Flexible Ureterorenoscopy in Upper Urinary Tract Pathologies: Tips and Tricks

Rahim Horuz, Mustafa Soytaş, Mustafa Yücel Boz, Vahit Güzelburç, Selçuk Güven
Department of Urology, Istanbul Medipol University Medical School, Istanbul, Turkey

Abstract

Retrograde intrarenal surgery is now being widely used in the treatment of upper urinary stone disease, as well as in both diagnosis and treatment of tumoral or stenotic pathologies. With the technical advances and increasing experience in flexible ureterorenoscopy, today urologists are performing retrograde intrarenal surgery successfully in larger sized stones and have the opportunity of diagnosing and treating more upper urinary tract tumors at earlier stages. During this procedures, considering certain details in preparation of the instruments, during the operation, and in the postoperative care of the patients are all essential for the success of the treatment. In this article, we present the technical and operative details, tips-and-tricks of flexible ureterorenoscopy.

Key Words: Flexible ureterorenoscopy, Operative technique, Kidney stone, Upper urinary tract pathologies

Introduction

After confirmation of the offered diagnostic and therapeutic advantages of endourologic procedures in time, the endoscopic technology has been significantly improved and subsequent revolutionary changes occurred in urology during recent decades. Particularly developments in the optical technology and endovision, in flexibility of endoscopes, and miniaturization of the instruments have resulted in a new era in urological practice. In this era of minimal invasiveness in the urology, one of the most attractive examples has been retrograde intrarenal surgery (RIRS) with flexible ureterorenoscope.

Flexible ureterorenoscopy (F-URS) was emerged upon this need, and it is now being used successfully in the treatment of various pathologies of upper urinary tract.[1] In 1983, using of a flexible ureteroscope was described, with the ability to flex 160° in one direction and 90° in the opposite direction.[2] Today, RIRS is widely used especially for kidney stone treatment and in the diagnosis and treatment of pathologies such as tumors and strictures of the upper urinary tract. With the technical advances and increasing experience in flexible ureterorenoscopy, today, urologists are performing this technique successfully in larger sized stones and have the opportunity of diagnosing and treating more upper urinary tract tumors at earlier stages.

We should have appropriate information regarding the technique and instruments in order to be able to...
perform a safe and effective surgical operation as well as to prevent any potential damage on the equipment. We have to remember that the durability and cost of the instruments is also a main concern in this technique. As many factors, such as the sizes of the access sheath, its level in the ureter, placement and settings of the laser probe, flexion and deflection capacity of the scope, orientation and operating ability in the collecting system, finding the stone with endoscope, use of fluoroscopy, extraction of fragmented stones, extraction of the access sheath, may all affect the success and safety of the procedure, we should be careful in every stage of the operation not only for the success of the procedure, but also for patient’s safety and equipment’s durability.

In this article, we present some tips and tricks regarding the F-URS equipment and the procedure itself, which may be helpful in reducing the complications, preventing time loss, protection of related equipment, and eventually increasing the success rate.

TIPS FOR PREOPERATIVE PROCESS / PREPARATION

Firstly, all of the preoperative radiologic imaging of the patient should be re-examined just before the operation, and they should also be available in the operating room (OR) especially in stone patients. This is particularly relates with Computerized Tomography images of radiolucent stones, since fluoroscopy in the OR would be useless in this cases.

A complete operating table is a must in the F-URS (Figure 1A,B). All disposables that may be needed during the operation should be kept in a mobile hanger in the operation room, in order to prevent time losses during the transfer of the needed disposables from outside of the OR (Figure 2). Before the operation, all devices to be used should be checked (Figure 3). Reusable instruments should be sterilized and stored appropriately (Figure 4). During or after the operation, endoscopes and the other equipment should be checked, stored and protected properly (Figure 5). The tighter enwrapping may cause damage to the laser probe (Figure 6A,B). Laser probe must be cut with the proper equipment at the beginning of the operation. This will extend life of the laser probe, and allows you to fragment the stone more effectively (Figure 7). Perioperative ultrasound may be helpful in evaluating the perirenal space if operation time gets longer or any damage in the collecting system occurs (Figure 8A,B). Active heating system should be used for heating the body and upper extremities (Figure 9). Lead barriers should be used to protect the gonads from the x-ray in pediatric patients (Figure 10).

