Benha Journal of Applied Sciences (BJAS) **print : ISSN 2356–9751**
Vol.(5) Issue(4) Part (2) (2020), xxx-xxx **online : ISSN 2356–976x**
http://bjas.bu.edu.eg

Mini- Percutaneous Nephrolithotomy (MPCNL) VS. Flexible Ureterorenoscopy (RIRS) for Renal Stones >2cm

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Abstract

To evaluate the efficacy and safety of mini percutaneous nephro-lithotripsy (mini PCNL) and retrograde intrarenal surgery (RIRS) in treatment of renal stones larger than 20mm in its longest diameter. Patients & Methods: In a prospective randomized study including 40 patients divided into two groups each 20 patient. Gathering An included 12 guys and 8 females with age went from 15 to 62 years had smaller than expected PCNL for renal pelvic and calyceal stones. Gathering B included 8 guys and 12 females with age extended from 18 to 65 years of age had RIRS. Adaptable ureteroscopy was utilized for pelvic and calyceal stones utilizing holmium:YAG laser (tidying approach). In the two gatherings the strategy result regarding Operative time, Blood misfortune, clinic remain, entanglements utilizing changed Clavien reviewing framework , the need of assistant systems , stone free rates following 3 weeks by utilizing CTUT, were assessed measurably. Measurable investigation of the information indicated that there was immaterial contrast between the {mean ± SD} of the BMI in patients of gathering A which was {27.850±3.183} kg/m2; while in patients of gathering B was {29.700±7.927} kg/m2 . With respect to measure, there was immaterial contrast between the {mean ± SD} of gathering A which was 2.57±0.22mm, while in bunch B was 2.6±0.24mm. With respect to usable time the {mean ± SD} of gathering A was 104.43±14.79 minutes which was altogether (P<0.05) higher contrasted with bunch B 59.71±19.44 minutes. As with respect to emergency clinic stay it was unimportantly (P lower 0.05) higher in bunch A 1.41±0.46 days contrasted with bunch B 1.29±0.44 days. Concerning free rate 89 % of patients rewarded with bunch A were without stone (17 out of 20), while in bunch B 83.4% of patients were sans stone (16 out of 20) following 3 weeks by utilizing CTUT imaging. As to utilizing changed Clavien evaluating correlation with our investigation in which Grade 1: 1 in bunch An and 0 in bunch B , grade 2: 1 in bunch An and 0 in bunch B , grade 3A : 1 in bunch An and 0 in bunch B likewise grade 3B : 0 in bunch An and 0 in bunch B additionally 0 in grade 4 and 5 in the two gatherings In patients with renal stones bigger than 20 mm , results indicated that little PNCL has higher stone free rate and longer employable time than RIRS in cost of higher entanglements rate, blood misfortune, and longer medical clinic remain.

1. Introduction

EUA rules prescribe to do PCNL in huge renal stones more than 2cm and additionally when ESWL isn't attainable in lower calyx stones from 1-2cm [1].

This method shows high SFR running from 76% - 98% in the writing .

Upgrades has been made as respect size of instrumentation to accomplish less horribleness like blood misfortune , torment , renal harm . so scaled down endoscope and small tract 11-20Fr is created from the start for pediatric patients huge stones [2-3].

Presently it is considered as treatment alternative additionally for grown-up for various stone size and area.

RIRS is created from the outset for treatment of littler renal stones .

Utilizing retrograde medical procedure pulled in urologists to attempt to manage a lot bigger stones in any case time of operation. [4].

PCNL still the standard treatment for huge stones as it gives high SFR in spite of the fact that it shows high horribleness and complexity rates [5-6].

When RIRS show less dreariness and entanglement rates urologists begins managing enormous stones by RIRS . later on EUA rules put RIRS as a first choice of some surgeons [6-7].

PCNL shows a few disadvantages as dying, torment, huge track, organ injury, long emergency clinic remain, yet in addition have focal points of about 90% SFR in any case its location [8].

Huge gathering of patients, for example, sullen hefty and draining issue are contraindicated for PCNL with the goal that another methodology can be attempted as a non intrusive method [9].

RIRS is utilized for the board of lower polar stones and become progressively famous with enormous headway that encourage its use [10-11].

