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Effects of Non-Surgical Therapy on the Treatment of Ureteral Stones

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Abstract: The purpose of this article is to evaluate the differences in the efficacy of non-surgical treatments for ureteral stones (6-15 mm). We retrospectively analyzed 595 patients who were treated in our hospital from June 2023 to May 2025 for ureteral stones (stones ranging in size from 6 to 15 mm). They were divided into three groups: Group A received conservative treatment with drugs (antispasmodic, analgesic, and ureteral dilation drugs), and Group B received ureteral double "J" Tube insertion plus oral stone expulsion drugs, group c extracorporeal lithotripsy (ESWL), compared the expulsion rate of upper and lower ureteral stones and stones of different sizes (≤10mm and >10mm) in the three groups. There was no statistically significant difference in age, gender, and stone location between the groups ($p>0.05$). The results of the analysis are: 1. Stone location: The stone expulsion rate in the lower section is higher than that in the upper section (mean comparison of each group, $P<0.05$); 2. Stone size: ≤10mm, the ESWL (group c) has the highest stone expulsion rate; >10mm, the stone expulsion rates in the three groups are all low. The conclusion drawn from the results is that ESWL has the best therapeutic effect for stones (6-15mm), and drug therapy and ureteral double "J" tube insertion can be used as the first intervention treatment for pain, infection, fever, and edema.

1. Introduction

Urinary tract stones represent a common global health issue, with an occurrence rate ranging from 2% to 15% [1]. Ureteral stones account for 20% of all urinary calculi. Currently, clinical techniques for managing urinary tract stones are well-established. Among them, ureteroscopy (URS), including rigid and flexible ureteroscopy, is the preferred treatment modality for larger ureteral stones. In recent years, continuous exploration and innovation by clinicians have led to the introduction of a new technique—the application of a negative pressure suction sheath during flexible ureteroscopy—which has significantly improved the stone-free rate for ureteral stones, achieving nearly complete clearance.

Minimally invasive surgical techniques currently employed in the clinical management of ureteral stones have reduced the risk of intraoperative and postoperative complications. These techniques are generally indicated for stones larger than 10 mm. However, for ureteral stones smaller than 15 mm, extracorporeal shock wave lithotripsy (ESWL) remains a viable clinical alternative [2], as it is safer and more cost-effective. Conservative management, such as

pharmacotherapy, for stones smaller than 10 mm remains controversial due to its limited efficacy.

Clinical experience indicates that most patients with ureteral stones present with concurrent conditions such as obstructive infection, hydronephrosis, fever, and severe pain. These symptoms—primarily pain, infection, and fever—often require immediate emergency intervention. In tertiary hospitals in China, minimally invasive surgery is widely adopted for stones larger than 10 mm. However, there is limited targeted reporting on non-minimally invasive treatments for stones smaller than 15 mm. Therefore, we conducted a statistical analysis of non-minimally invasive treatments for ureteral stones at our hospital (Jizhou District People's Hospital) to evaluate their outcomes.

Based on outpatient and inpatient records from our institution, we discuss the following non-minimally invasive treatment strategies for ureteral stones: conservative management with medications (e.g., antispasmodics and analgesics for pain relief, and ureteral relaxants), combined with oral expulsion therapy after double-J stent insertion, and ESWL. This study focuses on upper and lower ureteral stones ranging from 6 mm to 15 mm in size, aiming to provide guidance for the non-surgical management of ureteral stones.

2. Information and methods

2.1 General information

A total of 595 patients diagnosed and treated for ureteral stones (stone size ranging from 6-15 mm) between June 2023 and May 2025 at our hospital were included in this retrospective study. All patients were confirmed to have ureteral stones through outpatient imaging (including color Doppler ultrasound and CT). Non-minimally invasive treatments included: medication therapy (primarily antispasmodic and analgesic agents, along with oral tamsulosin hydrochloride) for 190 patients; ureteral double-J stent placement followed by oral expulsion-promoting medications for 205 patients; and extracorporeal shock wave lithotripsy (ESWL) for 200 patients. The medication therapy group had an age range of 17-52 years, with 99 males and 91 females. The double-J stent implantation plus oral medication group had an age range of 45-72 years, with 105 males and 100 females. The ESWL group had an age range of 27-65 years, with 85 males and 115 females.