TIPS FOR PERIOPERATIVE PROCESS / THE TECHNIQUE

Following the preparation of the patient, guidewire is sent to the renal collecting system. Using a ureteral access sheath (UAS) is not mandatory during F-URS, however we recommend it whenever possible, as it allows easy repeated passages with the ureteroscope, especially if the fragments are intended to be extracted at the end of operation. In addition, it dilates the ureter and provides a better visualization by facilitating the return of irrigation fluid. UAS also allows lower intrarenal pressure and subsequently reduces the risk of intrarenal reflux. It also makes possible the passage of small stone fragments spontaneously during the operation. At last, it protects the flexible ureteroscope and gives more stability to the scope.(3)
Figure 2: A mobile hanger in the operation room.

Figure 3: Using devices should be checked.
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Figure 4: F-URS and it’s damage (Wrong).

Figure 5: A wrong storing of F-URS and damage.

Figure 6: Tighter storing (A) (Wrong) and appropriate enwrapping of laser probe (B).

Figure 7: The proper equipment for cutting laser probe.
In the cases with unnoticed stones in the ureter, ureteral access sheath may not be placed and also may be hazardous, so diagnostic ureteroscopy is recommended before F-URS. In addition, by initial ureteroscopy, the length and calibration of the ureter is also evaluated to determine the size of the appropriate access sheath. Shorter access sheaths for short and/or female patients, longer ones for tall and/or male patients should be preferred. Access sheath should be placed carefully to the proximal ureter (Figure 11). After placing access sheath, it should be fastened to skin or surgical drapes to avoid damaging the ureter, or displacement of the sheath. Before placing access sheath, a 6-8Fr feeding tube should be placed for drainage of the bladder during the surgery (Figure 12). In pediatric patients, suprapubic aspiration should be used instead of the feeding tube along with access sheath, in order to avoid injuring the urethra (Figure 13). If the access sheath is placed lower in the ureter, longer ureteral segment will need to be proceeded multiple times while extraction of the fragments (Figure 14). If the access sheath is placed higher in ureter, the UPJ, renal pelvis or collecting system may be damaged (Figure 15).

Once the access sheath is in place, we are able to enter with F-URS and screen the collecting system. Before starting stone fragmentation, flexible ureterorenoscope should be pulled back into the access sheath to be straightened while laser probe is being advanced to the scene, in order to preserve the inner shield of the working channel from damage by the laser tip. When the laser probe is inside the working channel, laser must be deactivated/standby mode. Laser probe is fastened to the tip of the working channel. If the laser probe is pulled into the working channel more than it should be, working channel of the F-URS can be damaged during deflection or flexion movements. Contrarily, if the laser probe is advanced more than necessary, mucosal damage and subsequent bleeding
Figure 11: Placing access sheath to the proximal ureter.

Figure 12: Fastening access sheath to the skin and a 6 Fr feeding tube for drainage of the bladder.

Figure 13: Suprapubic drainage of the bladder with a vascular catheterization cannula in pediatric patients.

Figure 14: A lower placed access sheath.

Figure 15: A higher placed access sheath.
and loss of vision may occur (Figure 16). At the beginning of the operation laser settings should be at a low level, it may be increased or decreased according to hardness or volume of the stone (Figure 17). Following finding the stone, laser probe is pushed forward and stone is fragmented. Especially at the beginning of the learning period, orientation to stone and collecting system may be impaired because of respiratory movements. In these cases, reducing the respiration rate may be helpful for more effective stone fragmentation and less damage in surrounding tissue.

