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Comparison between flexible ureteroscopy in pre-stented group of patients and none pre-stented patients

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***Abstract*---**Background: Ureteroscopy has a low re-treatment rate and a high stone-free rate, making it a very successful therapy for ureteral stones. Though ureteral stent installation may make ureteroscope and ureteral access sheath insertion easier, it may come with more complications before and after the procedure. Aim: The objective of the research was to examine the disparities between pre-stenting and non-presenting ureteroscopy in the management of ureteral stones. Summary: Preoperative implantation of a ureteral stent may somewhat reduce the duration of surgery and enhance the stone-free rates in individuals having flexible ureteroscopy (fURS), however the effect is not statistically significant. Preoperative stenting resulted in a longer hospital stay and higher hospital expenses, but did not affect the incidence of complications and re-operations. Based on these data, it may be concluded that it is not justifiable to perform preoperative ureteral stent implantation before fURS for the treatment of upper urinary calculi. Nevertheless, due to the constraints of our study, more rigorous research, such as prospective randomized clinical trials, is necessary to validate our results.

***Keywords*---**flexible ureteroscopy, urolithiasis, upper urinary calculi, ureteral stent, urology.

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Flexible ureteroscopy

Flexible ureteroscopy (fURS) has seen substantial technological and technical progress over the last three decades, leading to the extensive use of fURS in treating various upper urinary tract disorders, including urolithiasis.(1)

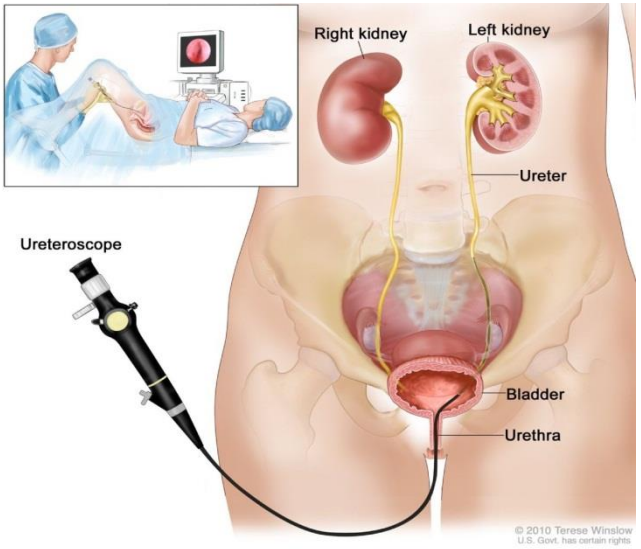

Fig (1). Flexible ureteroscopy. (2)

History and technological advancements of fURS

Marshall first reported fURS in 1964; since then, flexible ureteroscope technology has reached significant milestones, resulting in the present relative simplicity of clinical application, high success rate, and little related morbidity. (3) The development of fiberotic light-bundles, endoscope tip-deflection mechanisms (passive or active), and the addition of an irrigation working channel allowed for the substantial improvement of fURS in the 1980s, expanding its usage as a therapeutic instrument. (1)

In 1994, after the effective therapeutic use of a miniature flexible ureteroscope with a tip diameter of 7.5 Fr and an appropriate working-channel of 3.6 Fr, the following significant technical development occurred. The downsized flexible ureteroscope increased the endoscope's mobility and clinical usability by enabling active 2-way deflection with secondary passive deflection at the shaft.(2)

At the same time, when the Holmium: Yttrium Aluminium Garnet (YAG) laser was introduced as a safe and flexible intracorporeal lithotripter, there was a surge in interest in treating urolithiasis retrogradely. The capability to explore the complete pelvicaliceal system was enhanced with the introduction to the market in 2001 of a flexible ureteroscope with active 2-way exaggerated deflection (up to 270°). (3).

There was a later improvement in the longevity of flexible endoscopes, allowing for up to fifty therapeutic treatments before maintenance was needed. Introduced in 2006, digital flexible ureteroscopes extended the technological revolution in endoscopes by integrating the light-cable and camera into the endoscope, which enhanced picture quality and led to lighter equipment. (5)

Regrettably, ureteral access sheaths (UASs) were more often used with digital flexible ureteroscopes because to their greater diameter compared to traditional fiberoptic flexible ureteroscopes, increasing the risk of ureteral injury. Digital flexible ureteroscopes of smaller diameter, similar to the earlier conventional endoscopes, were introduced, however, as a result of additional development.(1)

The development of tiny diameter endoscopes that combine excellent image quality, maneuverability, and durability has been a continuous focus of technological advancements and improvements. In 2010, Sun et al. announced the first ureteroscope—named "the Sun's ureteroscope"—that combined rigid and flexible elements. By using this innovative ureteroscope—which has a retractable stiff shaft and a flexible tip—the authors were able to treat 175 patients with intrarenal stones effectively and expeditiously, eliminating the need to switch between endoscopes. With the Sun's ureteroscope, the operating time was reduced, and 83% of patients were able to avoid stones. (7) Prior research detailed an animal model for the viability of a novel robotic flexible ureteroscope, and subsequent reports on promising clinical experiences with the device in the treatment of urolithiasis were also detailed. (1)

