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Evaluation of the safety and the reliability of day case mini-PCNL in treatment of renal stones 1 to 2 cm

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Abstract

Introduction. The capacity to execute mini percutaneous nephrolithotomy (PCNL) as a day case procedure in the treatment on renal stones measuring between one and two centimetres is being assessed in this study. Mini-PCNL has been employed more and more in the treatment on renal stones with favourable results in terms on stone clearance and low morbidities.

Aim. To find a reliable replacement for E.S.W.L. and R.I.R.S in treating small renal stones that is safe, efficient, and reliable with the shortest post-operative stay period.

Materials and methods. Seventy patients underwent surgery for kidney stones that ranged in size from 1 to 2 cm and had densities greater than 1000 H.U. They were split into two groups: group B received mini-PCNL and group A received regular PCNL. Both procedures were carried out while the patients was in the prone position. In group A, we fragmented the material with an electrohydraulic lithotripter and removed the resulting fragments using forceps. In contrast, group B employed a 30 w Quanta Holmium laser in dusting mode (0.5 j and 15 Hz) with 550 um laser fibre and relied on our exit plan for the double-J stent implantation, which avoided the necessity for a nephrostomy tube.

Results. Operation duration was significantly longer in mini-PCNL group ($p < 0.001$). Intraoperative extravasation and its severity were non-significantly less frequent in mini-PCNL group ($p > 0.05$). All patients operated with mini-PCNL underwent double j stent, while the other group included only two patients who necessitated double J insertion insertion, and the remaining 33 patients depended on the insertion on a nephrostomy tube together with a ureteric catheter.

Conclusion: Mini-PCNL is a dependable day case method that is safe for treating tiny kidney stones. Larger sample size studies could be required to confirm mini-PCNL as a day case technique.

Keywords: mini percutaneous nephrolithotomy, day case procedure, renal stones, intraoperative extravasation, double J insertion

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Оценка безопасности и надежности однодневной мини-чрескожной нефролитотомии при удалении почечных камней размером от 1 до 2 см

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Резюме

Введение. В этом исследовании оценивается возможность проведения мини-чрескожной нефролитотомии (ЧНЛ) в качестве однодневной процедуры для удаления почечных камней размером от одного до двух сантиметров. При удалении почечных камней все чаще применяется метод мини-ЧНЛ, показывающий высокую эффективность в плане удаления камней и низкой частоты осложнений.

Цель. Найти надежную замену дистанционной ударно-волновой литотрипсии (ДУВЛТ) и ретроградной внутрипочечной хирургии (РВП) при удалении небольших почечных камней, которая является безопасным, эффективным и надежным методом с кратчайшим послеоперационным периодом.

Материалы и методы. Семидесяти пациентам были проведены операции по удалению почечных камней размером от 1 до 2 см и плотностью более 1000 НУ. Пациенты были разделены на две группы: пациентам группы В была проведена мини-ЧНЛ, а пациентам группы А — обычная ЧНЛ. Обе процедуры проводились в положении лежа. В группе А камни фрагментировали электрогидравлическим литотриптером, а образовавшиеся фрагменты извлекали при помощи щипцов. В группе В, напротив, использовали гольмиевый лазер Quanta мощностью 30 Вт в режиме дробления камней «в пыль» (0,5 Дж и 15 Гц) с лазерным волокном 550 мкм, при этом полагались на методику завершения процедуры путем имплантации двойного J-образного стента, что позволяло избежать необходимости использования нефростомической трубки.

Результаты. В группе мини-ЧНЛ продолжительность проведения операции была статистически значимо дольше ($p < 0,001$). Интраоперационная экстравазация и ее осложнения в группе мини-ЧНЛ встречались незначимо менее часто ($p > 0,05$). Всем пациентам, оперированным методом мини-ЧНЛ, был установлен двойной J-образный стент, в то время как в другую группу были включены только два пациента, которым потребовалась установка двойного J-образного стента, а остальным 33 пациентам была установлена нефростомическая трубка вместе с мочеточниковым катетером.

