

Efficiency and Safety of The Retrograde Intrarenal Surgery in Younger Compared to Elderly Patients

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ABSTRACT

Objective: To determine the outcomes of retrograde intrarenal surgery (RIRS) and its complications in both young and elderly patients.

Study Design: An observational study.

Place and Duration of Study: Departments of Urology, University of Health Sciences, Ankara Research and Training Hospital, Ankara, and Çorum Hitit University, Çorum, Turkey from April 2019 to January 2020.

Methodology: Patients with kidney stones up to 3 cm in maximal diameter on computerised tomography (CT) scan, were divided into two groups according to age (<60 vs. ≥60 years). RIRS was performed. Demographics, clinical data, and complications were recorded and compared.

Results: Mean age of 78 patients was 52.47 ±13.28 years. There were no significant difference in gender, American Society of Anesthesiology (ASA) scores, operation time, number of multiple sessions, success rates of outcome and complication rates between groups. At the end of the first session, stone-free rates were 91.1% vs 87.9% in younger and elderly groups, respectively; while, after the second session, all patients were stone-free in both groups. Fever, hematuria (macroscopic, more than 24 hours), and perirenal hematoma were the observed complications. Postoperative hematocrit levels significantly decreased without any need of transfusion; there were significant differences in the preoperative and postoperative creatinine levels (p=0.002) in the older group.

Conclusion: RIRS is a safe and effective method for treating kidney stones up to 3 centimeter diameter in all age groups. Although hemorrhagic events are mostly clinically unremarkable, there is a risk of renal function impairment in older (≥60 years) patients. Preoperative hydration and postoperative close follow-up is important.

Key Words: Retrograde intrarenal surgery, Elderly, Effectiveness, Safety.

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INTRODUCTION

Urinary tract stone disease has a lifelong risk of over 10%.¹ It is also very well known that world's population is aging; and by the coming three decades, people above the age of 60 years will be over 2 billion.² In the past, conservative approach to the kidney stones was the preferred management in the elderly. Open surgery is no longer advocated as it carries risks of urinary tract infections, sepsis and renal failure.^{3,4}

Over the last few years, with advances in laser and endoscopy technology, retrograde intrarenal surgery (RIRS), a minimally invasive technique, has become an alternative to standard methods like extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL) and conventional open surgery in the management of kidney stones all over the world.⁵ This technique is without any incisions, has lower pain and a faster recovery period.

In future, the treatment strategies for elderly patients, including urolithiasis, will gain more importance due to numbers mentioned above; but, there is a lack of prospective data on this endoscopic procedure.

In the current study, the aim was to evaluate the safety and efficacy of RIRS in elderly patient (≥60 years) with kidney stones and compare the outcome of the procedure with the younger population's outcomes

METHODOLOGY

After the ethical approval was obtained, 78 patients with kidney stones up to 3 cm in maximal diameter of computerised tomography (CT) findings, between April 2019 and January 2020 at Hospital Urology Departments, were investigated prospectively. Before RIRS, patients were divided into two groups (<60 vs. ≥60 years). Sample size was calculated from a reference study with the help of G*power (version 3.1.9.7) software with 0.05 type 1 error (95% confidence interval) and 0.20 type 2 error (minimum 80% power).⁶ Stone size, location, and number was recorded. Demographic features of the patients, ASA (American Society of Anesthesiologists) scores, operation time, stone-free rates, complication rates, preoperative and postoperative creatinine and hematocrit values, were also noted according to groups. Sterile urine culture of all patients was observed before surgery.

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Operations were performed under general anesthesia in a lithotomy position by two experienced surgeons (more than one hundred cases). Access sheath (9.5/11.5 F or 11/13 F) (Elite Flex, Ankara, Turkey) was inserted in the ureter of each patient at the beginning of the surgery. Then, flexible ureteroscope (Flex-X2, Karl Storz, Tuttlingen, Germany) was passed through the access sheath. Stones were fragmented by 200µm holmium laser (Ho YAG Laser; Lisa Med-Tech; Germany) with utilising the fragmentation and dusting methods and the operations were ended without removing the stone fragments. At the end of the procedure, a double J catheter was inserted to all patients. The operation time was calculated as the time between starting to endoscopic procedure and double J catheter placing. The mean time of indwelling stent placement was three weeks. Residual fragments, less than 2-mm in CT scan conducted one month after the procedure, were defined as stone-free. Complications were recorded as per modified Clavien Dindo classification.

Table I: Demographic, clinical data, and stone characteristics according to groups.

