

## MINI-PERCUTANEOUS NEPHROLITHOTOMY (MINI-PCNL) VERSUS STANDARD PCNL (S-PCNL) FOR RENAL STONE OF MORE THAN 2CM IN DUHOK GOVERNORATE

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### ABSTRACT

**Background:** This research aimed to make a comparison between the mini-percutaneous nephrolithotomy (Mini-PCNL) versus standard (S-PCNL) techniques for kidney stones of more than 20mm in regards of their rates of success and complications in candidates with urolithiasis in Azadi teaching hospital and Vajeen private hospital in Duhok governorate.

**Patients and procedures:** This clinical research was performed during April 2018-April 2019. Fifty participants with renal stones larger than 2cm were assigned into two groups regarding their treatment options by PCNL, either Mini-PCNL by using nephroscope 18 Fr through 24 Fr sheath, or by the S-PCNL by using 24 Fr nephroscope through 30Fr sheath. The stones were crushed with pneumatic lithotripsy.

**Results:** Our data have shown that there was no difference in the stone free rates in both groups but statistically significant differences in postoperative haematocrit level, operative time, analgesic requirement, hospital stay, and complication rate among the patients applying Fisher's exact tests, Chi square or Student-t test as needed. In addition to the logistic regression analysis. No significant differences were seen in patient's characteristic between the two groups with.

**Conclusions:** Mini-PCNL has similar efficacy and SFR with lower complication rates in comparison with S-PCNL.

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**Keywords:** Kidney stone, Mini-percutaneous nephrolithotomy, ureteroscopy, pneumatic lithotripsy, standard percutaneous nephrolithotomy.

**R**enal stone is regarded as one of the common diseases that affect at least 10 percent of people. About 70% of patients who got the kidney stones during their life will experience recurrence of kidney stones<sup>1</sup>. Different kinds of invasive and non-invasive, minimally invasive procedures are indicated as treatment for urinary Calculi, like medical therapy and extracorporeal shock wave lithotripsy, percutaneous nephrolithotomy (PCNL)

and open renal surgery. In the past three decades, PCNL as minimally invasive techniques was shown to be the attractive option for big stones placed in the kidney and upper ureter<sup>2</sup>.

Moreover, the protocol called Standard percutaneous nephrolithotomy (S-PCNL) is regarded as the first choice for treatment of kidney stones larger than 20mm in size with a high stone free rate (SFR). Inevitably this SFR was linked with complications mainly blood transfusion

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and bleeding. Various procedures were developed to reduce these complications. Mini-percutaneous nephrolithotomy (Mini-PCNL) is introduced to be the first procedure which tried to decrease the haemorrhage and parenchymal trauma through applying smaller nephroscope which may access the kidney through a smaller (24 Fr) sheath<sup>3</sup>.

Jackman et al. was the first who applied this procedure, the followed by Lahmeet al<sup>4,5</sup>. Although the complication outlook was better with Mini-PCNL when it compares to standard one, scientists were worried about the success rate in stones removal because the smaller view field may need more tool manipulations for stone removal especially with big-size ones.

Comparison between Mini-PCNL vs S-PCNL are very few<sup>3</sup>. Most of them were recruiting a small number of candidates. Besides, scientists discussion are on progress regarding their relative efficacy and safety.

The objective of the present research was to make a comparison between Mini-PCNL vs S-PCNL for treatment of renal calculi sized more than 20mm in Azadi Teaching Hospital and Vajeen private hospital in Duhok city.

### **METHODS**

Patient's Criteria:

This clinical study is for patients (age 17 Years and above) with kidney stones for whom Mini-PCNL or S-PCNL were performed between April 2018 to April 2019 in Azadi teaching Hospital and Vajeen private hospital in Duhok centres. Excluded criteria were patients with congenital renal anomalies,

pyonephrosis and patients with impaired kidney function or coagulopathies. All kidney stone sizes were included entitled that they were  $\geq 20$  mm.

