Biological and Clinical Sciences Research Journal
ISSN: 2708-2261
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2022i1.144
*Biol. Clin. Sci. Res. J., Volume, **2022**: 144*
Original Research Article

RIRS AND MINI-PCNL IN MANAGEMENT OF KIDNEY STONE: A COMPARATIVE STUDY

AKHTAR M[1], KHAN MU[1], USMAN HM[1], RAZA QH[2], ASLAM N[1], ULLAH MS[1]

[1]*Department of Nephrology & Urology, Multan Medical and Dental College (MMDC) & Ibn-e-Sina Hospital & Research Institute Multan*
[2]*Department of Pediatrics, The Children's Hospital and The Institute of Child Health (CH&ICH), Multan*
Correspondence author email address: drkhan1224@yahoo.com

(Received, 10th May 2022, Revised 18th November 2022, Published 21st November 2022)

Abstract: *To compare results of retrograde intrarenal surgery and minimally invasive percutaneous nephrolithotomy in older patients, a retrospective study was conducted at the Department of Nephrology & Urology of MMDC & Ibn-e-Sina Hospital Multan from January 2021 to January 2022. The study included 135 patients, 65 underwent M-PCNL while 70 underwent RIRS. Gender, age, BMI, ASA scores, stone location and size, ESWL history, SFR and relevant parameters were recorded. Characteristics like gender, age, BMI, stone size and location, HU and ESWL history did not vary significantly in both group (p>0.05). Mean ASA scores and the data of ASA I and ASA II in both groups was also similar (p>0.05). Postoperative Clavien complications, operation time and postoperative transfusion rate in both groups did not vary significantly (p>0.05). M-PCNL patients had greater post operative SFR values (p<0.05). Retrograde intrarenal surgery and minimally invasive percutaneous nephrolithotomy are recommended methods in treatment of kidney stones.*

Keywords: Kidney Stones, older patients, Retrograde Intrarenal Surgery, minimally invasive percutaneous nephrolithotomy

Introduction

Kidney stones is common occurrence (Keller et al., 2020). Thus, its treatment gained importance. The European Association of Urology recommend percutaneous nephrolithotomy (PCNL) for treating stones> 2cm and Retrograde Intrarenal Surgery (RIRS) and ESWL (Extracorporeal Shock-Wave Lithotripsy) for stones <2cm (Türk et al., 2016). With improvement of technology, PCNL and RIRS surgical procedures have also developed thus increasing treatment options. RIRS can now be used for treatment of larger stones (Türk et al., 2016). While in PCNL, miniature tools are used for Mini-PCNL (M-PCNL), allowing surgery in smaller tracts. In M-PCNL 14–22Fr Amplatz Sheath is used (Jain et al., 2021). Both PCNL and RIRS are safely used in children and adults (Besiroglu et al., 2020; Ekici et al., 2018; Erkoc and Agalarov, 2019). Recently there has been increasing comparison between the effectiveness of both methods . Many studies have compared both procedures, particularly in children (Wang et al., 2019). According to meta analysis studies both procedures can be compared for treatment of kidney stones > 2cm in all age groups (Barone et al., 2020). This study aims to evaluate the comparative safety and efficacy of RIRS and M-PCNL in older patients.

Methodology

The retrospective study was conducted at Department of Nephrology & Urology of MMDC & Ibn-e-Sina Hospital Multan from January 2021 to January 2022. The study included 135 patients, 65 underwent M-PCNL while 70 underwent RIRS. Patients aged above 50 years were selected for the study. The patients with calyx stones, congenital kidney anomalies and previous surgical removal of kidney stones were excluded. All the patients signed an informed consent to be included in the study. The Ethical Board of the hospital approved the study. Urine culture tests, posterior anterior radiography, electrocardiography, coagulation, routine biochemistry and preoperative hemogram were performed. Double J (DJ) was evaluated on the first post operative day by applying Kidney-Urinary Bladder (KUB). Noncontract computed tomography (NCCT) was done preoperatively and post operatively. Stones≤ 3mm were considered stone free (SF) post operatively. Patients who were not SF secondary intervention were performed after third post operative month. NCCT was used for the evaluation of final SFR rates at sixth post operative month. RIRS or ESWL was used for non-SF RIRS group. DJ stents were used intra operatively in all patients and were removed after 3 weeks. Gender, age, BMI, ASA scores, stone location and size,