Today it is considered as an option for PCNL to diminish its risks [12-13]

Late investigations shows practically identical SFR of RIRS from 77% to 90% for renal stones and 62% to 85% for lower polar stones [14].

A few places of urology applying RIRS shows higher achievement rates in treatment of enormous renal stones so it turns out to be more alluring than ESWL [15].

2. Patients and methods

Between September 2017 and September 2019 forty patients, running from 15 to 65 years of age, admitted to the Urology Department, giving renal pelvis or calyceal stone (>2cm)

Tolerant evaluation included definite clinical history, physical assessment and research facility tests including urinalysis, pee culture, total blood tally, and serum natural chemistry. Renal stone was determined to have registered tomography (CT) (counting hub, sagittal and transverse areas). Stone size was surveyed as the longest hub of the stone on CT examine.

All patients were educated about the focal points, weaknesses and plausible entanglements of both m PNL and RIRS before the determination of the methodology.

Patients chose the medical procedure type without anyone else without being under any impacts and

composed educated assent was acquired from all patients preceding the medical procedure. Patients with the historical backdrop of past urinary stone medical procedure or urinary abnormality were prohibited. Patients were separated into

Twogatherings as per the patients' inclination of medical procedure type. Gathering 1 comprised of 20 patients who experienced mPNL and Group 2 comprised of 20 patients rewarded with RIRS.

All patients were assessed with serum organic chemistry and blood check

At the day after medical procedure. Likewise, all patients experienced CT for the stone leeway, at the primary postoperative month. Treatment achievement was characterized as sans stone status or clinically inconsequential

Leftver parts ≤4 mm. Patients were lined up at regular intervals with urinalysis, pee culture and ultrasonography.

Sans stone status, postoperative difficulties, usable time and hospitalization time were looked at in the two gatherings. Chi-square and t-

Test were utilized for factual investigation and measurable hugeness was characterized as p esteem <0.05 at 95% certainty stretch.

2.1 Operative Technique Gathering 1: mPCNL

The patient was set in lithotomy position and a 5F retrograde end flushing ureteric catheter was embedded. The tip of the catheter was sited at the renal pelvis or inside the upper shaft calyx, and its position was affirmed by ingraining a limited quantity of radiographic difference medium into the gathering framework.

A Foley catheter (6-10Fr) contingent upon patients' age and urethral gauge size was embedded per urethra and taped to the ureteric catheter.

Of every one of the 20 patients, we acted in recumbent situation with the side of the enthusiasm at the edge of the table with a little pad set under the flank to hoist it 15-20 degrees, at that point cleansing of the skin by povidone-iodine 10% arrangement, at that point toweling the patient was kept warm all through the strategy

The track was then expanded consecutively at first by utilizing plastic fascial dilators 6, 8, and 10F up to 16 F. The 16F metal sheath was then disregarded the 16F dilator, and once the tip of the sheath is affirmed inside the gathering framework, the dilator was evacuated under fluoroscopic direction .

This metal sheath 16F has a sideway for association with pull framework which encouage recovery of rock through the method.

Stones were divided utilizing 12Fr RZ nephroscope and pneumatic lithotripsy , and the sections expelled consecutively by utilizing different kinds of stone getting a handle on. the patient ureteral catheter was pulled back after addition of guide wire and supplanting it by JJ

Gathering 2

All methods were performed by 7.5-Fr (Storz, FLEX-X2,) adaptable ureteroscope. All patients got a third era cephalosporin at the acceptance of sedation. Under general sedation, patients were put in the lithotomy position on a fluoro- - endoscopic table. After by passing a 0.038-inch security guidewire into the renal pelvis, a ureteral get to sheath (9.5/11.5 or 12/14Fr) was set to take into consideration ideal representation, to keep up low intrarenal pressure, and to encourage extraction of stone parts. For the cases where the 12/14Fr ureteral get to sheath couldn't advance normally under the fluoroscopic control, 9.5/11.5Fr sheath was utilized. The stones were divided by a holmium: YAG laser (Lisa; Sphinx 30 W, Katlenburg University, Germany) (272µ bore fiber) until they were regarded little enough to pass precipitously. Toward the start of the laser lithotripsy, the laser working boundaries were 1.5 Joule/11 Hertz and when the stone sizes diminished to 10 mm the boundaries were changed to 10 J/12 H so as to maintain a strategic distance from the pneumatic impact of the laser, which could relocate the stone to different posts. Bin extraction of lingering sections was not routinely performed; notwithstanding, some remaining parts were expelled by tipless nitinol bushels for stone examination. Toward the finish of the methodology, a twofold J stent was set routinely in all patients. JJ stents of the patients were expelled at postoperative first month.

