No Touch Technique in Ureteroscopic Treatment of Renal Stones

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Abstract

Introduction and Objectives. Large meta-analyses demonstrated that wires and access sheaths (UAS) have their specific complications rate during and after flexible ureteroscopy (fURS). So, in selected cases, we applied no touch technique (NTT) by only visual insertion and progression of the flexible scope with intrarenal disintegration of the stones.

Materials and Methods. A total of 288 patients with single pyelocaliceal stone (largest diameter between 11 and 29 mm) underwent fURS: 144 using the 12/14 Fr UAS (group 1) and 144 without UAS (Group 2). For NTT we used 4 types of ureteroscopes: Olympus URF-V2 (8.5 Fr) – 33 cases, Storz Flex X2 (8.4 Fr) – 60 cases, single-use PUSEN PU 3022 (9.5 Fr) – 37 cases and single-use PUSEN – PU 3033A (7.5 Fr) – 14 cases. For the group 1 patients we used the Olympus URF – V2 ureteroscope in 44 cases, the Storz Flex X2 in 58 cases, and the single-use PUSEN PU 3022 in 42 cases. We compared the operative time, hospitalization periods and complications. Clinical data and outcomes were compared between the 2 groups.

Results. Successful access sheath insertion was 83.3% in Group 1 and successful ureteroscope insertion was 90.9% in Group 2. The average operative time was slightly higher in Group 1 vs. Group 2 (47 vs. 39 min.). SFRs were overall lower in the Group 2 (76.3% vs. 86.8%) at 1 month. At 3 months we didn't find significant difference between these 2 Groups. Superficial mucosal ureteral wall lesions were found in 38.8% of the Group 1 and 4.1% in the Group 2. The average urinary tract infection rate was slightly higher in the Group 2 (11.1% vs 9%). Hospitalization periods were longer in Group 1 vs. Group 2 (21 vs. 29 hours). A special mention for single-use 7.5 Fr ureteroscope: the insertion was simple, we did not encounter any mucosal ureteral wall lesions, and all patients were discharged in the same day.

Conclusions. Despite clear advantages of UAS using, there are a lot of disadvantages for the patient. Larger diameter UASs involve greater risk for ureteral wall injury. NTT seems to be very efficient and safe. The new Ureteroscope 7.5 Fr maximize surgical efficiency and minimize the complication rate in ureteroscopic treatment of renal stones.

Key-words: renal stones, ureteroscopy, no touch technique

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Introduction and Objectives

The prevalence of kidney stone disease has increased over the past 3 decades and reaches a lifetime rate of approximately 14%. This increase is reported to affect most of the developed countries. In addition, stone disease appears to be related with multiple factors such as socioeconomic conditions, lifestyle changes, environmental factors and has been found to be strongly associated with some comorbidities as obesity, diabetes and metabolic syndrome whose prevalence raised in the same period of time [1].

With the rapid development of the technology in flexible ureteroscopy, supporting instruments were created to ease and facilitate this treatment modality, including the introduction of the ureteral access sheath (UAS) in 1974 as a means of passing a flexible ureteroscope into the ureter. Although UAS placement performance was poor during its initial introduction (19% of 43 cases resulted in ureter perforation), UAS placement during ureteroscopy has now become an often-standard practice amongst endourologists since the introduction of modern UASs that are hydrophilic coated with hub-locking mechanisms. With such modifications, the safety and wide use of UAS was established, and is now commonly seen in every endourologist's weaponry.[2]

The introduction of a new generation of flexible ureteroscopes significantly advanced the therapeutic and diagnostic efficacy of the instrument, allowing greater access to all aspects of the upper urinary tract and facilitating wireless ureteroscopy.

This paper wants to present an alternative technique of the flexible ureteroscopy, a technique without using ureteral access sheath or a guidewire.

Materials and Methods

We conducted a retrospective study on a period of 2 years. A total of 288 consecutive patients with single pyelocaliceal stone (largest diameter between 11 and 29 mm) underwent fURS: 144 using the 12/14 Fr UAS (group 1) and 144 without UAS (Group 2). For NTT we used 4 types of ureteroscopes: Olympus URF-V2 (8.5 Fr) – 33 cases, Storz Flex X2 (8.4 Fr) – 60 cases, single-use PUSEN PU 3022 (9.5 Fr) – 37 cases and single-use PUSEN – PU 3033A (7.5 Fr) – 14 cases. For the group 1 patients we used the Olympus URF – V2 ureteroscope in 44 cases, the Storz Flex X2 in 58 cases, and the single-use PUSEN PU 3022 in 42 cases.