Заключение. Мини-ЧНЛ представляет собой надежный метод однодневного лечения, который является безопасным для лечения мелких камней в почках. Для подтверждения эффективности использования мини-ЧНЛ в качестве однодневного метода могут потребоваться исследования с выборками большего размера.

Ключевые слова: мини-чрескожная нефролитотомия, однодневная процедура, почечные камни, интраоперационная экстравазация, введение двойного J-стента

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INTRODUCTION

In many communities, kidney stones are a serious health issue. Nephrolithiasis is becoming more common in people on all ages worldwide, and as a result, more adults and children are needing treatment for renal stone disease [1].

Retrograde intrarenal surgery (RIRS), percutaneous nephrolithotomy (PCNL), and extracorporeal shock wave lithotripsy (ESWL) are among the available treatments. Other therapeutic options such as open and laparoscopic renal operations are possible, however they should only be considered for specific patients [1, 2].

A perfect stone treatment plan should seek to remove all stones with the fewest possible operations and with the lowest possible risk on complications [3].

RIRS or ESWL are the two primary treatment modalities for renal stones less than 2 cm [2, 3].

Due to the required tools and disposables, such as the access sheath, extraction baskets, and laser fibres, the high costs pose a significant barrier to the widespread adoption on RIRS. Furthermore, a significant problem that may require the implantation on a double-J stent two to three weeks before executing RIRS to aid in passive dilatation is the tight, non-dilatable ureters [3].

However, some stones may not respond to ESWL and ESWL may take more than one session to clear a single stone. Urinary stenting is frequently required before or even after ESWL [3].

We are attempting in this study to find a reliable replacement for E.S.W.L. and R.I.R.S in treating small renal stones that is safe, efficient, and reliable with the shortest post-operative stay period [4]. Treatment on a single small renal stone with multiple procedures carries much suffering with pain, and hospitalization is necessary [5].

Purpose on researching is to find a reliable replacement for E.S.W.L. and R.I.R.S in treating small renal stones that is safe, efficient, and reliable with the shortest post-operative stay period.

MATERIALS AND METHODS

Study design

A thirty-month, double-blind, randomized clinical investigation including seventy individuals. Including seventy patients who had regular PCNL or mini-PCNL for a single kidney stone with a diameter on one to two centimetres and a density on more than one thousand H.U. Every patient underwent surgery at the hospitals of Ain Shams University.

Sample size justification

A minimum sample size on 27 cases per group was needed to achieve statistical significance between the assumed postoperative hemoglobin decline (gm/dL) in mini-PCNL (0.87 ± 0.72) and standard-PCNL (1.48 ± 0.83), using PASS 11th release and power = 0.80 and $\alpha = 0.05$. For the sake on additional analysis and potential sample attrition, we included 35 cases in each group.

Ethical considerations

The local ethical committee gave its approval to the project. The trial was approved by the patients, who also received information about potential side effects, other treatment alternatives, and the possibility on a phased or auxiliary surgery.

Inclusion and exclusion

These patients had a single kidney stone that was between one and two centimetres in size and had a density on more than 1000 H.U. Patients with single kidney, untreated coagulopathy, skeletal abnormalities, congenital renal malformations, and renal impairment (defined as creatinine greater than 2 mg/dl) were not included in our sample. Neither were patients with renal stones less than 1000 HU in densities.

Pre-operative evaluation

Pre-operative Computed Tomography on the Urinary Tract (CTUT), normal laboratory investigations, physical examinations, and medical histories were all part on the initial thorough evaluation on patients.

Group A had a ureteric catheter (6 fr) and underwent prone PCNL with a nephrostomy tube. We extracted the resulting fragments using forceps after using an electrohydraulic lithotripter.

Group B had a prone mini-PCNL procedure performed without nephrostomy tubes and with a double J insertion. The Holmium YAG laser was used to break up the stones. We employed a 30 w Quanta Holmium laser in dusting mode (0.5 j and 15 Hz) using 550um laser fibre.

Data collection

Analyses were conducted on surgical outcomes, stone free rates, operational time, pain score, analgesic requirement, potential complications (based on the Calvien Dindo categorization system), and the suitability on mini-PCNL as a day case treatment. Success was defined as clearing the stone with no leftover fragments or fragments with a maximum dimension on less than 3 mm as determined by CTUT three weeks following the treatment.

