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Original Article *Özgün Araştırma*

OUR RETROGRADE INTRARENAL SURGERY EXPERIENCE IN THE TREATMENT OF MULTI-CALICEAL AND MULTIPLE KIDNEY STONES

Multikalisiyel ve Multiple Böbrek Taşlarının Tedavisinde Retrograd İntrarenal Cerrahi Deneyimimiz

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ABSTRACT

Objective: Multiple kidney stones are seen in 20-25% of the patients. Treatment of multiple kidney stones is challenging. Retrograde intrarenal surgery is used in the treatment of multiple kidney stones. Success is lower than the single stones of the same size. We aimed to report our retrograde intrarenal surgery experience in the treatment of multi-caliceal and multiple kidney stones.

Material and Methods: After approval of local ethics committee, patient data between 01.01.2014-01.01.2019 were retrospectively analyzed. Patients who had undergone retrograde intrarenal surgery for multi-caliceal and multiple kidney stones were included in our study. Demographic, intraoperative and postoperative data and complications were recorded.

Results: Forty-three patients were included in our study. The mean stone size was 13.69±6.21 mm.

Mean stone volume was 972.48 ± 905.24 mm^3. Mean Hounsfield unit was 1128.26±317.91 HU. The mean operation time was 51.97±20.18 minutes. Thirty-two patients were stone free. Postoperative complications were seen in four patients. Mucosal injury was observed in one patient and urinary tract infection was observed in three patients.

Conclusion: Multi-caliceal and multiple kidney stone treatment is challenging for urologists. There are various treatment methods. Retrograde intrarenal surgery is a safe and efficient alternative for the treatment of multi-caliceal and multiple kidney stones. Prospective and larger cohort studies are needed.

***Keywords**: Experience, multi-caliceal, retrograde intrarenal surgery*

ÖZ

Amaç: Multiple böbrek taşları % 20-25 hastada görülmektedir. Tedavisi zordur. Retrograd intrarenal cerrahi multiple böbrek taşı tedavisinde kullanılmaktadır. Başarı aynı boyuttaki normal taşlara göre düşüktür. Biz çalışmamızda kliniğimizdeki multiple taş tedavisinde retrograd intrarenal cerrahi deneyimimizi sunmayı amaçladık.

Gereç ve Yöntemler: Lokal etik kurul onayı alındıktan sonra 01.01.2014-01.01.2019 arası hasta verileri retrospektif olarak tarandı. Multikaliseal ve multiple böbrek taşı için retrograd intrarenal cerrahi yapılan hastalar çalışmaya alındı. Onsekiz yaş altındaki hastalar çalışmadan çıkarıldı. Demografik, intraoperatif, postoperatif veriler ve komplikasyonlar kaydedildi.

Bulgular: Çalışmaya 43 hasta alındı. Taş boyutu ortalama 13.69±6.21 mm idi. Taş volümü ortalama 972.48 ± 905.24 mm^3, Hounsfield ünitesi ortalama 1128.26±317.91 HU idi. Ortalama operasyon zamanı 51.97±20.18 dakikaydı. Taşsızlık 32 hastada sağlandı. Postoperatif komplikasyonlar dört hastada görüldü. Bir hastada mukozal yaralanma, üç hastada idrar yolu enfeksiyonu izlendi.

Sonuç: Multikaliseal ve multiple böbrek taş tedavisi ürologlar için zorludur. Çeşitli tedavi yöntemleri mevcuttur. Retrograd intrarenal cerrahi güvenli ve etkin bir alternatiftir. Prospektif ve yüksek hasta sayılı çalışmalara ihtiyaç vardır.

***Anahtar Kelimeler**: Deneyim, multikalisiyel, retrograd intrarenal cerrahi*

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INTRODUCTION

Over the years, there has been a transition from open surgery to minimal invasive surgery in the surgical treatment of kidney stones. While open surgery was initially used, open surgery was replaced by percutaneous nephrolithotomy (PNL) (1,2). Although PNL has higher success rates, serious complications may be seen in PNL. This led to the search for alternative treatment methods (3,4). Retrograde intrarenal surgery (RIRS) was first performed by Hoffman et al. RIRS became more popular with advances in flexible instruments and laser devices (5). Multiple kidney stones are seen in 20-25% of patients (6). Treatment of multiple kidney stones is challenging. Multiple access may be required for treatment of multiple stones in PNL. And this may cause blood loss as well as kidney function loss (7,8). RIRS is used in the treatment of multiple kidney stones. Success is lower than the single stones of the same size (7). In our study, we aimed to report our RIRS experience in the treatment of multi-caliceal and multiple kidney stones.

