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Mini-Percutaneous Nephrolithotomy vs Retrograde Intra-Renal Surgery – Edge?

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Abstract **Original Research Article**

Introduction and objective: Mini-Percutaneous Nephrolithotomy (MINI-PCNL) and Retrograde Intra-Renal Surgery (RIRS) are 2 treatment modalities for renal stone disease. This study was undertaken to compare and assess the suitability among these two, with respect to our demographic settings, which is characterized by high stone burden, long waiting period and hence loss of working hours for economically challenged population. ***Methods*:** A randomized prospective study of patients presenting to our medical center from January 2018 to January 2020, diagnosed with renal-calculi of size between 1-2 cm and who underwent alternatively MINI-PCNL (N=50) and RIRS (N=50) were included in our study. ***Results:***

	MINI-PCNL	RIRS
Stone-Free-Rate	96%	88%
Hospital stay (mean-days)	2	3.5
Operative-time (mean-minutes)	38	68
Blood-transfusion required	4%	Nil
No. of Procedures	1	2.5

Conclusion: In a limited-resources setup with high patient burden, keeping in mind the socio-economic status of our patients, MINI-PCNL fared better than RIRS. Reduced operative time with better stone clearance, need for one operative sitting, reduced hospital stay, avoidance of stent related symptoms which decrease quality of life translating to loss of working hours, lesser need for antibiotic coverage, avoidance of psychological trauma of being subjected to multiple operation-room visits, all these benefits at the cost of slight increase in blood loss with potential need for transfusion, as the only factor MINI-PCNL asks for which can be easily covered up in view of plethora of benefits to patient and health care setup.

Keywords: Mini-Percutaneous, Nephrolithotomy, Retrograde Intra-Renal Surgery.

INTRODUCTION

Renal calculi is a common urological disorder which is characterized by high incidence and prevalence, high recurrence rate [1], leading to high burden on medical infrastructure and society at large. Urolithiasis management has changed drastically over the past few decades, owing to the development of newer mini-invasive instruments, fiber optic technology, flexible intra-corporeal lithotripters etc.

The possibility to extract a stone through a percutaneous access under fluoroscopic control was given by Johanson and Fernstrom in 1976[2]. Between 1981 and 1984 Alken, Wickham and Segura further refined the procedure [3-6]. Perez Castro in 1980 proposed and promoted rigid ureterorenoscopy in the stone treatment [7]. Mini-PCNL described by Helal *et al.* in 1998[8]. RIRS has its roots to beginning of fURS described by Marshall [9], developed further and reported in 1994 by Grasso and Bagley [10]. Over the years both – the anterograde and retrograde techniques were perfected and miniaturized

Mini-PCNL and RIRS are two effective, minimally invasive approaches available in urologist's armamentarium. For the question which one amongst the 2, should be a better choice to replace the standard tract PCNL? There is no conclusive evidence as yet.

AIM AND OBJECTIVE

This study was undertaken to compare and assess the suitability among these two treatment modalities, with respect to our demographic settings,

which is characterized by: high stone burden, long waiting period and hence loss of working hours for economically challenged population.

MATERIALS AND METHODS

It is a randomized prospective study of all patients who have presented to our MDM hospital, unit of Dr S.N. Medical College, Jodhpur from January 2018 to January 2020 with renal stone disease.

Inclusion criteria

- Age >16 years.
- Single renal calculus.
- Calculus of size between1 – 2 cm.

Exclusion Criteria

- Anomalous kidney
- Solitary kidney/ solitary functioning kidney
- Prior procedures : ESWL /open/ endoscopic surgery
- Azotemic patients
- Coagulopathies
- Pyonephrotic kidneys
- Ureteral stricture

Total of 100 patients were included in our study after they satisfied the inclusion and exclusion criteria, who were assigned alternatively to Mini-PCNL (n=50) and RIRS (n=50) group after taking informed written consent.

Procedure

Pre-operative all patients were evaluated with investigations: CBC, S.Creatinine, Bleeding & Coagulation profile, Urine routine & culture, ECG, Chest X-Ray, USG Abdomen & Pelvis, IVP.

Mini-PCNL was performed after cystoscopically placing 5.5Fr ureteric catheter. Single puncture was done in prone position under fluoroscopic guidance and dilated upto 15/16fr dilators. 12fr nephroscope (Karl Storz, Germany) with 12 degree angle was used to visualize the stones. Stones were fragmented/dusted using holmium laser system (lumenis pulse) employing 365 micron end-firing fibre. Fragments were removed with two-pronged forceps. UC was fixed to foley's catheter. On the first post-op day, repeat CBC done. Foley's catheter along with UC was removed on second post-op and patient discharged.

RIRS was performed using 8.5fr flexible ureteroscope (Karl Storz, Germany). After placing 10/12fr access sheath (cook medical) on the affected side ureter, post serial dilatation (teflon ureteral dilators). Stones were dusted using holmium laser system (lumenis pulse) employing 200 micron end-firing fibre. 5.5fr DJ stent was placed post procedure and patient catheterized. On the first post-op day, patients underwent repeat CBC. Patient was discharged with DJ stent insitu.