Demographic data	Group 1 (<60 y.o.)	Group 2 (≥60 y.o.)	p-value
Number of patients (%)	45 (57.7%)	33 (42.%)	
Gender			
Male	30 (66.7%)	18 (54.5%)	0.277 ^c
Female	15 (33.3%)	15 (45.5%)	
Age (years)	43.27 ±9.71	65.03 ±3.60	<0.001 ^a
ASA score (% within group)			<0.001 ^d
ASA 1	7 (15.6%)	0 (0%)	
ASA 2	30 (66.7%)	13 (39.4%)	
ASA 3	8 (17.8%)	19 (57.6%)	
ASA4	0 (0%)	1 (3%)	
Presence of multiple stones (% within group)			0.963 ^c
Yes	8 (17.8%)	6 (18.2%)	
No	37(82.2%)	27 (81.8%)	
Stone size, mm Median (IQR)	14 (8)	13 (9)	0.495 ^b
Stone localization (% within group)			0.835 ^d
Upper pole	12 (26.6%)	9 (27.2%)	
Middle pole	8 (17.7%)	6 (18.2%)	
Lower pole	8 (17.7%)	6 (18.2%)	
Upper and middle pole	6 (13.3%)	4 (12.1%)	
Middle and lower pole	5 (11.1%)	3 (9%)	
Upper and lower pole	3 (6.6%)	3 (9%)	
Renal pelvis	3 (6.6%)	2 (6%)	
Complications (% within group)			0.167 ^d
Fever (more than 38°C)	0 (0%)	3 (9%)	
Hematuria (macroscopic, more than 24 hours)	0 (0%)	2 (6%)	
Perirenal hematoma	1 (2.2%)	0 (0%)	
Sessions (% within group)			0.716 ^d
One	41 (91.1%)	29 (87.9%)	
Two	4 (8.9%)	4 (12.1%)	
Median operation time(min,IQR)	40 (29)	40 (15)	0.891 ^b

^aIndependent samples t-test; ^bMann-Whitney U-test; ^cChi-square test; ^dFisher's Exact test.

Data were analysed statistically using SPSS for Windows version 23.0 software (SPSS Inc. Co., Chicago, IL, USA). Descriptive statistics of categorical variables were presented by number and percentage; while numerical variables were with mean ± standard deviation or IQR with median, depending on normal distribution. Normal distribution was tested with Shapiro-Wilks test. The comparisons of hemotocrit and creatinine values (before and

after the operation) were done by paired t-test or Wilcoxon signed rank test depending on the distribution. Comparison of the age distribution was done by independent sample t, and the operation time was done by Mann-Whitney U-test. Comparisons of ASA scores, stone localisation stone-free rates, number of sessions and complication rates were done by Chi-square test or Fisher's Exact test. Ap-value <0.05 was accepted statistically significant.

RESULTS

Of the 78 patients included in the present study, 48 (61.5%) were males and 30 (38.5%) were females. The mean age was 52.47 ±13.28 years (range=19-74 years). The mean follow-up was 9 months (range: 2-12 months). At the end of the first session, stone-free rates were 91.1% and 87.9% in younger and elderly groups, respectively; while after the second session, all patients were stone-free in both groups. The demographic data of patients, the ASA scores, and the outcomes are shown in Table I. Procedure duration was 35.3 ±6.7 vs. 34.9 ±6.1 seconds (p=0.754) in younger and elderly groups, respectively. Fever (more than 38°C), hematuria (macroscopic, lasting more than 24 hours), and perirenal hematoma were the observed complications. All were stabilised with hydration and medical therapy and classified as grade I, according to the modified Clavien classification. All patients were stabilised with hydration and medical therapy. Preoperative and postoperative hematocrit and creatinine levels are summarised in Table II. There were no significant difference in success rate of outcomes between groups. On the other hand, there were significant differences in the preoperative and postoperative creatinine levels.

DISCUSSION

Aging affects the complications and outcomes of many procedures and operations. Urolithiasis in the elderly is challenging since there are a lot of comorbidities in this age group; and sometimes classic symptoms of renal colic is not present. Also, it was found that the incidence of stone disease is increasing in the elderly population. This may lead to later presentation of aging population with larger and more complex stone disease to urology clinics all over the world.⁷

In this manner, RIRS seems a good alternative of treating kidney stones and is being widely used for the treatment of kidney stones up to 20 mm with high stone-free rates and low morbidity. In reasonable time and minimum risk accessing almost every part of the kidney is possible with new flexible instruments.⁸ This was started to be used in the management of larger (>2 cm) stones with very high stone-free rates.⁹ In the current study, there were 10 (%12.82) patients with a stone diameter 2 to 3 cm and nine of them (90%) was stone-free with one or two sessions. Bussaidy *et al.* concluded RIRS appears to be emerging as a commonly utilised primary treatment option for renal stones up to 4 cm in size.¹⁰ Although both the European and American Urological Associations do not currently recommend this modality stones over 2 cm, the authors believe that RIRS is a safe and effective method for stones up to 3 cm; and with the developments, this limit will probably be increased.