Statistical analysis

Using IBM SPSS statistics (Statistical Package for Social Sciences) software version 28.0, IBM Corp., Chicago, USA, 2021, the gathered data were coded, tabulated, and statistically analyzed. The Shapiro-Wilk test was used to check for normalcy in quantitative data. The data was then defined as mean SD (standard deviation) and the minimum and maximum on the range, and the results were compared using an independent t-test between two separate groups. Number and percentage descriptions on qualitative data are compared using the Chi square test and, for variables with tiny predicted numbers, Fisher's exact test. When the p-value

was less than 0.050, it was considered significant; otherwise, it was considered non-significant.

Surgical Procedures

The identical pre-operative bowel preparation procedure was used on each patient. The day before the procedure, they had a 12-hour pre-operative fast and were given two tablets on Eucarbon every six hours. Third-generation cephalosporins were administered intravenously (IV) as a preventative measure to the patients.

General anaesthesia was used for the procedures on each subject. A 6 Fr ureteric stent was put under fluoroscopy guidance and guided by a sensor guide wire during a diagnostic cystoscopy procedure carried out in the lithotomy position. The stent was then fixed to an 18 Fr urethral catheter.

Mini-PCNL

An 18-gauge needle was inserted using the triangulation technique to the intended calyx, through which a very rigid guide wire was inserted under fluoroscopic guidance.

Amplatz dilators were used to dilate the tract up to 16 Fr. in order to pass a semi-rigid 16 Fr. plastic sheath. Subsequently, the Karl Storz, 16-feet mini-PCNL nephroscope was inserted into the intended calyx via the sheath. Holmium laser lithotripsy (Quanta system laser equipment) was used to fragment the stone. Quanta Holmium laser 30 w in dusting, using 550um laser fibres, 15 Hz frequency, and 0.5 j power.

Nephrostomy tubes were not inserted by us. As part on our departure plan, we had to implant a double J stent in order to carry out a day case surgery. The urethral catheter was positioned so that it could be taken out 12 hours following the procedure.

Standard PCNL

Once in the prone position, an additional stiff guide wire was inserted through an 18 gauge needle that was guided by fluoroscopy into the desired calyx. Using consecutive Amplatz dilatation devices, tract dilatation was carried out up to 30 fr. We fragmented the material using an electro-hydraulic lithotripter, then extracted the resulting fragments using extraction forceps. All patients had a nephrostomy tube placed, which would be taken out 48 hours later. Meanwhile, the ureteric catheter was fastened to the patient's body and would be taken out on the third postoperative day.

Two on the thirty-five surgical patients required a double J stent to replace their ureteric catheters because on unanticipated extravasation.

Post-operative follow up

Throughout the early post-operative hours, the surgical patients were closely monitored, with vital signs, urine colour, and amount and colour recorded. When

necessary, analgesics were administered and discomfort was managed. Hb evaluation twelve hours following surgery.

With the exception on one patient who had a slight to moderate fever on the first day and required an extra day in the hospital, all patients who underwent mini-PCNL surgery were released from the hospital within 18 and 24 hours following the procedure. Within the nephrostomy tube was removed, all on the patients who underwent surgery using the usual PCNL approach were released from the hospital within two to three days.

The patients were apprised on the scheduled follow-up appointments and instructed on potential indications on difficulties that could require an early return to the hospital rather than waiting for the scheduled dates. Between visits, phone consultations were offered.

After three weeks, all patients had follow-up CT scans to evaluate the stone clearance and determine whether any additional treatment was necessary.

RESULTS

Two cases in standard-PCNL group lost follow up, the analysis followed intention-to-treat strategy where the outcomes related to the allocated 35 cases (Fig. 1).

Table 1 showed that: No significant difference between the study groups regarding demographic characteristics; age and gender as well as stone characteristics; laterality, site, density, size and History on failed ESWL.