3. Results

This study included 40 patient (20 male and 20 female) with a renal pelvis or calyceal stone (right side in 15patients and left side in 35 patients), all cases were done in supine position according to surgeon preferance. Mean ± standard deviation (SD) of age was 36.06±12.28 rang from (15-65).. Stone size, operative, and fluoroscopy times had mean ± SD of 2.37±0.22mm& (2.1-3.0)min, 84.07±26.3min (40-120), 6.96±2.32 (range 3-10 minutes), respectively.

Twenty eight patients had radiopaque stones, whereas 12 patients had radiolucent stones. Mean ±SD of hospital stay duration was 1.05±0.55 (range 1-3 days) . We observed mean preoperative hemoglobin ± SD of 13.81±0.96 (12.5-14.5)mean postoperative hemoglobin± SD of 13.18±1.09 (11.5-14.5)

Only one case of m PCNL had significant bleeding for which one unit blood was transfused. One patient of m PCNL had renal pelvic perforation and extravasation which was a small perforation and resolved with Double J stent and conservative measures , nephrostomy tube was inserted in both cases. Two cases of m PCNL developed postoperative fever .

Primary stone free rate was 89% in m PCNL & 83.4 % in RIRS which increased to 100% after successfully treating the residual fragments by a second percutaneous procedure in 3 cases of m PCNL & in 5 cases of RIRS (12.5)%

Table (1) Comparison between (M PCNL) and (RIRS)according to stone character & location.

	mPCNL (35)	RIRS (35)	Statistical test (x^2)	P value
Size mean ±SD	2.57±0.22mm	2.6±0.24mm	St t= 1.28	0.24
Site				
Lower calyx	4	6	FET= 9.85	0.037*
Lower calyx +pelvis	5	3		
Pelvis	3	2		
Upper calyx	2	4		
Middle calyx	6	5		
Density				
Opaque	15	13	2.7	0.18
Lucent	5	7		

Table (2) Comparison between (M PCNL) and (RIRS) according to perioperative data.

	mPCNL (35)	RIRS (35)	Statistical test (x^2)	P value
Operative time/minutes mean ±SD	104.43±14.79	59.71±19.44	St t=10.83	<0.001**
Fluoroscopic time mean ±SD	8.11±2.05	5.8±1.98	St t=4.8	<0.001**
SFR				
Residual (2nd look)	3	4	0.47	0.50
Stone free	17(89)	16(83.4)		
Hospital stay mean ±SD	1.41±0.46	1.29±0.44	St t=1.19	0.24
1 day	10	15	FET= 2.84	0.25
2 days	8	5		
3 days	2	0		

4. Discussion

With high mechanical progression, urologists who assume responsibility for urolithiasis are in control of high method instruments, which prompts more secure and increasingly viable lithotripsy. So far PCNL is viewed as the suggested treatment for huge stones > 2.0 cm by both AUA and EAU rules. Moreover, with the improvement of the "miniPCNL" strategy, littler access sheaths (≤20 F) are getting progressively well known for its relative wellbeing. Plus, ongoing reports proposed that RIRS is a more secure methodology that could prompt less inconveniences and Hb drop than typical tract PCNL

Standard PCNL is generally characterized as working with a huge sheath (24–30F) [16].

It was a powerful method to manage huge calculi (as a rule >2 cm) however with high entanglement rate and long emergency clinic remain. MPCNL was a likely method to diminish the confusion rate and medical clinic remain, yet its adequacy and wellbeing were still in contention.

SFR is a key boundary to assess the adequacy of stone surgery [17].

Of the lower shaft stones, the benefit of little PCNL was progressively self-evident. It was because of the ominous life systems and restrictions of RIRS in the treatment of lower post stones [18].

The life systems of the kidney, for example, the infundibulopelvic edge, the infundibular width, and infundibular length, can have any kind of effect to the SFR of the lower shaft stones [19].