Among renal units submitted to RIRS, 96.2% (75/78) were rendered stone-free with similar results in both younger and the older groups. The present results are similar to the literature with the RIRS success rates more than 90% up to 3 cm stones.¹¹

Table II: Comparison of pre- and post-operative hematocrit and serum creatinine levels in two groups (n=78).

	Group 1 (n=45) Mean \pm S.D		p-value	Group 2 (n=33) Median (IQR)		p-value
Preoperative vs postoperative hematocrit	44.05 \pm 5.03	41.81 \pm 4.37	<0.001 ^a	35.7 (6.55)	35 (4.60)	<0.001 ^b
Preoperative vs postoperative creatinine	0.88 \pm 0.21	0.89 \pm 0.20	0.759 ^a	1 (0.40)	1.1 (0.40)	0.002 ^b

^a Paired samples t-test; ^b Wilcoxon signed rank test.

Pan reported initial stone-free 71.4% with a higher rate in the longer follow-up.¹² There are many factors affecting the stone-free rates; the experience of the surgeon, type, size and the localisation of the stones and the factors that belong to the patients like infundibulopelvic angle, calicial anatomy etc. In order to guarantee a standard procedure, two senior urologists performed all surgeries. Although the composition of the stones were not analysed, the size of two groups were similar.

There are two main alternatives to RIRS in kidney stones: PCNL and ESWL, but in especially smaller (<2 cm) stones in which most of our patients exist, PCNL is not the first option. There are conflicting results with ESWL; but in a recent meta analysis, six prospective randomised comparison trials and eight retrospective comparison trials were included, involving more than 2,000 patients; and for renal stone 1-2 cm, RIRS provided a significantly higher stone-free rate (SFR), and lower retreatment rate (RR-(OR 0.07, 95 % CI 0.01-0.37, p = 0.002). For renal stone <1 cm, RIRS technique also showed a significantly higher SFR than ESWL.¹³ ESWL may be a good option for especially upper and middle pole stones; but due to senile physiological changes such as sclerotic alterations of the renal parenchyma and lower glomerular filtration rate, it is found that the results are less effective than younger population, although some series demonstrate equal results.^{14,15} It must be in mind that ESWL is still one of the first treatment options for proximal ureteral and kidney stones less than 2 cm.

Only 10 (12.7%) patients' stone was more than 2 cm and the maximum diameter was less than 3 cm. PNL is the first treatment option in kidney stones larger than 2 cm, but it has more disadvantages and potential complications of that surgery, like bleeding, adjacent organ injuries, postoperative pain, long hospital stay, urinary fistulae etc.¹⁶ The economic burden of urolithiasis is another important issue.¹⁷ Due to many comorbidities, elderly patients' hospital stay will be longer after surgeries, like PNL, open surgeries. In that manner, RIRS can be a cost-effective method.

This study prospectively compared different age groups also for the evaluation of complications after RIRS. The overall complication rate was 2.2 % and 15.2% in the younger and older groups, respectively; and were in accordance with the reported percentages of the published series.^{18,19} There was no statistically significant difference between the two groups in terms of any complications. The main difference is in postoperative creatinine levels. In the elderly group of the current study, a significant increase was observed.

Preoperative hydration and postoperative close follow-up is more important in older ones and with preexisting renal insufficiency. Lastly, although there was a significant hematocrit decrease in all groups, it is well known that hemorrhagic events in RIRS are normally self-limiting and none of our patients necessitated erythrocyte transfusion.²⁰

This study is not devoid of limitations. First, the number of cases included was relatively limited. Second, the postoperative follow-up for some patients was short. Third, stone analysis was not available in all patients. Prospective studies investigating long-term outcomes with different surgeons and larger patient populations including stone recurrence are needed.

CONCLUSION

RIRS is a safe and effective method for treating kidney stones with a diameter up to 2 cm in all age groups. In selected patients, up to 3 cm sized kidney stone can be cleared. Hemorrhagic events are mostly clinically mild but in order to reduce the risk of renal function impairment preoperative hydration and post operative close follow up is crucial in the elderly patients.

ETHICAL APPROVAL:

Ethics Committee approval was received for this study from the local Ethics Committee prior to initiation of the research work (2019-127/03).

PATIENTS' CONSENT:

Informed consents were obtained from all patients to publish the data concerning this case.

CONFLICT OF INTEREST:

Authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

BCO: Data collection, writing, drafting of the work.

ME: Study design, data collection, literature review.

MMB: Final review, approval of article.

ED: Statistical analysis, final review.