Figure 1. CONSORT flow chart on the studied cases
Рисунок 1. Блок-схема изученных случаев CONSORT

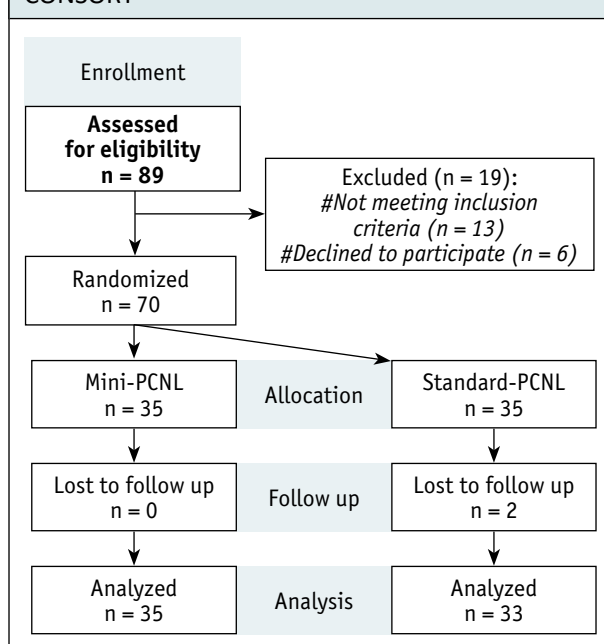


Table 2 and showed that: Operation duration was significantly longer in mini-PCNL group.

Table 3 and showed that: Intraoperative extravasation was non-significantly less frequent in mini-PCNL group. Among cases with intraoperative extravasation, severity was non-significantly lower in mini-PCNL group.

All the patient operated with mini-PCNL underwent double j stent, while the other group included only two patients who necessitated double J insertion insertion, and the remaining 33 patients depended on the insertion on a nephrostomy tube together with a ureteric catheter.

Table 4 showed that: Mini-PCNL group significantly had longer operation duration, less frequent intraoperative

Table 1. Demographic and stone characteristics between the study groups

Таблица 1. Демографические характеристики и свойства камней в группах исследования

Variables		Mini-PCNL (Total = 35)	Standard-PCNL (Total = 35)	p-value
Age (years)		39.3 ± 10.3	41.7 ± 9.3	0.309 [^]
Gender	Male	20 (57.1%)	21 (60.0%)	0.808 [#]
	Female	15 (42.9%)	14 (40.0%)	
Laterality	Right	17 (48.6%)	15 (42.9%)	0.631 [#]
	Left	18 (51.4%)	20 (57.1%)	
Site	Renal pelvis	13 (37.1%)	15 (42.9%)	0.896 [§]
	Upper calyx	2 (5.7%)	1 (2.9%)	
	Middle calyx	10 (28.6%)	11 (31.3%)	
	Lower calyx	10 (28.6%)	8 (22.9%)	
Density (HU)		1313.9 ± 146.4	1325.2 ± 156.9	0.756 [^]
Size (mm)		1.6 ± 0.3	1.5 ± 0.2	0.704 [^]
History on failed ESWL		11 (31.4%)	9 (25.7%)	0.597 [#]

Data presented as Mean ± SD or n (%). [^] Independent t-test.

[#] Chi square test. [§] Fisher's Exact test.

Table 2. Operation duration (minutes) between the studied groups

Таблица 2. Продолжительность операции (минуты) в группах исследования

Measures	Mini-PCNL (Total = 35)	Standard-PCNL (Total = 35)	p-value
Mean ± SD	54.3 ± 7.6	45.5 ± 8.5	<0.001* [^]
Range	37.0–76.0	31.0–65.0	

* Significant. [^] Independent t-test.

Table 3. Intraoperative extravasation between the studied groups

Таблица 3. Интраоперационная экстрavasация в группах исследования

Variables		Mini-PCNL	Standard-PCNL (Total = 35)	p-value
Intraoperative extravasation (n, %)		Standard-PCNL (Total = 35)	3 (8.6%)	0.614 [§]
			p-value	
Severity (n, %)	Mild	2 (100.0%)	1 (33.3%)	0.999 [§]
	Moderate	0 (0.0%)	2 (66.7%)	

[§] Fisher's Exact test.