Additionally, the inclusion of the laser test decreases the redirection capacity of the adaptable ureterorenoscope was not favorable for RIRS to the treatment of the lower post stones [18].

The aftereffects of Pei Lu et.,al 2017 examination propose that PCNL, in spite of the fact that related with a more extended medical clinic remain, has a higher without stone rate contrasted with RIRS when utilized with treat kidney stones more noteworthy than 20 mm in kids.

Be that as it may, no distinction was distinguished as far as activity time, absolute without stone rate, and confusion rate

Yan et al [20]. indicated a total freedom pace of 85.2% for renal calculi in preschool age youngsters utilizing smaller than normal PCNL monotherapy. Likely, the stonefree rate declined drastically in kids with multiple stones or expanded stone size (>20mm) [21].

Giusti et al. rewarded kidney stones >2 cm in breadth by means of RIRS. An aggregate of 162 patients had a normal stone measurement 2.7 ± 0.6 cm. The achievement rate was 87.7% with a normal of 1.48 employable meetings per persistent. RIRS was viewed as protected and compelling when used to treat kidney stones >2 cm in breadth [22].

Hyams et al. utilized RIRS to treat 120 patients with kidney stones 2-3 cm in breadth Of these, 63% had lingering stones < 2 mm in measurement and 83% remaining stones < 4 mm in width. The entanglement rate was 6.7%, and 78% of patients were treated in the outpatient center [23].

Fluoroscopy time is significant while picking the ideal treatment. Delayed presentation to X-beams hurts both specialist and patient. The defensive proverb utilized is named ALARA ([exposure is to be] as low as sensibly reachable) [24].

Today, RIRS is an incredible insignificantly intrusive treatment elective for intrarenal stones littler than 2 cm and announced without stones rates are higher at this stone size [25,26 and 27].

Expanded encounters of the urologists and advancements in the innovation have made the base of this achievement. Advancement of new age (bidirectional 270º flexion limit, little bore shaft and improved optics) adaptable ureteroscopes, improved adaptability of holmium laser filaments, extraordinary and little distance across stone recovery gadgets with the capacity of encouraging intrarenal moves have brought about expanded treatment achievement and diminished technique related grimness, in the administration of renal stones [28.29].

Also, ureteral get to sheaths gave lower intrarenal pressure during delayed methodology and encouraged the recovery of numerous stone sections [30,31].

Every one of these developments and particularly expanded involvement with RIRS stimulated the urologists' enthusiasm to the accomplishment of this method in bigger and lower calyceal renal stones.

RIRS is known to have less difficulties contrasted with PNL [27].

Significant difficulties optional to RIRS are less normal and reduction in time. Today, with the diminishing size of instruments, noteworthy entanglements, for example, ureteral separation are very uncommon. Furthermore, RIRS has been furnished safe in patients with high hazard and co-morbidities, for example, pregnant lady, sullen corpulence, draining diathesis and in whom PNL might be contraindicated [32,33] .

We directed this examination to deliberately break down the results of two smaller than usual systems, little PCNL and RIRS, which cause significantly lesser injury than standard PCNL, to discover which one could prompt better viability and wellbeing.

SFR is the most significant boundary for assessing the viability of two methodologies. As indicated by the amalgamation examination of information, little PCNL has a higher SFR than RIRS bunch 89 %& 83.4% without stone rates are associated with the lithotripsy and the area or size of stones

As indicated by Hongyang j ., et al 2017 Operative occasions were accounted for in 12 included examinations, and six investigations demonstrated that smaller than normal PCNL invested shorter working energy, while four investigations supported RIRS.

In our examination we found substantially more time with MPCNL without factual criticalness. the examination of postoperative grimness between smaller than expected PCNL and RIRS.The results demonstrated that RIRS gave a lower intricacy rate than miniPCNL. The difficulties of small PCNL are like those of PCNL; dying, agony, and fever are exceptionally basic [34.35].

5. Conclusion

The most significant downside of scaled down PCNL is extensive employable time , because of, the requirement for fracture into exceptionally little stones appropriate for ureteroscopic graspers or potentially bushels, and the little sheath Which may prompt reduced intraoperative field perceivability. We accept the procedure might be simpler by the utilization of stone cleaning method by Laser lithotripter. We prescribe additionally utilization of pull connection to the pneumatic lithotripter to diminish the usable time through extraction of little parts.