Both the above procedures were performed under general anaesthesia. All patients were called for review after one month. Stent removal and evaluation with X-ray KUB and USG KUB to look for residual stones. Residual stones were defined as one greater than 3mm in size.

RESULTS

Table-1: Patient demographics and clinical characteristics

CHARACTERISTICS	MINI-PCNL	RIRS	P VALUE
AGE (MEAN-YRS)	44.5	40	0.82
SEX : MALE	34	30	
FEMALE	16	20	
STONE SIZE(MM)	16	14	0.017
STONE LOCATION			
RENAL PELVIS	26	16	
UPPER CALYX	12	8	
MIDDLE CALYX	8	10	
LOWER CALYX	4	16	

Table-2: Summary of operative parameters

CHARACTERISTICS	MINI-PCNL	RIRS	P- VALUE
OPERATIVE TIME (MIN)	38	68	0.0003
STONE CLEARANCE RATE	96%	88%	0.29
NO. OF PROCEDURES	1	2.5	

Table-3: Summary of post-operative parameters

CHARACTERISTICS	MINI-PCNL	RIRS	P-VALUE
DROP IN Hb%	16%(8)	-	0.0001
BLOOD TRANSFUSION	4%(2)	-	0.0001
FEVER	8%(4)	16%(8)	0.0001
POST-OP PAIN (VAS)	5.2+/-2.4	2.7+/-1.6	0.0004
HOSPITAL STAY(DAYS)	2	3.5	0.0006

Table-4: Follow-up visits

CHARACTERISTICS	MINI-PCNL	RIRS	P-VALUE
LOSS OF WORKING DAYS	5	10.5	0.001
NEED FOR ANALGESICS	7	15	0.0001

DISCUSSION

Both the procedures were compared using various parameters: Mean operative time, Stone clearance rate, No. of procedures, Drop in Hb% and blood transfusion, Fever, Post-op pain, Hospital stay, Loss of working days.

Mean operative time: Mini-PCNL: 38 +/-14 min vs RIRS: 68 +/-17min.

Attributed to: RIRS being a relatively new procedure adopted in our institute. Placement of ureteral access sheath, time-consuming maneuvering, requirement of complete dusting of stones, diminished operative field visibility. Familiarity and experience with PCNL procedures.

Stone clearance rate: Mini-PCNL: 96%; RIRS: 88%.

Familiarity and comfort with PCNL, better operative field vision, ability to remove fragments using accessories – forceps, less fatigue (less operative time).

No of procedures: Mini-PCNL: 1vs RIRS: 2.5

In RIRS 25/50 patients had undergone prior DJ stenting and all patients had to undergo DJ removal after 4 weeks. In Mini-PCNL we had 96% clearance rate, there was no need for any ancillary procedures.

Drop in Hb% and blood transfusion: Mini-PCNL: 16% & 4%; RIRS: nil.

In 8/50 patients from Mini-PCNL group there was decrease in Hb% noted. Only 2 patients required blood transfusion. In RIRS there was no bleeding noted, no fall in Hb%.

Fever: Mini-PCNL: 8%; RIRS: 16%.

8% (4pts) of patients from Mini-PCNL group had fever vs 16% (8pts) of patients from RIRS developed fever. Necessitating longer duration of injectable antibiotic cover, adding to the increased duration of hospitalization and overall cost of procedure.

Post-op pain: Mini-PCNL: 5.2+/-2.4; RIRS: 2.7+/-1.6.

Pain experienced by patients was more in Mini-PCNL group, which was effectively managed with additive analgesic dosing.

Hospital stay: Mini-PCNL: 2 days; RIRS: 3.5 days.

Additional procedure of prior DJ stenting and DJ removal, increased duration of antibiotic cover, stent related abdominal colic were factors which contributed to increased duration of hospitalization.

Loss of working days: Mini-PCNL: 5 days; RIRS: 10.5 days.

Loss of more no. of working days seen with RIRS group can be significant in economically challenged population. Owing to the need of repeated hospital visits for stent related symptoms and ancillary procedures and increased duration of hospital stay.

CONCLUSION

The advantages of Mini-PCNL over RIRS being: Better stone clearance, need for one operative sitting, reduced duration of hospital stay, avoidance of stent related symptoms which decrease quality of life / loss of working hours, lesser need for antibiotic coverage, avoidance of anxiety, apprehension, psychological trauma of being subjected to multiple operation-room visits. At the cost of slight increase in blood loss with potential need for transfusion as the only factor against Mini-PCNL, which can be covered up in view of plethora of benefits to patient and health care setup.

Mini-PCNL fared better than RIRS for our demographic setting, which is characterized by limited-resources setup, high patient burden and lower socio-economic status of our patients. Need of a larger randomized study in this direction is recognized.

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