An earlier research documented the first steps taken using a novel robotic platform for fURS. The novel robotic platform was evaluated by seven seasoned surgeons as they treated eighty-one patients suffering from urolithiasis. The first attempt was fruitful, and it was linked to better ergonomics than the old-fashioned alternatives. (5)

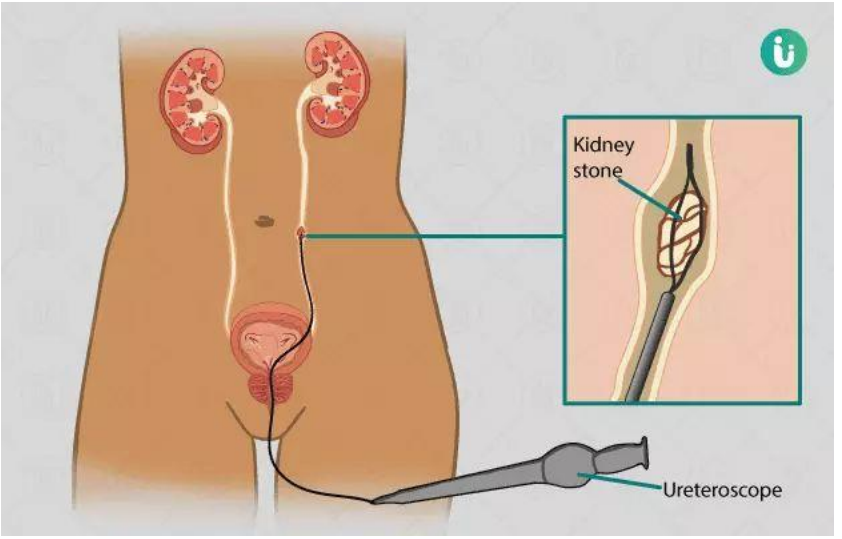

Fig. (2). Flexible ureteroscopy. (1)

Indications

The treatment options available for patients with kidney stones include Extracorporeal shockwave lithotripsy (ESWL), Flexible ureteroscopy (fURS), Percutaneous Nephrolithotomy (PCNL) which includes standard and miniaturized approaches such as mini-PCNL, ultramini-PCNL, and micro-PCNL, as well as open surgical and laparoscopic removal.(3)

ESWL is not suitable for treating cystine or uric acid stones due to their characteristics. Cystine stones are often difficult to detect on X-rays and are resistant to being broken down by ESWL. Similarly, pure uric acid stones do not show up on X-rays.

The latest EAU guidelines state that active stone removal of renal stones is recommended in the following cases: symptomatic stones (such as those causing pain or hematuria), stones larger than 15 mm, stones smaller than 15 mm if observation is not preferred, obstruction caused by stones, stone growth, stones in high-risk patients for stone formation, infection, patient preference, comorbidity, social situation of the patient (such as their profession or travel plans), and choice of treatment. The AUA Guidelines recommend treating asymptomatic stones in instances when there is evidence of stone development, presence of infection, and in particular scenarios such as vocational reasons. Alternatively, surgical intervention is recommended for individuals who have symptomatic stones and/or blockage.

After determining the need for stone removal, the treatment method is selected based on various stone characteristics including size, location, composition (if known), and the anatomy of the collecting system. Other factors such as the rate of complications, the patient's existing medical conditions, their personal preference, the availability of technical equipment, and economic considerations are also taken into account.(2) Both the American Urological Association (AUA) and the European Association of Urology (EAU) provide guidelines for choosing the appropriate method for actively removing kidney stones.

Flexible ureteroscopy in pre-stented group of patients and none pre-stented patients

Flexible ureteroscopy (fURS) represents a pivotal advancement in the treatment of urological conditions, particularly for managing kidney and ureteral stones. The technique's minimally invasive nature offers significant advantages over traditional methods, including reduced postoperative discomfort and faster recovery times. An ongoing debate within the urology community pertains to the benefits and drawbacks of pre-stenting prior to undergoing fURS. (8)

Introduction to Pre-stenting

Pre-stenting involves the placement of a ureteral stent, a small tube that facilitates urine flow from the kidney to the bladder, before performing fURS. This procedure aims to dilate the ureter, potentially easing the passage of the ureteroscope and enhancing the management of ureteral stones or strictures.