In the group 1 the mean diameter of the stone was 18 mm, respectively 16 mm in group 2. The stones were localized mainly in the lower pole in both groups (87 in group 1 and 82 in group 2). We compared the operative time, hospitalization periods and complications. Clinical data and outcomes were compared between the 2 groups.

Concerning the technique used, in the group 1, a guidewire was placed alongside the ureter, and the ureteral access sheath is placed fluoroscopically. Then is introduced the ureteroscope and the stone manipulation can begin. In the group 2, we visually inserted and ascended the flexible ureteroscope with intrarenal disintegration of the stone.

Results

Successful access sheath insertion was 83.3% in Group 1 and successful ureteroscope insertion was 90.9% in Group 2. In the cases we couldn't insert the access sheath or the ureteroscope, a double J stent was inserted to recalibrate the ureter. The average operative time was slightly higher in Group 1 vs. Group 2 (47 vs. 39 min.). SFRs were overall lower in the Group 2 (76.3% vs. 86.8%) at 1 month. At 3 months we did not find significant difference between these 2 Groups. We did not achieve stone free in the cases with lower pole stone that was hard of access. The average diameter of the stone for which was obtained stone free was 16 mm in group 1 and 14 mm in group 2. Concerning the postoperative complications, we encountered 5 Clavien IIIA complications (4 in group 1 and 1 in group 2), 33 Clavien II (15 in group 1 and 18 in group 2), and 43 Clavien I (34 in group 1 and 9 in group 2). The Clavien IIIA complication was renal colic that required double J stenting, the Clavien II complications were sepsis (1 case), urinary tract infections (29 cases) and ureteral stent discomfort (3 cases), and Clavien I complications were hematuria and light ureteral stent discomfort. Superficial mucosal ureteral wall lesions were found in 38.8% of the Group 1 and 4.1% in the Group 2. The average urinary tract infection rate was slightly higher in the Group 2 (11.1% vs 9%). We encountered 1 case of sepsis in group 2, solved by iv antibiotics administration. Hospitalization periods were longer in Group 1 vs. Group 2 (21 vs. 29 hours). A special mention for single-use 7.5 Fr. Ureteroscope: the insertion was simple, we did not encounter any mucosal ureteral wall lesions, and all patients were discharged in the same day.

Discussions

The use of a UAS during ureteroscopy allows for the access and investigation of the urinary collecting system in rapid repeated succession, lower intrarenal pressures, improved visibility as well as improved drainage around the ureteroscope. Despite these benefits of UAS placement, current guidelines of the European As-

sociation of Urology have no clear recommendations for UAS usage during typical ureteroscopy procedures, whereas the American Urological Association guidelines recommend the use of a UAS when performing retrograde intrarenal surgery for complex, high-volume renal stones. Despite widespread adoption of the UAS, concerns and controversies remain surrounding the use of UAS.

With the continuous advance in technology, and the ureteroscopes being thinner and more developed, our results let us introduce the technique of ureteroscopy without ureteral access sheath or safety guidewire.

Concerning the stone free rate, it is still a debate among the authors proving whether the ureteral access sheath improves the stone free rate or not. Traxer et al. reported in a multi-institutional prospective study that SFRs were overall lower with the use of a UAS (73.9% vs. 82.8%). However, this difference was not statistically significant, and the authors commented that their results suggested that UAS placement should not be primarily used to increase SFR [3]. In addition, Berquet et al. and Kourambas et al. showed no significant difference in the SFR [4, 5]. On the contrary, L'esperance et al. showed in their retrospective study that UAS placement leads to significantly higher SFRs in all portions of the kidney. However, subgroup analysis on stones per location in the renal pelvis and calices showed no significance [6]. In a meta-analysis regarding the efficacy and safety of the ureteral access sheath during ureteroscopy, Jian Huang, Zhijian Zhao et al. concluded that using a UAS in ureteroscopy has not an effect on SFR, operative time, hospitalization time, or intraoperative complications but significantly increases the incidence of postoperative complications. The study did not manifest an obvious advantage for using a UAS during ureteroscopy, which indicated the use of UAS should not be a routine in all cases [15]. Our study showed a lower stone free rate at one month in the group without using UAS, but at 3 months we did not find any statistical difference between the stone free rate in both groups.