MATERIALS AND METHODS

After approval of local ethics committee, patient data between 01.01.2014-01.01.2019 were retrospectively analyzed (Yozgat Bozok University Rectorship, Ethics Committe of Clinical Research, date: 17.04.2020; number: 2019-04-17). Patients who had undergone RIRS for multi-caliceal and multiple kidney stones were included in our study. Patients who were <18 years old were excluded.

Routine blood tests and imaging methods such as kidney ureter bladder graphy (KUBG), ultrasonography (US), intravenous pyelography (IVP) and unenhanced computed tomography (CT) were preoperatively performed. Preoperative urine cultures were sterile. Stone size was measured as the longest diameter of each stone by KUBG and US for opaque and non-opaque stones, respectively. Stone volume and Hounsfield unit were measured from CT. Informed consent was obtained from all patients before the operation.

Parenteral antibiotic was administered one hour before the operation. All procedures were performed under general, spinal or epidural anesthesia. After anesthesia induction, the patient was taken to modified supine lithotomy position. Semirigid ureterorenoscopy was performed. This also dilated the ureter. Hydrophilic guide wire of 0.035/0.038-inch was inserted into the ureter and ureteral access sheath (UAS) (9.5/11.5 F or 11/13 F) (Elite Flex, Ankara, Turkey) was placed over the guidewire. Flexible ureterorenoscope (Flex-X2, Karl Storz, Tuttlingen, Germany / Karl Storz, Flex X2, GmbH, Tuttlingen, Germany) was inserted into the UAS and access to the stone was provided. Access to the stone was provided with the advancement of the flexible renoscope over the guidewire if UAS could not be placed. Fragmentation was performed with Holmium YAG (Ho YAG Laser; Dornier MedTech; Munich, Germany / Dornier Med-Tech GmbH, Medilas H20 and H Solvo, Wessling, Germany) laser device. Dusting and fragmentation methods were used by the surgeons. All of the calyxes were controlled at the end of the operation with flexible ureterorenoscope. Double J (DJ) stent and urethral catheter were inserted at the end of the operation. The operation time was defined as the time between starting endoscopy and urethral catheter insertion. Urethral catheter was removed at postoperative first day and DJ stent was removed at the postoperative 3rd week.

KUBG was performed at postoperative first day. US was performed for nonopaque stones. CT was performed in the first month after surgery. Success was considered as being stone free after intraoperative and postoperative controls.

Demographic data, intraoperative and postoperative data and complications were recorded. Only descriptive analyses of these data were given in this study. The counts were given as “number (percentage)”. The

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values for numerical data were given as mean ± standard deviation SD). The statistical evaluation of the data was performed using the SPSS for Windows 22.0 software package (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). No statistical comparison was made; therefore, no p value was given in the manuscript.

RESULTS

Forty-three patients were included in our study. The average age was 49.09±14.52 years. Twenty-six patients were male, seventeen patients were female. Five patients had a history of preoperative shock wave lithotripsy (SWL). Eight patients had preoperative DJ stent. Fourteen patients were primary. Nine patients had previous PNL, 13 patients had previous RIRS, 2 patients had previous ureterorenoscopy (URS) and five patients had a history of another previous surgery.

Table 1: Demographic Data and Stone Data of the Patients

	Group n=43
Age(year) (mean±SD)	49.09±14.52
Gender(M/F) (n)	26/17
Preop SWL (n, %)	5(11.6)
Preop JJ (n, %)	8(18.6)
Preop Operation (n, %)	
PNL	9(20.9)
RIRS	13(30.2)
URS	2(4.7)
Other	5(11.6)
None	14(32.6)
Stone Laterality (Right/Left)	24/19
Stone Size(mm) (mean± SD)	13.69±6.21
Stone Volume(mm^3) (mean± SD)	972.48±905.24
Opacity (n, %)	36(83.7)
Hounsfield Unit (HU) (mean± SD)	1128.26±317.81

SD: standart deviation; SWL: Extracorporeal Shock Wave Lithotripsy; JJ: Double J; PNL: percutaneous nephrolithotomy RIRS: Retrograde Intrarenal Surgery URS: Ureterorenoscopy; mm: milimeter; mm^3: milimetercube; HU: Hounsfield Unit

The stones were in the left kidney in 19 patients, and in the right kidney in 24 patients. The mean stone size was 13.69±6.21 mm. The mean stone volume was 972.48±905.24 mm^3. Hounsfield unit was 1128.26±317.91 HU. Thirty-six patients had opaque stones (Table 1).

