comparable to those attained using mini-PCNL. The need for a second session is by far RIRS' biggest drawback when compared to PCNL

[15]. Results of 15 PCNL and 12 RIRS patients who received treatment for the clearance of 1 to 2 cm renal calculi were compared by Chung *et al.* They stated that the percentages of PCNL and RIRS patients without stones were 87% and 67%, respectively [16]. In this study results the mean hospital stay time was significantly low in RIRS group 01.81 $\pm$  0.59 days as compared to mini-PCNL group (p value <0.001). The operation time was 63.72  $\pm$  14.94 minutes for mini-PCNL and 72.65 $\pm$ 15.83 minutes for RIRS group. The average operation times for the group RIRS and PCNL in the study by Akman *et al.* were 58.2  $\pm$  13.4 and 38.7  $\pm$  11.6 min, respectively [15]. For the ureteroscopic therapy of renal stones vary between in size from 02 to 04 cm, Mariani *et al.* observed a mean operating time of 64 minutes [17]. Earlier study results of Mishra *et al.* compared standard percutaneous nephrolithotripsy and mini-PCNL, the researchers came to the conclusion that while the mini-PCNL procedure took longer than the standard PCNL, it had advantages over the latter in terms of a significantly lower hemoglobin drop and a lower need for analgesics. Additionally, we used the mini-PCNL method with nephroscope sizes between 16 and 18 to treat the LP stone. In our investigation, we discovered that the mini-PCNL group's achievement rate was 97.2% and its stone-free ratio was 89.1% [18]. For LP calculi, RIRS is a suitable alternate therapy approach. According to the recommendations of the Urology Association of Europe, RIRS is now the third option for stones that are between 1 and 2 cm in size or the second alternative for calculi less than 1 cm in size. Since RIRS has been used in urological practice, authors have looked into its effectiveness in prior studies. Low rates of morbidity and complications are RIRS's benefits. Compared to RIRS, PCNL is a best intrusive therapy choice and is known to have more general problems [19, 20].

## CONCLUSIONS

Both RIRS and mini-PCNL are very safe and effective therapies for renal lithiasis, and both can be utilized to achieve exceptional stone-free rates.

## Conflicts of Interest

The authors declare no conflict of interest

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