Table 4. Operative findings between the studied groups

Таблица 4. Результаты операций в группах исследования

Variables		Mini-PCNL (Total = 35)	Standard-PCNL (Total = 35)	p-value
Operation duration (minutes)		54.3 ± 7.6	45.5 ± 8.5	<0.001**
Intraoperative extravasation		1 (2.9%)	3 (8.6%)	0.614 [§]
Severity (Total = 1,3)	Mild	1 (100.0%)	1 (33.3%)	0.999 [§]
	Moderate	0 (0.0%)	2 (66.7%)	
Type (n, %)	Double J stent	35 (100.0%)	2 (5.7%)	<0.001**
	Ureteric stent and nephrostomy	0 (0.0%)	33 (94.3%)	
Hemoglobin drop (gm/dL)		0.6 ± 0.1	1.7 ± 0.1	<0.001**
Need to blood transfusion		0 (0.0%)	0 (0.0%)	NA

Data presented as Mean ± SD or n (%). NA: Not applicable. * Significant.

^ Independent t-test. # Chi square test. § Fisher's Exact test.

Table 5. Postoperative hemoglobin drop and need to blood transfusion between the studied groups

Таблица 5. Снижение уровня гемоглобина после операции и необходимость в переливании крови в группах исследования

Variables		Mini-PCNL (Total = 35)	Standard-PCNL (Total = 35)	p-value
Hemoglobin drop (gm/dL)	Mean ± SD	0.6 ± 0.1	1.7 ± 0.1	<0.001**
	Range	0.4–0.7	1.5–1.9	
Need to blood transfusion (n, %)		0 (0.0%)	0 (0.0%)	NA

NA: Not applicable. * Significant. ^ Independent t-test.

Table 6. Postoperative pain (VAS-10) between the study groups

Таблица 6. Интенсивность послеоперационной боли (ВАШ-10) в группах исследования

Postoperative time		Mini-PCNL (Total = 35)	Standard-PCNL (Total = 35)	p-value
Postoperative pain (VAS-10)				
Hour-0		2.1 ± 0.7	3.3 ± 0.5	<0.001**
Hour-2		2.9 ± 0.8	3.6 ± 0.7	<0.001**
Hour-4		2.7 ± 0.6	3.9 ± 0.6	<0.001**
Hour-6		1.2 ± 0.5	4.5 ± 1.0	<0.001**
Hour-12		1.1 ± 0.3	4.5 ± 1.0	<0.001**
Hour-18		1.1 ± 0.2	2.7 ± 0.6	<0.001**
Hour-24		1.0 ± 0.2	2.3 ± 1.0	<0.001**
Postoperative fever		1 (2.9%)	4 (11.4%)	0.356 [§]
Duration on hospital stay (n, %)	One day	34 (97.1%)	0 (0.0%)	<0.001**
	Two days	1 (2.9%)	22 (62.9%)	
	Three days	0 (0.0%)	13 (37.1%)	
Residual fragments (n, %)		1 (2.9%)	3 (8.6%)	0.614 [§]
Size (n, %)	<3.0 mm	1 (100.0%)	1 (33.3%)	0.999 [§]
	≥3.0 mm	0 (0.0%)	2 (66.7%)	

Data presented as Mean ± SD or n (%). NA: Not applicable. * Significant.

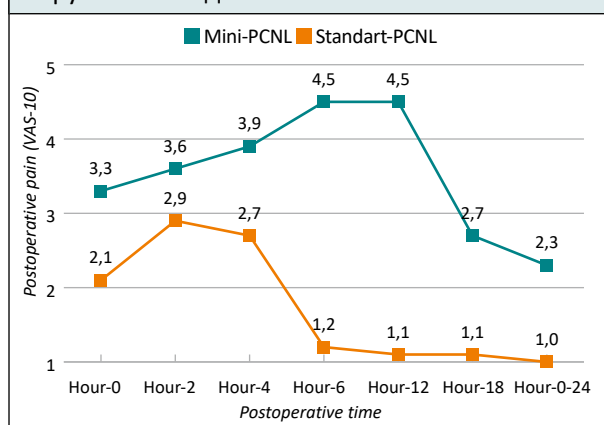
^ Independent t-test. # Chi square test. § Fisher's Exact test.

extravasation, and lower hemoglobin drop. Among cases with intraoperative extravasation, severity was non-significantly lower in mini-PCNL group.

