The PU 3033A 7.5 Fr Disposable Ureteroscope and its Role in the Treatment of Renal Stones

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ABSTRACT

Introduction: Flexible ureteroscopy is undergoing continuous technological development, and disposable ureteroscopes represent an increasingly used alternative due to the elimination of the risk of progressive deterioration, performance variability and costs associated with sterilization. The aim of this study was to evaluate the efficacy and safety of the PU 3033A model in the treatment of renal stones.

Material and method: A retrospective study was conducted on 98 patients with renal lithiasis <3 cm, treated by flexible ureteroscopy with PU 3033A. Patients were divided into three groups according to the size of the stones: <10 mm, 10–20 mm and 20–30 mm. All patients benefited from standard perioperative protocol and postoperative imaging control. Success was defined as the absence of fragments >3 mm.

Results: The success rate after a single procedure was 94% for stones <10 mm, 91.2% for stones 10–20 mm and 78% for stones 20–30 mm. Re-interventions were required in 1 patient in group II and 4 patients in group III. All complications (20.4%) were minor (Clavien I and II). The increased maneuverability of the endoscope, due to the small caliber, allowed efficient access to the inferior calyces.

Conclusions: The PU 3033A is a safe and effective instrument in the treatment of renal lithiasis, with consistent results for stones up to 20 mm and satisfactory results for stones 20–30 mm. The small caliber and optimal deflection may represent major advantages in intrarenal access and reduction of complications. Disposable ureteroscopes remain a viable alternative for a wide range of clinical situations.

Key-words: disposable, flexible ureteroscopy, renal stones, single-use ureteroscopes

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Introduction

Flexible ureteroscopes are constantly changing and developing and have come a long way from the first generation of analog devices to the latest digital technologies, which offer increased flexibility and reliability.

In recent years, the flexible ureteroscopic approach has become one of the most widely used treatment methods for kidney stones, due to its minimally invasive nature and reasonably short learning curve [1, 2, 3].

Until recently, ureteroscopy could only be performed using reusable ureteroscopes. [4]. In this context, a variable number of surgical interventions can cause the performance of the reusable ureteroscope to decrease for subsequent procedures[5], with a potential significant impact on success rates.

Disposable flexible ureteroscopes were developed as an alternative to reusable ureteroscopes. In addition to the problem of deterioration and decrease in deflection capacity after a certain number of uses, also depending on the degree of difficulty of the procedures (the so-called fatigue process), there is also the problem of sterilization costs and the risk of cross-infection. Some disposable ureteroscopes have similar characteristics to reusable flexible ureteroscopes, others even offer superior performance.

One of the most widely used ureteroscopes that emerged after the older 9.2 Fr Uscope 3022 is the PU3033A ureteroscope, with a caliber of 7.5 Fr, significantly thinner than its predecessor.

The aim of this study was to analyze the efficacy and safety of the Pusen PU 3033A in renal lithiasis pathology.

Material and method

A total of 98 patients with renal lithiasis, treated by retrograde approach with the flexible disposable ureteroscope PU 3033A, were retrospectively analyzed. The inclusion criteria were: age over 18 years, sterile urine culture or patient with antibiotic treatment performed in the last 72 hours prior to the intervention, renal lithiasis evidenced by CT with dimensions smaller than 3 cm.

All patients were examined biohumorally, monitoring the following parameters: hemogram, urea, creatinine, blood glucose, coagulation tests, urine summary, urine culture.

Each patient received prophylactic antibiotic therapy according to the EAU Guidelines.

Patients were analyzed in three groups, depending on the size of the kidney stones: group I with stone size <10 mm, group II with stone size between 10 and 20 mm, group III with stone size greater than 20 mm, but not greater than 30 mm.

Table 1 Distribution of patients in the 3 study groups

Stone diameter Group 1	Stone diameter Group 2	Stone diameter Group 3
<10 mm	10-20 mm	20 - 30 mm

On the first postoperative day, all patients underwent simple reno-vesical radiography, and one month postoperatively, they underwent ultrasound or low-dose CT without contrast medium. The success of the intervention was defined as the absence of fragments larger than 3 mm

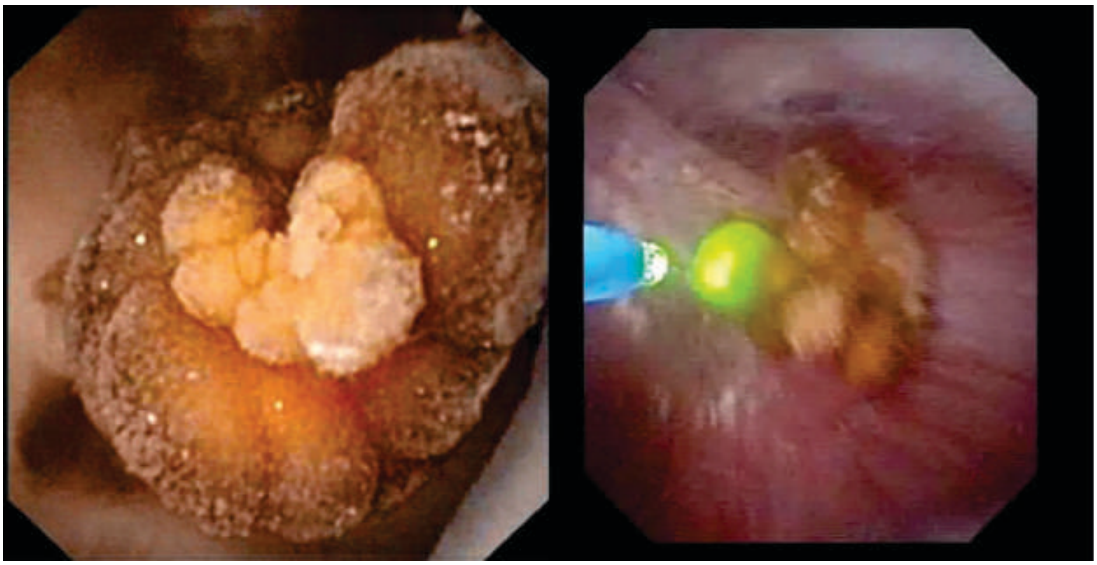


Figure 1 Stone in the process of fragmentation

The model PU 3033A was used, which is a flexible digital disposable ureteroscope with a design similar to that of reusable ureteroscopes. The model has an up/down deflection angle of 270/270 degrees and a field of view of 120 degrees. The working channel is 3.6 Fr.