References

[1] C. Tu¨rk, k. A. Petrˇı´, K. Sarica, EAU Guidelines on Diagnosis and Conservative Management of Urolithiasis, copy right 2015 European Association of Urology. Published by Elsevier European Urology , Vol.6 9, PP. 4 6 8 – 4 7 4,2016.

[2] R.M. Desai, R. Sharma, S. Mishra, Single-Step Percutaneous Nephrolithotomy (Microperc): The Initial Clinical Report, THE JOURNAL OF UROLOGY July, Vol. 186, PP.140-145,2011.

[3] N. Ferakis, M. Stavropoulos , Mini percutaneous nephrolithotomy in the treatment of renal and upper ureteral stones: Lessons learned from a review of the literature. Urology Annals, Vol.7(2), PP.141-1482015.

[4] 4.D. H. Bagley, "Expanding role of ureteroscopy and laser lithotripsy for treatment of proximal ureteral and intrarenal calculi," *Current Opinion in Urology*, Vol. 12(4) , PP. 277–280, 2002.

[5] A. Breda, O. Ogunyemi, J. T. Leppert, "Flexible ureteroscopy and laser lithotripsy for single intrarenal stones 2 cm or greater—is this the new frontier?" *Journal of Urology*, Vol. 179, (3) , PP. 981–984, 2008.

[6] C. Turk, T. Knoll, A. Petrik, "Guidelines on urolithiasis," *European Urology*, Vol. 40 (4), PP. 362– 371, 2001.

[7] Arbeitskreis Harnsteine der Akademie der Deutschen Urologen1, Arbeitskreis Endourologie und Steinerkrankung der Osterreichischen Gesellschaft f¨ur Urologie, "S2 guidelines on diagnostic, therapy and metaphylaxis of urolithiasis: part 1: diagnostic and therapy," *Der Urologe*, Vol. 48(8), PP. 917–924, 2009.

[8] A. G¨ok, Z. Gunes, S. Kilic, B. G¨ok, and A. Yazicioglu, "Factors influencing the duration of fluoroscopy in percutaneous nephrolithotomy," *Journal of Clinical and Analytical Medicine*, Vol. 5(4), PP. 300–303, 2014.

[9] D.M. Albala, D.G. Assimos, R.V. Clayman, Lower pole I: A prospective randomized trial of extracorporeal shock wave lithotripsy and percutaneous nephrostolithotomy for lower pole

nephrolithiasis-initial results. J Urol, Vol. 166, PP. 2072-80,2001.

[10] J.E. Lingeman, Y.I. Siegel, B. Steele, a critical analysis. 2. Michel MS, Trojan L, Rasweiler JJ. Complications in percutaneous nephrolithotomy. Eur Urol , Vol.51, PP. 899-906,2007.

[11] A. Unsal, B. Resorlu, A.F. Atmaca, Prediction of morbidity and mortality after percutaneous nephrolithotomy by using the charlson comorbidity index. Urology, Vol.79, PP. 55-60,2012.

[12] M. Grasso, M. Ficazzola, Retrograde ureteropyeloscopy for lower pole caliceal calculi. J Urol, Vol.162, PP.1904-8,1999.

[13] M. Gupta, M.c. Oct, J.B. Shah , Percutaneous management of the upper urinary tract. Campbell-Walsh Urology, 9th ed. Philaselphia, PA: Saunders Elsevier, vol 25(10), PP. 1544-8,2007.

[14] M.N. Azili, F. Ozcan, T. Tiryaki , Retrograde intrarenal surgery for the treatment of renal stones in children: factors influencing stone clearance and complications. J Pediatr Surg, Vol.49, PP.1161–5,2014.

[15] A. Salerno, S.G. Nappo, E. Matarazzo, Treatment of pediatric renal stones in a Western country: a changing pattern. J Pediatr Surg, Vol.48, PP.835–9,2013.

[16] C. Tu¨rk, T. Knoll, A. Petrik, Guidelines on Urolithiasis. European Urological Association Web site, Vol.30(5), PP. 213-225,2017.