Concerning post-operative fever, two patients suffered from post-operative fever, one in each group. The fever started at the early postoperative hours, did not exceed 38.5 °C and it subsided spontaneously by the end on the 1st postoperative day. For the patient operated by Mini-PCNL technique, he needed to extend hospitalization for another day.

Table 5 showed that: Postoperative hemoglobin drop was significantly lower in mini-PCNL group. Need to blood transfusion was not detected in either group.

Table 6 showed that: Pain in mini-PCNL group was low immediately postoperative, and then increased to reach its moderate peak at hour-2, after then decreased gradually until hour-4, followed by rapid reduction to reach a low base at hour-6, and continued gradual reduction until hour-24. Pain in standard-PCNL group was moderate immediately postoperative, and then increased to reach its high peak at hour-6 with a constant level until hour-12, after

Figure 2. Postoperative pain between the studied groups**Рисунок 2.** Наличие послеоперационной боли в группах исследования

then decreased rapidly until hour-24 to reach a moderate level. Postoperative pain was significantly lower in mini-PCNL group throughout the studied time points.

Mini-PCNL group significantly had less frequent postoperative fever, shorter duration on hospitalization, less frequent residual fragments. Among cases with residual fragments, size was non-significantly smaller in mini-PCNL group (Fig. 2).

Table 7 showed that: Duration on hospitalization was significantly shorter in mini-PCNL group which serves the purpose on performing mini-PCNL as a day case procedure.

Table 8 and Fig. 3 showed that: Residual fragments were significantly less frequent in mini-PCNL group. Among cases with residual fragments, size was non-significantly smaller in mini-PCNL group.

DISCUSSION

Due to its lower complication rates compared to regular PCNL and higher stone clearance rates compared to other treatment alternatives, such as ESWL, mini-PCNL has gained popularity as an alternative for the treatment on renal stones.

In this study, the reliability on mini-PCNL as a day case procedure was assessed. Two groups on 35 patients, each with a single renal stone measuring 1 to 2 cm and a density exceeding 1000 H.U., were operated on; group A received standard prone PCNL technique, while group B received mini-PCNL technique.

There were no appreciable differences between the two groups, and their demographic and stone features were almost identical.

Considering the step on insertion on a double j (two patients in group A required double j insertion),

Table 7. Duration on hospitalization between the studied groups**Таблица 7.** Продолжительность госпитализации в группах исследования

Variables		Mini-PCNL (Total = 35)	Standard-PCNL (Total = 35)	p-value
Duration (n, %)	One day	34 (97.1%)	0 (0.0%)	<0.001**
	Two days	1 (2.9%)	22 (62.9%)	
	Three days	0 (0.0%)	13 (37.1%)	

* Significant. # Chi square test.

Table 8. Residual fragments between the studied groups**Таблица 8.** Анализ остаточных фрагментов в группах исследования

Variables		Mini-PCNL (Total = 35)	Standard-PCNL (Total = 33)	p-value
Residual fragments (n, %)		1 (2.9%)	2 (6.0%)	0.614 [§]
		Total = 1	Total = 2	
Size (n, %)	<3.0 mm	1 (100.0%)	1 (50%)	0.999 [§]
	≥3.0 mm	0 (0.0%)	1 (50%)	

[§] Fisher's Exact test.

the surgical time for conventional PCNL technique was substantially shorter (45.5 ± 8.5) than for mini-PCNL technique (54.3 ± 7.6). S.N. Mahmood et al. found that the mini-PCNL technique had a significantly shorter operative time (39.58 ± 24.7). Their study included 120 patients who had the same stone characteristics as ours, but they measured the operative time after turning the patient to a prone position, whereas we measured it from the moment anaesthesia was induced [4].