[Citation: Akhtar, M., Khan, M.U., Usman, H.M., Raza, Q.H., Aslam, N., Ullah, M.S., (2022). RIRS and mini-PCNL in management of kidney stone: A comparative study. *Biol. Clin. Sci. Res. J.*, **2022***: 144*. doi: https://doi.org/10.54112/bcsrj.v2022i1.144]

ESWL history, SFR, duration of hospital stay, and post operative complications were recorded. The operation was performed under general anesthesia. For M-PCNL guided wire was placed in ureter of the affected kidney and 6Fr ureter catheter was placed through it. Contrast media was given, and Chiba needle was used for kidney evaluation. After dilation stones were fragmented and removed using forceps. For RIRS, rigid uretero-renescope (URS) was used for gaining ureteral access. Guided wire was placed, and ureteral access sheath was placed over it. The stone was fragmented and removed.

SPSS 18.0 was used for data analysis. RIRS and M-PCNL groups were compared using chi-square test. Normal distribution continuous variable was evaluated through Student's t-test, while which did not have normal distribution were evaluated through Wilcoxon test. P value ≤ 0.05 was considered statistically significant.

Results

Characteristics like gender, age, BMI, stone size and location, HU and ESWL history were similar in both group (p>0.05). Mean ASA scores and the data of ASA I and ASA II in both groups was also similar (p>0.05). However, ASA III patients were significantly higher in RIRS group (p<0.05). This higher number in the retrograde intrarenal surgery group was due to the inability of the patients to be laid in prone position. ASA scores, stone characteristics and demographic data of the patients are outlined in Table I. Postoperative Clavien complications, operation time and postoperative transfusion rate in both groups did not vary significantly (p>0.05). Both the methods were considered safe. Angioembolization was performed in single subject in M-PCNL group, because to bleeding. In terms of post operative hemoglobin loss and duration of hospital stay, RIRS group showed better results (p<0.05). Post operative SFR values were greater in mini-PCNL group (p<0.05). Surgical data is outlined in Table II.

Table I: Demographic patient characteristics

Variables	M-PCNL (n=65)	RIRS (n=70)	P value
Mean age (SD)	59.44±9.18	60.33 ±9.66	0.534
Gender			
Male	44 (67.6%)	48 (68.6%)	0.831
Female	21 (32.3%)	22 (31.4%)	0.776
BMI (kg/m2)	26.22 ±3.62	26.83 ± 3.46	0.748
Stone CT density	918.32 ±244.27	927.32 ±254.51	0.229
Stone size (mm)	25.31±7.19	23.77 ± 6.33	0.363
Operation site			
Right	39 (60%)	38 (54.3%)	0.922
Left	26 (40%)	32 (45.7%)	0.888
Stone location			
Pelvic	31 (47.7%)	33 (47.1%)	0.937
Upper calix	7 (10.8%)	10 (14.3%)	0.749
Lower calix	17 (26.1%)	16 (22.9%)	0.775
Multiple calix	10 (15.3%)	11 (15.7%)	0.976
History of ESWL	16 (24.6%)	20 (28.5%)	0.641
ASA category			
Mean	1.88 ± .62	1.98 ± .66	.119
ASA I	33 (50.8%)	34 (48.5%)	.236
ASA II	28 (43%)	28 (40%)	0.264
ASA III	4 (6.1%)	8 (11.4%)	0.006

Table II: Surgical data

Variables	M-PCNL	RIRS	P value
Duration of operation (minutes)	57.69 ± 18.33	58.14 ± 17.81	0.177
Duration of Hospital stay (days)	2.55 ± .33	1.62 ± 0.25	.001
SFR			
At 3 months	55 (84.6%)	51 (72.8%)	0.001
At 6 months	60 (92.3%)	60 (85.7%)	0.006
Postoperative hemoglobin loss (g/dl)	1.772 ± 0.661	0.936 ± 0.353	0.002
Postoperative transfusion rate	3 (4.6%)	1 (1.4%)	1.100
Postoperative complications			
Clavien 1	7	8	.973
Clavien 2	3	2	0.100
Clavien 3	1	0	0.273
Post-op ESWL	11	14	
Post-op RIRS	0	8	