The image is in HD resolution, with a limited operating capacity of 4 hours. Lithotripsy was performed with a Dornier Medilas H Solvo 35W laser. Laser settings also influence retropulsion, which could affect the effectiveness of lithotripsy, increase operating time and push ureteral stones into the renal pelvis.

For the dusting mode we used low energy (0.8J) and high frequency (approximately 15Hz), for the popcorn mode we used high energy (1J) and medium frequency (approximately 10Hz), and for the fragmentation mode we used high energy (1.2 J) and low frequency (8Hz).

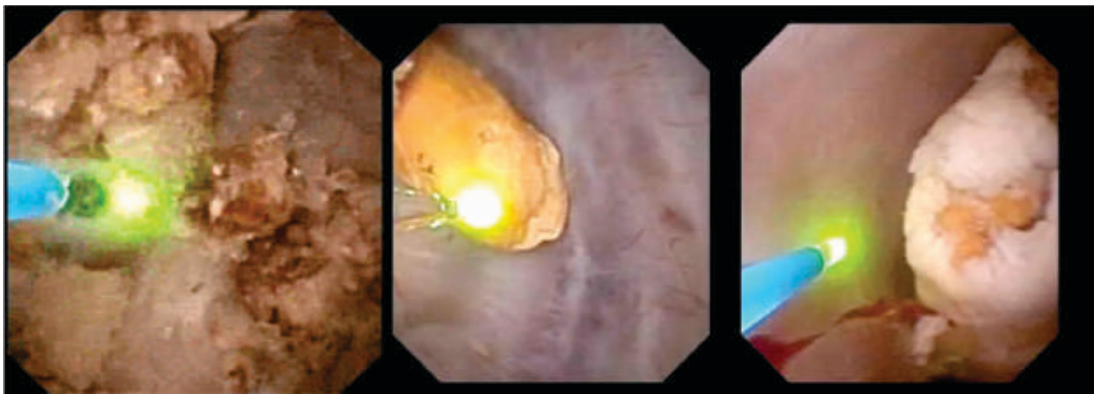


Figure 2 Various stones during laser fragmentation

Results

In group I, the stones were located in the renal pelvis (28 patients), superior calyx (12 patients), middle calyx (7 patients) and inferior calyx (6 patients). In group II, the stones were located in the pelvis (17 patients), superior calyx (7 patients), middle calyx (5 patients) and inferior calyx (3 patients). In group III, 9 patients presented renal pelvis stones and 2 each in the middle and inferior caliceal.

The success rates obtained and the complications classified according to the Clavien-Dindo system were followed.

In the first group, consisting of 53 patients, after one procedure, a success rate of 94% resulted. In the second group, the success rate after one procedure was 91.2%. In 1 patient, a second ureteroscopic intervention was required. In the third group, 13 flexible ureteroscopies were initially performed with a success rate of 78%. The remaining 4 patients required multiple endoscopic procedures.

All complications (20.4%) were minor: Clavien I (they did not require pharmacological or surgical treatment, endoscopic or radiological intervention; mild analgesics, antiemetics, antipyretics, diuretics were used) and Clavien II (other medication than the aforementioned was used, including blood transfusion and parenteral nutrition).

Discussions

The performance obtained in our study is consistent with the literature, where single-use flexible ureteroscopes have demonstrated comparable success rates to reusable devices, while offering the advantages of eliminating the need for sterilization and the risk of iatrogenic infection, as well as providing consistent image quality with each use [6].

The success rate was highest in the first group and was also influenced by the size of the stone. With the increase in size of the stones in groups II and III, the success rate decreased, increasing the need for an additional procedure.

The operative time, stone-free rate, and severity of complications can be influenced by many factors. Longer procedures are associated with higher risks of systemic inflammatory response syndrome (SIRS), fever, or sepsis, especially in patients with infectious stones [7]. It is important to avoid endoscopic procedures exceeding 90 minutes. Also, aspiration can reduce intrarenal pressure, temperature, and operative time.

The maneuverability of a flexible ureteroscope is essential during intrarenal procedures, for access and exploration of the renal pelvis, calyces, and in the approach to diverticula. This aspect becomes even more important when attempting to treat lower calyceal stones. The small caliber of the ureteroscope used (7.5 Fr) can be a major advantage in achieving this goal. Smaller diameter devices tend to have a more permissive deflection and superior maneuverability, a fact also reported by recent studies showing a correlation between the profile of the instrument and the success rate in the treatment of lower pole stones [8].

Conclusions

This study demonstrated that the PU 3033A flexible disposable digital ureteroscope is a safe and effective instrument in the treatment of renal lithiasis, with consistent results for stones up to 20 mm and satisfactory results for stones 20–30 mm. The small caliber and optimal deflection may represent major advantages in intrarenal access and reduction of complications. Disposable ureteroscopes remain a viable alternative for a wide range of clinical situations.

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