### **CONFLICT OF INTEREST**

The research was confirmed by the Azadi teaching Hospital board committee and all technique were done in comply with the ethical standards of the Azadi Teaching hospital and Vajeen private hospital regulation. All patients' information kept in confidential. The researcher declares that there was "no conflict of interest".

### **PROCEDURES AND PATIENTS MONITORING**

Before surgery, candidates were evaluated by medical history, physical examination, laboratory investigations (urinalysis, blood sugar level, blood count, coagulation profile, liver enzymes and serum creatinine). Urine culture and sensitivity was also performed. Computed tomography CT scan and or IVU were conducted for all participants at diagnosis and monitored later on. Formula " $(\text{length} \times \text{width} \times \pi \times 0.25)$ " were employed for stone sizes. SFR was described as the absence of any residual fragments one month after operation. Also microbiological culture for urine were done for all patients.

All the protocol in the study is done by urologists with previous expertise in the field of endo urology and both procedures (Mini-PCNL and S-PCNL).

All our patients were given 3rd-generation cephalosporin namely (cefuroxime vial 1gm) at the time of induction of anesthesia.

In both groups a 6 Fr ureteric catheter were placed through cystoscopy in lithotomy position. The pelvi-calyceal system was visualized by fluoroscopy after retrograde injection of the diluted contrast. Both S-PCNL and Mini-PCNL were done through 30 Fr and 24 Fr tracts, respectively.

In Mini-PCNL procedure, "the tract was dilated slowly with fascial dilators (Cook Urological, UK) and 24 Fr sheath was then placed or inserted. After that, a semi-rigid nephroscope (18 Fr) (Richard Wolf; Deutschland) is applied using the "pneumatic lithotripter for the stone fragmentation. An automated irrigation pump was employed during the procedure (MMC Guangzhou; PRC).

In the S-PCNL, the tract is dilated by applying the "telescopic metal Alken dilators and a 30 Fr Amplatz sheath was inserted. The standard 24 Fr nephroscope was used (Karl Storz, American) with pneumatic lithotripsy too.

After the operation was finished in the both groups, the clearance of renal calculi was checked by nephroscopy.

The insertion of nephrostomy tube at the end of surgery was optional and depends on the stone clearance rate and complications.

Patients were discharged after removal of nephrostomy tube with stable general condition, usually in the second post operative day.

In case of residual stones if left behind and proved by imaging study a second look nephroscope performed before discharging the patient.

For all participants, follow up abdominal ultrasound was performed at the first day and one month post-operatively.

### STATISTICAL ANALYSIS

Comparison between S-PCNL and Mini-PCNL regarding stone Free rate, complications, operative time and hospital stay besides other perioperative characteristics by using Chi square ( $\chi^2$ ), Student-t, as required. We have used Statistical Package of Social Science Software program (SPSS), version twenty for statistical analysis. In these study values < 0.05 were regarded statistically significant.

### RESULTS

In this study we compared 23 patients in Mini-PCNL group vs. 27 patients in S-PCNL group. Both groups were same in term of patients recruiting. Table 1 reveals the patient characteristics in both groups. The table 2 shows the Comparison of Clinical data of participants and surgical outcomes of the two groups.

**Table 1: Shows Participants Characteristics**

Patients characteristic Mean $\pm$ (SD)	S-PCNL n=27	Mini-PCNL n=23	P value
Sex ratio (male: female)	17:9	16:7	>0.05
Age(years)	42( $\pm$ 16)	45( $\pm$ 15)	>0.05
BMI (Kg/m <sup>2</sup> )	23.8 ( $\pm$ 2.6)	25.8 ( $\pm$ 2.6)	>0.05
Stone size (cm)	2.10 ( $\pm$ 0.2)	2.19 ( $\pm$ 0.5)	>0.05
Laterality (Left: Right)	19:6 (2bilateral)	17:8 (1bilateral)	>0.05

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<b>Diabetes</b>	2/27 (7%)	2/23(8%)	>0.05
<b>HTN</b>	5/27(18%)	4/23(17%)	>0.05

BMI; body mass index, HTN; hypertension. Data are showed as number of patients (%) or mean  $\pm$  SD (range) as

required. P value >0.05 is not significant statistically.