Fluid irrigation is another important issue during the procedure. For a better vision and expulsion/mobilization of the stone fragments, irrigation fluid may need to be pumped by a device or manually, however unnecessarily frequent or forced pumping should be avoided because of the risk of increase in intrarenal pressure and resultant infectious complications. Particularly in the cases in whom no UAS used, we should be very careful while pumping of the irrigation fluid, as intrarenal pressures may easily be increased in such cases as the drainage of the fluid may be somewhat difficult.

Fragmentation of the stone should be continued until the smallest fragments in order to make spontaneous expulsion easy. A pop-corn fragmentation technique may be needed for that purpose (Figure 18). Fragments should be taken out with an extraction catheter, not only to reduce the number of them for spontaneous expulsion but also to make stone-analysis (Figure 19). During the stone extraction you must be sure about that the size of fragment is compatible with the ureter.
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or access sheath. With deep flank or abdominal palpation, you can mobilize the stones from a hard-to-see localization to an easier endovision area (Figure 20A,B). A guidewire should be sent into the collecting system before removing the access sheath, for precautional purposes. Placing a ureteral catheter depends on the physician’s preference (Figure 21).

F-URS can be effectively used in the diagnosis, and also in the treatment to a lesser extent, of the tumoral diseases of the upper urinary tract. Biopsy can be taken using a basket catheter (Figure 22). Adequate amount of tissue should be taken at once with great care in order to prevent bleeding or perforation. Biopsy procedure should be run under reduced pressure. Especially in the lesions of the renal pelvis, tumor necrosis should be kept in mind for possibility of perforation and extravasation.

POSTOPERATIVE PROCESS / FOLLOW UP

Since the most important and commonest complication after RIRS is infection, urinary culture must be performed before the operation and appropriate antibiotherapy should be given if the culture is positive. However, we should remind that the urinary culture may report false-negative results in the patients who have complete obstructing stone, although the urine in the collecting system is infected. The guidelines (EAU and AUA)

Figure 20: Deep abdominal palpation and mobilizing the stone to an easier endovision area (A from B).

Figure 21: Remove of the access sheath and placing a ureteral catheter.
recommend antimicrobial prophylaxis before the operation. (4) Nonobstructive pyelonephritis is the main postoperative complication and is reported in 0.7–8% of cases, while septic shock is rare (0.4%). It is important to administer the appropriate antibiotic therapy on time and to eliminate the possibility of ureteral obstruction. (5)

Routinely placing a stent in the ureter at the end of an ureteroscopy is not obligatory for uncomplicated URS. Ureteral injury, large stone burden, ureteral stricture, operating in a solitary kidney, chronic renal failure, a prolonged surgery time are most important indications for ureteral stenting. (4) Ureteral stent would be helpful in the patients in whom complicated with Stone street after the operation. This complication is generally encountered in the cases with larger stone burden, and its overall incidence is reported being as 1.6 to 4% (6)

Follow-up schedule after the operation mainly depends on patient and stone characteristics, as well as peri- and early postoperative course of the patient. Size of the stone, need for a second operative session, ureteral or urethral stenosis, difficulty/injury during UAS placement, stenting or not, the patient’s tolerability to the stent, amount and size of the residual fragments, anomalies in the collecting system are all important factors determining the follow-up schedule after the operation and, if necessary, the timing of additional procedures. Stone analysis and then medical metaphylaxis accordingly are important for not only to prevent the recurrences, but also this promotes the patient’s awareness.

In conclusion, as in all kind of surgical procedures, the eventual success of the F-URS relates mainly with a complete preoperative assessment and preparation, an uneventful operative session by experienced hands, and a vigilant postoperative care and appropriate follow up. By keeping some certain tips and tricks of all of these stages in mind, RIRS would be performed as a successful, safe, and cost-effective minimal invasive surgical method.

REFERENCES