REFERENCES

1. Campbell's Urology. Urinary Lithiasis: Etiology, diagnosis, and medical management. ed. 8th, Philadelphia, *Sounders* 2002.
2. Chatterji S, Byles J, Cutler D, Seeman T, Verdes E. Health, functioning, and disability in older adults present status and

- future implications. *Lancet* 2015; **385(9967)**:563-75.
3. Watts KL, Srivastava A, Lin W, Schoenfeld D, Abramowitz M, Stern JM. Baseline chronic kidney disease does not predict long-term renal functional decline after percutaneous nephrolithotomy. *Urolithiasis* 2019; **47(5)**:449-53.
 4. Gupta M, Bolton DM, Gupta PN, Stoller ML. Urolithiasis in renal failure. *J Urol* 1994; **152**:1086.
 5. York NE, Zheng M, Elmansy HM, Rivera ME, Krambeck AE, Lingeman JE. Stone-free outcomes of flexible ureteroscopy for renal calculi utilizing computed tomography imaging. *Urology* 2019; **124**:52-6.
 6. Sahin A, Atsü N, Erdem E, Oner S, Bilen C, Bakkaloğlu M, et al. Percutaneous nephrolithotomy in patients aged 60 years or older. *J Endourol* 2001; **15(5)**:489-91.
 7. McCarthy JP, Skinner TA, Norman RW. Urolithiasis in the elderly. *Can J Urol* 2011; **18(3)**:5717-20.
 8. Nagele U, Tokas T, Traxer O. Future of kidney stone surgery: will we treat small stones with large-sized PCNL and big stones with RIRS? training and research in urological surgery and technology (T.R.U.S.T.) group. *World J Urol* 2019. doi: 10.1007/s00345-019-02983-5. [Online ahead of print].
 9. Atis G, Culpan M, Pelit ES, Canakci I, Ulus B, Gunaydin A, et al. Comparison of percutaneous nephrolithotomy and retrograde intrarenal surgery in treating 20-40 mm renal stones. *Urol J* 2017; **14(2)**:2995-9.
 10. Busaidy SSA, Kurukkal SN, Al Hooti QM, Alsaraf MS, Al Mamari SA, Al Saeedi AK. Is RIRS emerging as the preferred option for the management of 2 cm-4 cm renal stone: Our experience. *Can J Urol* 2016; **23(24)**:8364-7.
 11. Sabnis RB, Jagtap J, Mishra S, Desai MR. Treating renal calculi 1-2 cm in diameter with mini percutaneous or retrograde intrarenal surgery: A prospective comparative study. *BJU Int* 2012; **110(8)**:e346-9.
 12. Pan J, Chen Q, Xue W, Chen Y, Xia L, Chen H, et al. RIRS versus mPCNL for single renal stone of 2-3 cm: Clinical outcome and cost-effective analysis in Chinese medical setting. *Urolithiasis* 2013; **41(1)**:73-8.
 13. Mi Y, Ren K, Pan H, Zhu L, Wu S, You X, et al. Flexible ureterorenoscopy (F-URS) with holmium laser versus extracorporeal shock wave lithotripsy (ESWL) for treatment of renal stone <2 cm: a meta-analysis. *Urolithiasis* 2016; **44(4)**:353-65.
 14. Tonner PH, Kampen J, Scholz J. Pathophysiological changes in the elderly. *Best Pract Res Clin Anaesthesiol* 2003; **17(2)**:163-77.
 15. Ichiyanagi O, Nagaoka A, Izumi T, Kawamura Y, Kato T. Age-related delay in urinary stone clearance in elderly patients with solitary proximal ureteral calculi treated by extracorporeal shock wave lithotripsy. *Urolithiasis* 2015; **43(5)**:419-26.
 16. Fayad AS, Elsheikh MG, Ghoneima W. Tubeless mini-percutaneous nephrolithotomy versus retrograde intrarenal surgery for lower calyceal stones of <2 cm: A prospective randomised controlled study. *Arab J Urol* 2016; **15(1)**:36-41.
 17. Hyams ES, Matlaga BR. Economic impact of urinary stones. *Transl Androl Urol* 2014; **3(3)**:278-83.
 18. Skolarikos A, Gross AJ, Krebs A, Unal D, Bercowsky E, Eltahawy E, et al. Outcomes of flexible ureterorenoscopy for solitary renal stones in the Croes Urs Global Study. *J Urol* 2015; **194(4)**:137-43.
 19. Hu H, Lu Y, He D, Cui L, Zhang J, Zhao Z, et al. Comparison of minimally invasive percutaneous nephrolithotomy and flexible ureteroscopy for the treatment of intermediate proximal ureteral and renal stones in the elderly. *Urolithiasis* 2016; **44(5)**:427-34.
 20. de la Rosette J, Denstedt J, Geavlete P, Keeley F, Matsuda T, Pearle M, et al. The clinical research office of the endourological society ureteroscopy global study: Indications, complications, and outcomes in 11,885 patients. *J Endourol* 2014; **28(2)**: 131-9

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