**Table 2: Shows the Result Comparison between Mini-PCNL, S-PCNL Patients**

Variables Mean ( $\pm$ SD):	Mini-PCNL n=23	S- PCNL n=27	P value
<b>SFR %</b>	92%(5.1)	(93%)(4.4)	>0.05
<b>Hospital stay (in days)</b>	2.43 $\pm$ 1.46 (0–10)	4.29 $\pm$ 1.28 (2–10)	<0.05
<b>Complications (modifiedClavien)</b>	2/23(8%)	5/27(18%)	<0.05
<b>Hb drop ( g/dL)</b>	1.65 (1.20)	3.13 (1.06)	<0.05
<b>Operation time, Min</b>	47 (4.3)	50 (5.6)	>0.05
<b>Analgesic need (mg tramadol prn)</b>	55 $\pm$ 50	70 $\pm$ 50	>0.05
<b>Postoperative pain (VAS score).</b>	3.1 $\pm$ 0.6	3.3 $\pm$ 0.5	>0.05

Data are showed as number of patients (%) or mean  $\pm$  SD (range) as needed. SFR %; stone free rate per cent. Visual analogue scale (VAS). Hb; Haemoglobin. P value <0.05 significant. P value not significant >0.05.

### DISCUSSION

Few studies have been done to make a comparison between the standard-PCNL vs. Mini-PCNL<sup>6</sup>. A lot of them were recruiting a small number of participants<sup>7</sup>, applied various lithotripsy protocol in both groups<sup>8</sup>, have conducted various stone sizes<sup>9</sup>, position<sup>10</sup>, or complexity<sup>11</sup>. The objective of the recent finding was to compare the post-operative outlook and outcomes of Mini-PCNL vs S-PCNL. Our pre-operative characteristic data showed that no difference in both groups. The outcome of this finding is indicating that the main benefit of Mini-PCNL were vivid when we analyzed operation complications

which were importantly superior as a general and particularly complication such as, leakage, blood dropping and fever<sup>6</sup>. It is counted about 8% for Mini-PCNL whereas 18% of patients with S-PCNL got surgical renal complication. The present findings are in agreement with study conducted by Sakr *et al*, 2017 and his colleagues.

In term of Hospital stay, patients who underwent Mini-PCNL, was significantly lower than those in the S -PCNL (2.43  $\pm$  1.46 (0–10), 4.29  $\pm$  1.28 (2–10), respectively. It is important to mention that one of the main disadvantages of S-PCNL is longer hospital stay and medication and higher complication rate<sup>12</sup>. Hence, these scientific papers proved further backup for the present results.

Interesting results can be seen in analgesic need, our results revealed that little difference in pain (as measured by analgesic need) between the mini-PCNL

and S-PCNL groups. This study back up the general understanding that post-operative pain is mainly due to the presence of nephrostomy tube regardless the size of tracts<sup>13,14</sup>.

In order for Mini-PCNL to be a good option alternative to S-PCNL, it has to be fully acceptable with morbidity. According to our study, only a stone-free rate SFR that reaches about 100per cent would outweigh the disadvantages of a surgical operation need general anaesthesia. Many publishers have reported that mini-PCNL have a SFR that was in range of 60 percent to 90percent<sup>15, 16, 17</sup>. In our result, we didn't see significant difference between them in term of SFR% (92%)(5.1) for mini-PCNL vs (93 %)( 4.4) for S-PCNL.

