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Fluoroscopy Free Flexible Ureteroscopy: The Report of 248 Cases

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ABSTRACT

The goal of this study was to assess the results of 248 patients who underwent fluoroscopy-free retrograde intrarenal surgery. Between January 2017 and March 2020, 248 cases of retrograde intrarenal surgery (RIRS) were conducted using an access sheath and guidewire. Using ureteroscopy, two hydrophilic guide wires were inserted into the renal pelvis under direct eyesight (URS). When the ureter could not be entered with the 9.5 Fr URS, the ureter was first entered using the 7.5 Fr URS. Then, without flouroscopy, an access sheath was pushed up to the proximal ureter while examining the opening with URS. When an access sheath could not be placed, a double J stent was implanted. The operation was repeated after 3 weeks. The procedure's success rate was determined by the absence of stones or the presence of leftover fragments smaller than 3 mm.

The study included 161 (64.9%) male and 87 (35.1%) female patients with a mean age of 44.03 (± 16.04), (range 18-81) years. Mean stone size was 14.7 (± 3.7) mm. The mean operation time was 62.34 (± 8.2) minutes. Stone-free rate was 88.7% (n: 220). 28 of the patients had residual stone. Twenty patients (8%) had minor complications, including hematuria and fever and in 2 patients (0.8%) subcapsular hematoma was developed.

Kidney stones can be treated successfully with minimal morbidity and mortality. The insertion of an access sheath under urs guidance is possible without the need of fluoroscopy. Patients and surgeons are exposed to less radiation as a result of this procedure.

Keywords: Fluoroscopy, Kidney Stone, Radiation

Introduction

Treatment modalities of kidney stone disease are also improving day by day. The most minimally invasive therapeutic methods for urinary system stone disease are extracorporial shock wave lithotripsy (ESWL), ureteroscopy (URS), retrograde intrarenal surgery (RIRS), percutaneous nephrolithotomy (PCNL), and laparoscopic surgery. Renal stones and proximal ureter stones can be treated with flexible ureteroscopy (f-URS) because of the high complication rates of PCNL and low stone-free rates of ESWL (1). Flexible ureteroscopy is performed under fluoroscopy, routinely. Fluoroscopy is used not only to place access sheats, but also to identify the ureterorenal collecting system and locate the stone (2, 3). Radiation is a risk for both surgeons and other healthcare professionals and patients (3, 4). Some studies without the use of fluoroscopy have been reported to reduce radiation exposure (3, 5-7).

In this study, we aimed to investigate the efficacy and safety of flexible URS applied without using fluoroscopy but with a new guidance method for the patients with ureteral and/or renal stones.

Material and Methods

In this retrospective study, we evaulated the results of 248 patients who underwent f-URS for ureteral and renal calculi without fluoroscopy between January-2017 and March-2020. The study was performed on patients with ureteral and kidney stones smaller than 20 mm. Patients using anticoagulants, with solitary kidney, with congenital urinary anomaly, with bilateral renal stones and patients under 18 years of age were excluded. Demographic data, fluoroscopy, complications, stone-free rates, duration of operation and hospitalization were analyzed.

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All patients gave their informed consent. The patients were evaluated with physical examination, routine blood tests, urinalysis, urine culture, direct urinary system graphy (KUB), renal ultrasound (US), noncontrasted computed tomography (CT) . The stone size was calculated with the longest diameter and the diameter lengths were calculated in cases with more than one stone. The operation was performed on patients after sterile urine cultures documented. URS was performed to all patients who without any ureteral pathology or operation history, and stone (9.5 Fr Wolf Ureterorenoscope, Germany). When we can not enter ureter with 9.5 Fr URS, ureter was entered first with 7.5 Fr URS. This procedure was performed to dilate the ureter. Two guide wires were left into renal pelvis under direct vision using ureteroscopy. The length of the guide wire inserted through the URS was measured from ureteropelvic junction to external mea. This measurement was performed to determine the length of the access sheath to be advanced. Then, by viewing the orifice with reinserted URS, an 12/14 Fr access sheath was advanced over the one guidewire up to the proximal ureter without flouroscopy until resistance was encountered or any deflection in the access sheath was observed. No excessive force is applied during this time. When access sheath placement can not be achieved, a double J stent was inserted into renal pelvis, and left there. In patients who could not reach the stone, they were operated again 3 weeks later. The stones were fragmented using holmium YAG: laser until they were smaller than 3 mm. For lithotripsy of the stone, 5–10 Hz frequency, 0.8–1.5 J power was applied.