The constant development of the intrarenal treatment for the renal stones and the use of the ureteral access sheath becoming more widespread, the complications associated to the UAS appeared more frequent. These complications can range from intraoperative, immediately post-operative, and into the long term. Intraoperative complications associated with the use of UAS include bleeding, perforation and avulsion. Traxer and Thomas found superficial ureteral mucosal wall lesions in nearly half of the patients following the insertion of an access sheath, with 15% extending beyond the mucosa into the smooth muscle layer [7]. In addition, the use of the UAS may also result in stricture formation and edema of the ureteral smooth muscle that can lead to ureteral obstruction. In comparison to these studies, we observed superficial mucosal ureteral wall lesions in 38.8% of the patients in Group 1 and only in 4.1% in those in Group 2. These results demonstrate the fact that the ureteral access sheath is traumatic towards the ureteral wall, fact we have to consider from now on when we practice flexible ureteroscopy. In addition, using the single use 7.5 Fr ureteroscope we did not have any mucosal lesions.

As far as intrarenal pressure is concerned, it was demonstrated that using an UAS reduce the intrarenal pressure through facilitating flow and irrigate out of the collecting system. In laboratory studies on cadaveric human and porcine models, it was demonstrated that UAS placement is capable of reducing intrarenal pressure compared with no UAS at various irrigation pressures [8]. Moreover, the gradual reduction of the intrarenal pressure was shown to be associated with increasing diameter of the access sheath. It was demonstrated that a normal physiological intrarenal pressure could be achieved using only the 14/16 Fr UAS. Although the studies conclude that UAS placement during flexible ureteroscopy does decrease intrarenal pressures compared to without, the degree of pressure reduction may not reach sufficient levels to prevent complications associated with high intrarenal pressures during surgery, especially under pressure irrigation. In addition, a large diameter of a ureteral access sheath increase the percentage of associated complications. The newest ureteroscopes are thinner and permit a reduced intrarenal pressure by draining the irrigate around the scope. However, further studies might be performed to demonstrate the efficacy of using a thinner ureteroscope without a ureteral access sheath concerning the intrarenal pressure. In our study we encountered a higher urinary tract infection rate in the group without ureteral access sheath, which shows that the intrarenal pressure was higher without ureteral access sheath.

Concerning the stenting following ureteroscopy, it is advised that a double J stent to be placed when ureteral access sheath is used, to prevent obstruction, renal colic, deterioration of renal function or postoperative complications. If ureteral wall injury occurs during ureteroscopy due to a UAS placement, stenting post-operatively has been shown to play a reparatory role in the prevention of ureteral edema and directly minimizes pain secondary to residual stone fragments and blood clots [2]. In case of using the sheathless technique, the reasons to place a postoperative stent are fewer, mainly

because of the fact that there are slimmer chances that a thin ureteroscope can produce ureteral wall injury.

In the traditional technique, a safety guidewire was maintained alongside the ureteroscope during stone fragmenting, to prevent from losing access [11]. Nakada et al. published a paper showing that the wireless flexible ureteroscopy is safe, the only complications encountered being urinary tract infections (4 cases), urosepsis (2 cases) and urinary retention (one case). No patient had ureteral wall injury or avulsion [12]. Dickstein et al. showed that no safety guidewire was necessary in the uncomplicated ureteroscopy, no intraoperative complications resulting from the lack of guidewire [13]. Grasso et al. performed 227 procedures without using a safety guidewire in a study, treating successfully ureteral and renal stones and tumors [14].

We have to mention the new single use PUSEN 3033A (7.5 Fr) ureteroscope, because we did not encounter any intra or postoperative complications. Moreover, all the patients were discharged in the same day with the intervention.

Conclusions

Despite clear advantages of UAS using, there are a lot of disadvantages for the patient. Larger diameter UASs involve greater risk for ureteral wall injury. NTT seems to be very efficient and safe. The new single-use digital Uscope 7.5 Fr (the thinner digital single-use in this moment) maximize surgical efficiency and minimize the complication rate in ureteroscopic treatment of renal stones.

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