Our finding has shown that there was a slight difference operation time which was estimated about 47 (4.3) min for Mini-PCNL Vs 50 (5.6) min for S-PCNL. In a research conducted by Yang et al. was close to our result where he reported an operation duration of 45 min, SFR of 97.2 per cent, and without need of blood transfusion for mini-PCNL candidates with upper ureteric stones<sup>18</sup>. Postoperative pain in (VAS score) both groups have shown no significant variation between the participants. Feng et al. and his colleague evaluated that VAS at first post-operative day and a week after operation was showed no significant difference<sup>8</sup>. In contrary to our result Zhu et al., mini-PCNL revealed advantages in terms of VAS in the first postoperative day. This could be due either the smaller tract applied or omission of the nephrostomy tube<sup>19</sup>.

## CONCLUSIONS

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Mini-PCNL has nearly similar SFR out come to S-PCNL with statistically significant lower complication rates.

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## ثوخته

بابهت: بتر اور ديا دوو ريكييت دهينه ئهجامدان بو نسته رطريا بتر كين طولضيسكا كو مئزتر بن ذ

20ملم

## S-PCNL و Mini-PCNL

**تشكين و نارمانج:** نارمانج ذ ئهظي طهكوليننا زانستي ئهقوة كو جياوازي د ناظبئرا دوو ريكيين نيشترطري كو د بيذنئى Mini-PCNL و S-PCNL بو طهكرنا بتر كين دناف طولضيسكا دا كو رووبئرئ وان نثر بيت ذ 20 مليمئترا. بو زانين ئهظ نيشترطرية هاتبونه ئهجامدان ل هئر دوو نهخوشخانيين نازادى و نهخوشخانا طهذين يا تايبهت ل دهوكئى.

**ريكين كارئ:** ئهظ طهكولينه هاته ئهجامدان د ناظبئرا ههظا 4- 2018 ههئا ههظا 4- 2019 كو تئدا 50 نهخوش هاتبونه دابهشكرن ل سئر دوو طرووئان بو وان هئر دوو ريكييت هاتينه دياركرن.

**ئهجام:** د ئهظي طهكولينئدا هاته ديتن كو ئهقو نهخوشيهت تشكيننا ذ جورئى Mini-PCNL بو هاتيه كرئ كيئر خوين هاته رشتن و كاتئى نيشترطريئ كيئر بوو و ههروهسا مانا وان د ناظ نهخوشخانيئدا كيئر بو نئشى نيشترطريئ بتر اور د دطئل ريكا ديئر S-PCNL.

**دهستهفتين طهكولينئ:** ئهظ طهكوليننا زانستي دياركر و سهلماند كو ريكا Mini-PCNL بو ئهجامدانا تشكينيهت طريداى ب بتر كيت طولضيسكا طه باشتره زور كاريطرتره ذ ريكين كهظن ب ناظ و نيشان S-PCNL.

## الخلاصة

عملية حصى الكلى (أكبر من 2سم) بناظور الجلد المصغر (Mini-PCNL) مقارنة بطريقة المنظار القياسي S- (PCNL) في محافظة دهوك.

**الخلفية والأهداف:** البحث يهدف الى مقارنة تقنية منظار الكلى المصغر عبر الجلد بالمنظار القياسي لإستخراج حصى الكلى ( أكبر من 2سم) ونسبة الإختلاطات لدى المرضى في محافظة دهوك.

**المرضى وطرق العمل:** أجريت هذا الدراسة السريرية في الفترة بين نيسان 2018 ونيسان 2019 على 50 مريض تم توزيعهم الى مجموعتين في مستشفى آزادي وظنين في محافظة دهوك.

**النتائج:** بيانات البحث أظهرت أن هناك فرق ذات دلالة إحصائية مهمة في مستوى خضاب الدم بعد العملية، زمن استغراق العملية، الحاجة إلى مسكنات الألم، فترة الرقود في المستشفى، ونسبة المضاعفات بين المجموعتين باستخدام إختبارات إحصائية مثل Chi Square and student-T- tests.

**الاستنتاجات:** أثبتت الدراسة أن تقنية إستخراج حصى الكلى عبر منظار الجلد المصغر لها نفس الدور في علاج حصى الكلى الأكبر من 2 سم ونسبة أقل من المضاعفات مقارنة بالمنظار القياسي.