[17] S. De, R. Autorino, F.J. Kim, Percutaneous nephrolithotomy versus retrograde intrarenal surgery: A systematic review and meta-analysis. Eur Urol, Vol.67, PP.125–137, 2015.

[18] H. Kilicarslan, Y. Kaynak, Y. Kordan, Unfavorable anatomical factors influencing the success of retrograde intrarenal surgery for lower pole renal calculi. J Urol, Vol.12, PP.2065–2068, 2015.

[19] T. Inoue, T. Murota, S. Okada, Influence of pelvicaliceal anatomy on stone clearance after flexible ureteroscopy and holmium laser lithotripsy for large renal stones. J Endourol , Vol.29, PP.998–1005,2015.

[20] X. Yan, S. Al-Hayek, W. Gan, Minimally invasive percutaneous nephrolithotomy in preschool age children with kidney calculi (including stones induced by melamine-contaminated milk powder). Pediatr Surg Int, Vol.28, PP.1021–4,2012.

[21] K. Daw, A.M. Shouman, M.S. Elsheemy, Outcome of minipercutaneous nephrolithotomy for renal stones in infants and preschool children: a prospective study. Urology, Vol.86, PP.1019–26,2015.

[22] G. Giusti, S. Proietti, L. G. Luciani , "Is retrograde intrarenal surgery for the treatment of renal stones with diameters exceeding 2 cm still a hazard?" Canadian Journal of Urology, Vol. 21(2), PP. 7207–7212, 2014.

[23] E. S. Hyams, R. Munver, V. G. Bird, "Flexible ureterorenoscopy and holmium laser lithotripsy for the management of renal stone burdens that measure 2 to 3 cm: a multi-institutional experience," Journal of Endourology, Vol. 24(10), PP. 1583–1588, 2010.

[24] 24.H. Soylemez, B. Altunoluk, Y. Bozkurt, "Radiation exposure-do urologists take ¨ it seriously in Turkey?" Journal of Urology, Vol. 187(4), PP. 1301–1305, 2012.

[25] 25. M. Grasso, M. Conlin, D. Bagley , Retrograde ureteropyeloscopic treatment of 2 cm or greater upper urinary tract and minor staghorn calculi. J Urol , Vol.160, PP. 346-51,1998.

[26] 26. A.J. Mariani , Combined electrohydraulic and holmium: YAG laser ureteroscopic nephrolithotripsy of large (greater than 4 cm) renal calculi. J Urol , Vol. 177, PP. 168-73,2007.

[27] F.G. El-Anany, H.M. Hammouda, H.A. Maghraby Retrograde ureteropyeloscopic holmium: YAG laser lithotripsy for large renal calculi. BJU Int,Vol. 88,PP.850-3,2001.

[28] J.M. Riley, L. Stearman, S. Troxel , Retrograde ureteroscopy for renal stones larger than 2.5 cm. J Endourol , Vol. 23, PP. 1395-8,2009.

[29] G.B. Johnson, D. Portela, M. Grasso , Advanced ureteroscopy: Wireless and sheathless. J Endourol ,Vol.20, PP. 552-52006.

[30] J. Kourambas, R.R. Byrne, G.M. Preminger, Does a ureteral access sheath facilitate ureteroscopy? J Urol,Vol.165,PP. 789-93,2001.

[31] J.O. L'Esperance, W.O. Ekeruo, C.D. Scales, Effect of uretral Access sheaths on stone free rates in patients undergoing ureteroscopic management of renal calculi. Urology,Vol. 66, PP.252-5,2005.

[32] N.L. Miller , J.E. Lingeman , Management of kidney stones. BMJ,Vol.334, PP.468-72,2007.

[33] M. Pevzner, B.C. Stisser, J. Luskin, Alternative management of complex renal stones. Int urol Nephrol , Vol.43, PP.631-8,2011.

[34] R. Goel, M. Aron, P. K. Kesarwani, "Percutaneous antegrade removal of impacted upper-ureteral calculi: still the treatment of choice in developing countries," Journal of Endourology, Vol. 19(1), PP. 54–57, 2005.

[35] W. Zhu, J. Li, J. Yuan et al., "A prospective and randomised trial comparing fluoroscopic, total ultrasonographic, and combined guidance for renal access in mini-percutaneous nephrolithotomy," BJU International, Vol. 119(4), PP. 612–618, 2017.