Table 2: Intraoperative and Postoperative Data of the Patients

	Group n=43
Anesthesia Type (n, %)	
General	38(88.4)
Spinal	3(6.9)
Epidural	2(4.7)
Operation Time(min) (mean± SD)	51.97±20.18
Postoperative JJ (n, %)	43(100)
UAS (n, %)	41(95.3)
Stone Free Rate (n, %)	32(74.4)
Complication (n, %)	4(9.3)

Min: Minute SD: standart deviation JJ: Double J UAS: ureteral access sheath

DISCUSSION

With the developing technology, trends in kidney stone management have changed. Open surgery was used at first. Minimally invasive methods such as PNL and RIRS are used today. Multiple stones are seen in 20-25% of the patients. Success is lower in multiple stones than single stones of the same size. Cass et al. reported in a study of 13864 patients who had undergone SWL that stone free rate (SFR) was 69.5-72.1% in single stones. Success was <50% for SWL in the treatment of multiple stones (9). Ozgor et al. reported that success was lower in multiple stones than single stones of the same size in RIRS (83.8%/89.2%) (7).

Alkan et al. researched RIRS in the treatment of multiple kidney stones in 48 patients. SFR was 100% in the patients who had <2 cm sized kidney stones. SFR was 84% in the patients who had >2cm sized

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kidney stones (10). Breda et al. reported 52% SFR in a study of 27 patients who had > 2cm sized multiple kidney stones after first session. Total SFR was 85.1% (11). Takazawa et al. researched RIRS in the treatment of multiple kidney stones. SFR was 69.2% after first session. After the second session, SFR was 84.6% (12). In a study comparing RIRS and PNL in the treatment of 2-3 cm sized multi-caliceal and multiple kidney stones, SFR was 69.4% for RIRS (13). In another study comparing RIRS and PNL in the treatment of multi-caliceal and multiple kidney stones, SFR was 88.6% for RIRS (14). In our study, SFR was 50% in > 2 cm sized multiple kidney stones. In < 2 cm sized multiple kidney stones SFR was 78.3%. Total SFR was 74.4% in our study.

When we look at success of PNL in the treatment of multiple kidney stones, Cakici et al reported 82.1% SFR in their study (13). Demirbas et al. reported 59.6% SFR in their study (14). In another study Singla et al. reported 70.7% SFR (15).

In our study, operation time was 51.97±20.18 min. In a study comparing RIRS and PNL in multiple and multi-caliceal kidney stones, operation time was 56.11±10.89 min. for RIRS (13). Another study comparing RIRS and PNL in multiple and multi-caliceal kidney stones, operation time was 62.8±17.57 min. for RIRS (14). In the studies researching PNL in multiple stones, 82.32±34.06 min and 89.76±29.07 min were reported (13,14). Time for percutaneous access may cause longer operation time in PNL.

Complication rate is 6-16% in RIRS. UTI, ureteral injury, hematuria and renal colic are complications of RIRS (11,16,17). Alkan et al. reported 12.5% complication rate in the treatment of multiple kidney stones for RIRS (10). The complications were minor complications (10). Breda et al. reported a complication rate of 13.6% in their study (11). In two studies comparing RIRS and PNL for the treatment of multiple and multi-caliceal kidney stones, complication rates were 8% and 8.6%, respectively (13,14). PNL can be used in the treatment of multi-caliceal kidney stones. Multiple access may cause serious complications such as pleural injury, colon injury, sepsis and death (3).

In our study, spinal and epidural anesthesia were generally used for RIRS. There are studies comparing three types of anesthesia in RIRS (18,19). The appropriate anesthesia method is chosen according to the surgeon, anesthesiologist and patient features.

When we look at the limitations of our study, retrospective design, short patient follow up time and low number of patients are limitations of our study. We aimed to report our RIRS experience in the treatment of multi-caliceal and multiple kidney stones.

In conclusion, multi-caliceal and multiple kidney stone treatment is challenging for urologists. There are some treatment methods. RIRS is a safe and efficient alternative method for the treatment of multi-caliceal and multiple kidney stones. Prospective and larger cohort studies are needed.

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