Discussion

RIRS and PCNL now are frequent treatment modalities and open surgery is no longer used. A study showed that RIRS is reliable and effective procedure for pediatrics, while another study reported its effectiveness in elderly patients (Ekici et al., 2018; Erkoc and Agalarov, 2019).A Study conducted Ozcanli et al. by demonstrated that PCNL

[Citation: Akhtar, M., Khan, M.U., Usman, H.M., Raza, Q.H., Aslam, N., Ullah, M.S., (2022). RIRS and mini-PCNL in management of kidney stone: A comparative study. *Biol. Clin. Sci. Res. J.*, **2022***: 144*. doi: https://doi.org/10.54112/bcsrj.v2022i1.144]

is safe for all groups (Ozcanli and Erkoc, 2021). Recently both methods are being increasingly compared. A study conducted by Wang et al. showed that both methods are safe and effective; however M-PCNL is preferable as lesser anesthesia sessions are required for it (Wang et al., 2019). Likewise, a study conducted by Ozcift et al. showed that RIRS patients had short hospital stays, while M-PCNL is advantageous in terms of cost and few anesthesia sessions. Unlike the results of current study, they reported that RIRS group had shorter operation duration (Özçift and Tiryaki, 2020). Zhao et al. conducted a comparative study of RIRS with ESWL and M-PCNL and PCNL. They found that RIRS and M-PCNL were advantageous compared to other methods (Zhao et al., 2020). Cabrera et al, conducted a systematic review and reported that for stones between 10-20 mm hospital stay and complication rate of RIRS and M-PCNL were similar (Cabrera et al., 2020). Another study compared RIRS and M-PCNL and demonstrated that M-PCNL had higher SFR (Gu et al., 2021), like current study. Moreover, RIRS was considering post operative hemoglobin loss and hospital stay. Another study reported that M-PCNL was advantageous considering SFR. However, RIRS was superior considering complications (Li et al., 2022). The meta-analysis demonstrated that RIRS had the highest SFR among many procedures conducted in their study. They found that both procedures were advantageous regarding hospital stay (Jung et al., 2022). Our study was different from the others in terms of that it included patients aged above 50 years. Like previous literature, M-PCNL group had a higher SFR rate. Similarly, like previous literature RIRS was superior in terms of Postoperative hemoglobin loss and hospital stay. In current study, due to older patients, risk of anesthesia was considered before choosing surgical procedure. Factors including accompanying comorbid, patient position and operation duration were counted. Prone position increases anesthesia risk in patients having lung comorbidities or those using anti coagulants. Considering this RIRS is suitable for patients using anticoagulants, so it is preferable in patients with comorbid coagulopathy. The limitation of our study is that being a retrospective study there may be a data bias.

Conclusion

Retrograde intrarenal surgery and minimally invasive percutaneous nephrolithotomy are recommended methods in treatment of kidney stones.

Conflict of interest

The authors declared absence of conflict of interest.

References

Barone, B., Crocetto, F., Vitale, R., Di Domenico, D., Caputo, V., Romano, F., De Luca, L., Bada, M., Imbimbo, C., and Prezioso, D. (2020). Retrograde intra renal surgery versus percutaneous nephrolithotomy for renal stones> 2 cm. A systematic review and meta-analysis. *Minerva urologica e nefrologica= The Italian journal of urology and nephrology***72**, 441-450.

Besiroglu, H., Merder, E., and Dedekarginoglu, G. (2020). Percutaneous nephrolithotomy is safe and effective in aging male patients: a single center experience. *The Aging Male***23**, 705-710.

Cabrera, J. D., Manzo, B. O., Torres, J. E., Vicentini, F. C., Sánchez, H. M., Rojas, E. A., and Lozada, E. (2020). Mini-percutaneous nephrolithotomy versus retrograde intrarenal surgery for the treatment of 10–20 mm lower pole renal stones: a systematic review and meta-analysis. *World Journal of Urology***38**, 2621-2628.

Ekici, M., Ozgur, B. C., Senturk, A. B., Aydin, C., Yaytokgil, M., and Baykam, M. M. (2018). Efficacy and reliability of retrograde intrarenal surgery in treatment of pediatric kidney stones. *Cureus***10**.