There were no notable intraoperative problems, severe bleeding, or organ damage in either group. While Standard PCNL saw extravasation in 3 individuals out on 2 moderate cases that required the insertion on a double j rather than leaving ureteric catheters, Mini-PCNL provoked alower incidence on extravasation with only 2 mild cases.

While none on the surgical patients required blood transfusions, mini-PCNL had a markedly lower Hb decline (0.6 ± 0.1) than traditional PCNL (Mean \pm SD 1.7 ± 0.1), which is a major benefit on the mini-PCNL approach. For mini-PCNL, S.N. Mahmood et al. reported a Hb decline mean \pm SD 0.78 ± 0.49 , which is somewhat larger than our study [4].

Noting that they did not rule out patients with comorbidities, S. Khadgi et al. reported blood transfusion to 2.4% (2 on 83) on mini-PCNL and 12.9% (9 on 70) on regular PCNL performed patients [5].

The mini-PCNL approach was used to treat day case patients, and the results showed a considerable reduction in the degree and duration on post-operative pain as well

as the need for analgesics. When comparing mini-PCNL to regular PCNL, S. Khadgi et al. found a significant reduction in the intensity and duration on discomfort [5].

Grade I with modifications Fever ($<38.5^{\circ}\text{C}$) was a Calvien problem that affected 2 patients (2.9% on each group). The mini-PCNL patient's temperature reached 38.2°C , requiring an additional day on hospitalisation against the day-case procedure rule. In contrast, the conventional PCNL patient's fever (38.1°C) had no effect on the pre-detected hospitalisation term. Ten patients (8.3%) experienced early post-operative fever, according to Noori et al.; all on them spontaneously recovered in less than a day [4].

The length on hospital stay differed greatly between the two groups; individuals UNDERGOING mini-PCNL operations stayed in the hospital for a maximum on one day, with the exception on one patient who required an additional day. A hospitalisation period mean \pm SD 1.18 ± 0.944 days was reported by S.N. Mahmood et al. [4]. Conversely, on the patients who underwent PCNL surgery, twenty-two left the hospital after the third day, and the remaining thirteen left after the second.

Between the two groups, the SFR ascertained by CTUT was similar, with PCNL SFR being 94.3% and min-PCNL SFR being 97.1%. Two patients had residual fragments after routine PCNL; the other patient's fragment was 5 mm and required additional care, while the first patient's residual fragment was less than 3 mm, which is regarded as negligible. There is just one patient for Min-PCNL, and the leftover fragment is only 3 mm in size, therefore it is negligible.

While S.N. Mahmood et al. reported an overall SFR on 93.3% for patients who underwent mini-PCNL surgery, S. Khadgi et al. found SFRs for regular PCNL on 88.6% and 83% for mini-PCNL [5]. While S.N. Mahmood et al. included individuals with almost identical characteristics

to those in our analysis, S. Khadgi et al. included a higher stone burden than we did [4, 5].

Mini-PCNL is more cost-effective than other day case treatments since it requires a significantly smaller initial capital expenditure than R.I.R.S. because its metallic scopes and instruments are not brittle and can be sterilised and reused without causing damage. Mini-PCNL uses less disposables in terms on operating expenses [6–10].

In terms on operating expenses, mPCNL uses less disposables. Operating expenses are still kept to a minimum. Disposables are costly and essential for RIRS. The operational costs increase to 600–900 USD per case if disposable scopes are utilized. It has been discovered that other operating expenses, like hospital and operating room time, are comparable [11–15].

The surgeon's decision may also be influenced by other variables. Technical proficiency in one or more areas is unquestionably essential. Furthermore, consent for every choice should always be obtained from the patient. Patients will be required to pay for their care outright or in part in several countries. Of course, prices associated with disposables also play a significant role [16, 17].

CONCLUSION

Mini-PCNL has the advantages on being a day case method that is attainable, dependable, achieves high levels on SFR, and has a low rate on complications. In terms on preserving blood and reducing the need for blood transfusions, it might be seen as a great choice.

Early healing and a prompt return to work are advantages on mini-PCNL as a day case surgery. Increased patient happiness and cost effectiveness are the outcomes on this.

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