Proponents of pre-stenting argue that it can lead to better procedural outcomes, including higher success rates and reduced risk of complications. However, this practice is not without its critics, who highlight the potential for stent-related discomfort and the implications of increased healthcare costs.(9)

Procedural Success and Efficacy

The effectiveness of fURS is often measured by the stone-free rate (SFR), the percentage of patients with no residual stones after the procedure. Pre-stenting can theoretically improve SFR by allowing easier access to and removal of stones, attributed to the dilated ureter. Enhanced visualization and reduced operative times are additional benefits that may contribute to the procedure's success. Conversely, studies comparing pre-stented and non-pre-stented groups have shown that, in certain scenarios, especially with smaller stones or uncomplicated anatomical conditions, the outcomes may be similar. This suggests that the advantages of pre-stenting in terms of SFR might be more pronounced in specific patient populations or stone characteristics.(10)

Safety and Complications

Safety is paramount in any surgical procedure, and fURS has an excellent track record. Pre-stenting is thought to reduce the risk of ureteral injury, one of the more serious complications associated with ureteroscopy, by preconditioning the ureter to withstand the trauma of instrument passage. Moreover, it may decrease the incidence of postoperative complications, such as ureteral strictures. However, the act of stent placement itself introduces risks, including urinary tract infections, stent migration, and the syndrome of pain and bladder irritation associated with stents.(11)

Patient Experience and Recovery

Patient-centered care emphasizes not only clinical outcomes but also the patient's experience and quality of life during and after treatment. Stent-related symptoms, including pain, hematuria, and urinary urgency, can significantly impact a patient's recovery and overall satisfaction with the procedure. (12)

Although pre-stenting may facilitate a smoother and potentially less painful fURS procedure, the discomfort associated with the stent itself, often described as stent discomfort syndrome, can detract from these benefits. The decision to pre-stent must therefore carefully consider the potential for improved procedural outcomes against the likelihood of stent-related discomfort.(13)

Evidence-Based Perspectives

A comprehensive review of literature and clinical trials reveals a nuanced view of the pre-stenting practice. While some studies advocate for its benefits in increasing SFR and reducing complications, others suggest that these advantages may not be universally applicable. The variability in outcomes underscores the importance of individual patient assessment and the need for a personalized approach to the use of pre-stenting in fURS.(14)

Factors such as stone size, location, ureteral anatomy, and patient health must be considered in deciding whether to pre-stent. Additionally, surgeon experience and preference play significant roles, as familiarity with the procedure can influence its success and the management of potential complications.(11)

The debate over pre-stenting before fURS encapsulates the balance between optimizing procedural outcomes and minimizing patient discomfort and healthcare costs. The evidence suggests that while pre-stenting can enhance the technical execution and success of fURS for certain patients, its benefits must be weighed against the potential for stent-related symptoms and increased initial healthcare expenditure.(10)

Future research should focus on identifying specific patient cohorts that stand to benefit the most from pre-stenting, along with the development of new techniques or materials that could minimize stent-related discomfort. Large-scale, randomized controlled trials are essential to provide more definitive guidance on this issue, ensuring that urological practice continues to evolve in a direction that maximizes both efficacy and patient well-being.(9)

In the interim, the decision to pre-stent should be made on a case-by-case basis, with a thorough discussion between the physician and patient regarding the potential advantages and drawbacks. As the field of urology advances, the ongoing refinement of techniques like fURS, coupled with a nuanced understanding of pre-operative preparation, promises to enhance patient outcomes while adhering to principles of safety and cost-effectiveness.(13)

In recent years, fURS has been more popular because to technological developments and the availability of a large variety of disposable products. According to the latest EAU recommendations, fURS is recommended as the main treatment option for upper urinary tract stones that are less than 2 cm (15). However, the need of inserting a ureteral stent before flexible ureteroscopy (fURS) is still a subject of discussion.

Previous research has shown that using stents before surgery may greatly improve the success rates of fURS (flexible ureteroscopy) after 3 days. This finding aligns with other earlier studies.(16) Nevertheless, the stent insertion did not result in any substantial disparity in the SFRs of patients compared to those who did not get stents, as seen three months post-surgery. Furthermore, the duration of the surgical procedure was notably decreased (by roughly 6 minutes) in comparison to the group without stents. The increased success rate of ureteroscopic access and greater visualization of the ureteral tract may be ascribed to the dilatation of the ureter with preoperative stent implantation.(17) Nevertheless, the decreased duration of the procedure lacks practical significance in the context of clinical practice. Several studies have shown that the stent-free rates (SFRs) were significantly higher in patients who had undergone flexible ureteroscopy (fURS) without any serious problems prior to stenting.(18) The variation in results might be attributed to the generally smaller size of stones and their higher position in our dataset.

Based on our retrospective study, the incidence of complications and re-operations were not substantially different between the preoperative stented and non-stented groups. These findings align with earlier research. (19) Preoperative stent implantation is important for treating upper ureteral calculi, but it leads to longer hospital stays and higher hospital expenses. This might be attributed to the additional preoperative stenting surgery, which would surely prolong the hospitalization period and escalate hospital expenses. In cases with ureteral Stone Street, when there are big remaining stones that cannot be expelled via ESWL, it is recommended to do rigid ureteroscopy or secondary fURS as a follow-up procedure. Nevertheless, this is unrelated to the preoperative positioning of Double-J tubes.The number is 16. Our study concluded that Placing stent 2 to 3 weeks prior to flexible ureteroscopy helps reduce the complications related to procedure; specially ureteral injuries.

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