Erkoc, M., and Agalarov, S. (2019). RIRS (Retrograde Intrarenal Surgery) is safe and effective in aging male patients: A single surgeon experience.

Gu, Z., Yang, Y., Ding, R., Wang, M., Pu, J., and Chen, J. (2021). Comparison of retrograde intrarenal surgery and micro-percutaneous nephrolithotomy for kidney stones: a meta-analysis. *Urologia Internationalis***105**, 64-70.

Jain, M., Manohar, C., Nagabhushan, M., and Keshavamurthy, R. (2021). A comparative study of minimally invasive percutaneous nephrolithotomy and retrograde intrarenal surgery for solitary renal stone of 1–2 cm. *Urology Annals***13**, 226.

Jung, H. D., Chung, D. Y., Kim, D. K., Lee, M. H., Lee, S. W., Paick, S., Jeon, S. H., Lee, J. Y., Endourology, K. S. o., and Committee, R. R. (2022). Comparison of Ultra-Mini Percutaneous Nephrolithotomy and Retrograde Intrarenal Surgery for Renal Stones: A Systematic Review and Meta-Analysis from the KSER Update Series. *Journal of clinical medicine***11**, 1529.

Keller, E. X., De Coninck, V., Doizi, S., and Traxer, O. (2020). The role of ureteroscopy for treatment of staghorn calculi: A systematic review. *Asian Journal of Urology***7**, 110-115.

[Citation: Akhtar, M., Khan, M.U., Usman, H.M., Raza, Q.H., Aslam, N., Ullah, M.S., (2022). RIRS and mini-PCNL in management of kidney stone: A comparative study. *Biol. Clin. Sci. Res. J.,* **2022***: 144*. doi: https://doi.org/10.54112/bcsrj.v2022i1.144]

Li, Z., Zhongying, Y., Hui, L., Hanrong, Z., Qinghe, G., Yuehong, Z., Jinyu, L., and Meihong, L. (2022). Retrospective study of visualized ultra-mini percutaneous nephrolithotripsy vs. flexible ureterorenoscopy for nephrolithiasis patients with 1.5-2.5 cm kidney stones and without hydronephrosis. *European Review for Medical and Pharmacological Sciences***26**, 3185-3191.

Ozcanli, Y. T., and Erkoc, M. (2021). The Comparison of Two Versus More Than Two Tracts Percutaneous Nephrolithotomy for the Management of Staghorn Calculi/Staghorn Bobrek Taslarinin Yonetiminde Iki ve Ikiden Fazla Giris Perkutan Nefrolitotominin Karsilastirilmasi. *Bagcilar Medical Bulletin***6**, 37-42.

Özçift, B., and Tiryaki, H. T. (2020). Comparison of miniaturized percutaneous nephrolithotomy and retrograde intrarenal surgery: Which is more effective for 10-20 mm renal stones in children? *Archivos españoles de urología***73**, 643-650.

Türk, C., Petřík, A., Sarica, K., Seitz, C., Skolarikos, A., Straub, M., and Knoll, T. (2016). EAU guidelines on interventional treatment for urolithiasis. *European urology***69**, 475-482.

Wang, W., Ge, Y., Wang, Z., Wang, L., Li, J., and Tian, Y. (2019). Comparing micropercutaneous nephrolithotomy and retrograde intrarenal surgery in treating 1–2 cm solitary renal stones in pediatric patients younger than 3 years. *Journal of pediatric urology***15**, 517. e1-517. e6.

Zhao, F.-Z., Li, J., Tang, L., Li, C.-M., Zhang, Y., Wang, W.-Y., Chen, N., and Tian, Y. (2020). Comparison of efficacy and safety of minimally invasive procedures for 10–20 mm pediatric renal Stones—A bayesian network meta-analysis. *Journal of Pediatric Urology***16**, 771-781.

.

[Citation: Akhtar, M., Khan, M.U., Usman, H.M., Raza, Q.H., Aslam, N., Ullah, M.S., (2022). RIRS and mini-PCNL in management of kidney stone: A comparative study. *Biol. Clin. Sci. Res. J.,* **2022***: 144*. doi: https://doi.org/10.54112/bcsrj.v2022i1.144]