Success was determined presence of residual fragments smaller than 3 mm. Intraoperative residual stone sizes were confirmed by ultrasound. At the end of the operation, the acces sheat and the flexible ureteroscope were withdrawn by observing the ureter for ureteral injury. Then, a double-J stent was inserted via R-URS, when it was necessary. It was removed after three weeks.

All patients' stone-free rates were assessed using KUB and US on the first day and months after surgery. Non-contrasted CT was also used to assess individuals with non-opaque and rest stones.

The statistical analysis was carried out using the statistical analysis tool Statistical Package for Social Sciences (SPSS) 22 (Inc, Chicago, Illinois, USA).

Results

Of 248 patients who underwent F-URS, 87 (35.1%) were female and 161 (64.9%) were male. The mean age of the patients was 44.03 (± 16.04), (range18-81) years. F-urs was performed in 138 (55.6%) of the patients the left kidney stone and in 110 (44.4%) of the patients the right kidney stone was performed. The mean stone size was 14.7 (± 3.7), (range 7-20) mm. Twenty four (9.7%) of the patients were in the upper pole, 37 (14.9%) were in the middle pole, 81 (32.7%) were in the pelvis and 106 (42.7%) were in the lower pole. The mean length of the guide wire was measured from ureteropelvic junction to external mea 34 (± 5.1) (range 30-45) cm. Double J stent was inserted in 210 (84.7%) of the patients. Of these patients, 16 (6.4%) were patients in whom the access sheath could not be placed. The mean operation time was 62.34 min (± 8.2),(range 35-95). The mean hospitalization time was 22.4 hours (18-54). Of the 248 patients, 20 (8%) of the patients developed first and second degree (urinary tract infection, hematuria) complication according to the Modified Clavian Classification and in 2 patients (0.8%) subcapsular hematoma was developed (Modified Clavien System-Grade 3A). Stone-free rate (postoperative 1 month) was 88.7% (n: 220). The stone-free rate was calculated as 91.6 % (n: 22) in the upper pole, 100% (n: 81) in the renal pelvis, 89.2% (n: 33) in the middle calyx and 82.1% (n: 87) in the lower pole. Twelve of the patients (4.8%) had residual stone and the mean residual stone size was 7.2 mm. While the stone size of patients with stone free was 11.92 mm (± 3.8), the mean stone size of patients with residual stones was 17.0 (± 2.9) mm (p: 0.01). Reflex or ESWL was applied to 28 (11.3%) patients who could not unable to insert access sheath and could not be reached stone-free. Only 2 patients needed scopy (0.8%).

Discussion

With minimal morbidity, retrograde intrarenal surgery (RIRS) has become an efficient treatment option for stones smaller than 2 cm in size (1).

The fragmentation of stones with holmium laser via flexible ureterorenoscopes has changed the treatment of kidney stones, in particular. However, with the continuously developing technology, not only the success of the treatment, but also the sensitivity of the patients and health professionals to less harm during the treatment has begun to come to the fore. Genetic mutations

Table 1: Stone Free Rate According To Stone Placement

	Upper Pole	Renal Pelvis	Middle Calyx	Lower Pole
Patients	24	81	37	106
Stone Free	22	81	33	87
Stone Free Rate	%91.6	100%	%89.2	%82.1

and secondary malignancies are the potential risks of the radiation exposure (2,8). For this reason, the radiation of the tomography was reduced with the stone protocol. The application of ultrasonic PNL and the reduction of the scopy dose during PNL are the result of this sensitivity (3, 9). Patients are exposed to about the same amount of radiation during ureteroscopy as they are during a regular x-ray of the kidneys, ureters, and bladder. When fluoroscopy is conducted, radiation doses should be kept as low as reasonably possible based on the dose–risk relationship (10, 11).

The first step that necessitates fluoroscopic guidance is the insertion of a safety guidewire. A safety access is important to avoid important complications such as ureteral perforation and severe bleeding (3). Fluoroscopy is used not only for placing the acces sheat, but also for evaluating the anatomical structure and seeing the location of the stone (12). In urological operations, the radiation exposure of surgeons, patients, and operating room staff has also increased (4).

Before Ureteral access sheath insertion, diagnostic URS is recommended that allows ureter dilatation (7). In our study, we performed diagnostic URS in all patients for this reason.

The use of fluoroscopy should be reduced to reduce the risk of radiation. In this respect, the fluoroscopy-free F-URS technique has been reported. Hamdt et al reported the study in which they placed acces sheat without using fluoroscopy (5, 13). In another study, ıt was reported that they monitored the progress of the access sheath in to orifice by displaying urs, similiar to us (7). However, in this study we did not encounter any information about how much accessory should be improved. In our study, we measured the length of the guided wire that we placed from urs up to extrenal mea and determined how far we should improve the access sheath. We achieved access to all calices, through active deflection of the ureteroscope.

We know that even in the standard method in which fluoroscopy is used, ureteral access is not always achieved (13). In this case, it is recommended to install a DJ stent and the procedure is repeated after a session. In our study, we could not improve acess sheath in 16 patients (6.4%). We could see that the acess sheath did not advance from the orifice, was forced, curled into the bladder with the imaging of ureteroscope. DJ stents were left to these patients and f urs were performed after three weeks.

In 144 patients who have the average diameter of the stone was 140.4 mm., Peng et al. tested the fluoroscopy-free RIRS. Only one patient, who had a double collecting system, required fluoroscopy. In 134 individuals (95.7%), stone-free status was reached (6). In 76 patients with a stone dimension of 14.1±4.1 mm, Krac et al. completed RIRS with a reduced fluoroscopy dose, using single-shot fluoroscopy for just guidewire insertion (14). Only 4 patients (5.2%) required further fluoroscopy for stone localization in two individuals and identification of collecting system anatomy in two patients who had previously undergone surgery. They stated that their SFR was 82.9%. Only two individuals (0.8 %) in our study required fluoroscopy for localisation of the tumor.

Flexible ureterorenoscopy is a method with high success (55%-93%) and low complication rate (15,16)(6). A meta-analysis of nine research was reported by Aboumarzouk et al, they reported complication rate as 10.1% (major 5.3%, and minor 4.8%) (17). In another study ıt was reported 16.6% minör complication rate (9). Also, complication rate was reported between 3.6% and 6.6% without any major complications in studies which are fluoroscopy-free RIRS (6, kıraç). Peng and kıraç et al. reported a Stone-free status of 95.7%, 82.9%, respectively. In our study, stone free rate was found 88.7%, complications were seen in 8.8 % of patients, of which 8% was grade 1and two ,0.8% was grade 3A according to Clavien-Dindo classification. Our results were found to be consistent with the studies in the literature.

It is known that the most related factor with the stone-free rate in F-urs is stone size and stone number (18, 19). In our study, the difference between stone size of stone free patients and stone size of patients with residual stone was statistically significant (p: 0.01). As stone size increases, the success rate of stone-free can be increased by repeated sessions or combined treatment methods (19, 20). In our study, stone-

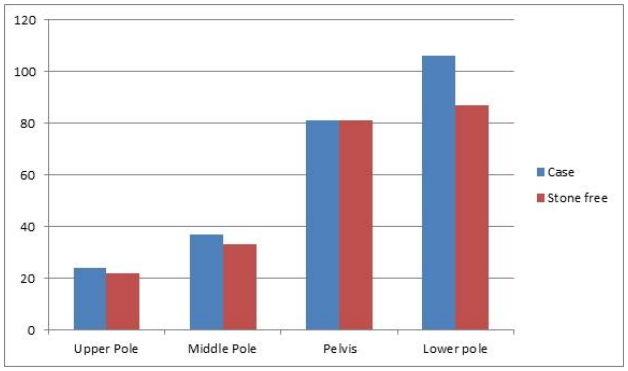

Fig.1.

free success was achieved with repeated sessions or combined treatment methods in patients with residual stones.

There are articles in the literature that reported a significant relationship between the localization of the stone in the kidney and the proportion of residual stone. The lower pole is indicated as the highest residual risk (7, 19). In our study, the stone-free rate was 93.8% in the upper pole, 100% in the renal pelvis, 91.5% in the middle calycem and 82.7% in the lower pole. The result was consistent with the literature.

Routine double j stent placement after flexible ureterorenoscopy is controversial. In many studies, it is stated that if there is no clinically significant residual stone and no ureteral trauma, double j stent may not be inserted after ureteroscopy (21, 22). However, Rapoport et al. recommends double j placement after ureterorenoscopy (23). In our study, 84.7% patients underwent double j stents. We think that the reason for this high rate was not using basket in any patient. We recommend routine DJ stent placement in patients who do not use a basket and have a residual stone.

Flex URS is becoming increasingly common. So we need to think more about how to protect the patient, the surgeon and staff of operation room. As shown in our study, performing scopy f-URS may be a protective method. But, the present study had certain limitations. As this was a retrospective and non-comparative study.

Conclusion: Without fluoroscopy, flexible ureterorenoscopy can be conducted with low risk and a high success rate.

Approval on Ethical Grounds: All methods in this study were carried out in line with the Institution's and/or National Research Committee's ethical standards, as well as the 1964 Declaration of Helsinki and its later revisions or comparable ethical standards.

Consent With Knowledge: Written informed consent form was obtained from all patients.

Potential For Conflict of Interest: There are no conflicts of interest declared by the author.

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