2.2 methods

Tatistical Review: From June 2023 to May 2025, 595 patients with ureteral stones were included as study subjects.

Patients who did not undergo minimally invasive surgery but received pharmacological treatment were assigned to Group A, primarily receiving antispasmodic and analgesic therapy with phloroglucinol and stone expulsion therapy with tamsulosin.

Patients in Group B were hospitalized and underwent ureteral double-J stent placement for pain relief, and those with obstruction, pain, or fever who were ineligible for extracorporeal shock wave lithotripsy (ESWL) were treated with Shenshitong Granules.

Group C consisted of outpatients without contraindications to ESWL who directly received ESWL.

One week after treatment, all three groups underwent follow-up ultrasound or CT examinations, and patients were confirmed to have passed stones during urination. The stone expulsion rates among the three groups were statistically compared.

2.3 Statistics

Statistical analysis of the relevant data was performed using SPSS software (version 22.0). Measurement data were analyzed by t-test and are expressed as mean ± standard deviation ($\bar{x} \pm s$). Count data were analyzed by the χ^2 test and are presented as number (percentage) [n (%)]. A P-value < 0.05 was considered statistically significant.

Table 1 Ureteral stone discharge size (average) and discharge rate

Mean stone size	Proximal	A groups	B groups	C groups
	Distal	3.0	8.5	9.0
Stones left and	Right position	6.5	8.0	9.0
		78/112	120/85	108/92
Stone discharge	Proximal	21%(40)	26.4%(60)	39%(78)
rate	Distal	33.3%(45)	40%(82)	62.5%(125)

Table 2 Extraction of ureteral stones in the Proximal ureteral stones with 10mm

	A groups		B groups		C groups	
Stone size	≤10	>10	≤10	>10	≤10	>10
discharge rate	40/21%	0	52/25%	8/3%	60/30%	18/9%

Table 3 Extraction of ureteral stones in the Distal ureteral stones with 10mm

	A groups		B groups		C groups	
Stone size	≤10	>10	≤10	>10	≤10	>10
discharge rate	45/33.3%	0	58/28%	24/12%	80/40%	45/22.5%

3. Result

From June 2023 to May 2025, approximately 1,290 patients with ureteral stones were treated in our hospital, aged 17 to 92 years. Among them, 670 were male and 620 were female. The stones were located on the left side in 705 patients and on the right side in 585 patients. retrospective analysis was conducted on 595 patients who received oral medication therapy, ureteral double-J stent placement combined with oral medication therapy, or extracorporeal shock wave lithotripsy (ESWL). The average size of successfully expelled ureteral stones was 9 ± 3 mm. There were no statistically significant differences in age, gender, or stone location among the groups ($p > 0.05$).

Based on the selected research subjects, the overall stone clearance rate was 29.9% in the upper section and 42% in the lower section. The average size of cleared stones was smaller in the middle section than in the lower section among groups A, B, and C. The clearance rate in the lower section was also significantly higher than that in the middle section.(Corresponding Table1);

We assessed stone clearance during outpatient follow-up one week after treatment. 10 mm size threshold differentiated the clearance rates between groups. Stones ≤10 mm were cleared in groups a, b, and c, while those >10 mm were cleared in groups A, B, and C. (Corresponding Table 2 and Table 3)

4. Discussion

In the clinical practice of urology, ureteral stones, a type of urinary calculi, represent a condition most likely to cause renal colic and urinary tract obstruction. Among the current treatment modalities for ureteral stones, the majority of those smaller than 5 mm can pass spontaneously *ex vivo*; therefore, they can be effectively managed without surgical intervention, regardless of the

presence of symptoms. In contrast, larger ureteral stones that induce ureteral obstruction, renal colic, urinary tract infection, and fever require clinicians to administer active symptomatic treatment, including antispasmodics, analgesics, antibiotics, or ureteral double-J stent insertion. Currently, in tertiary hospitals, the primary clinical approach for managing ureteral stones is minimally invasive surgery, with ureteroscopy (URS) being the main technique employed to remove larger stones. However, for stones measuring 5–10 mm, non-surgical management is generally adopted. Nevertheless, if 5–10 mm ureteral stones fail to pass spontaneously over an extended period and are complicated by obstruction and hydronephrosis, URS may also be considered [3,4].

Although URS is effective, it is associated with higher costs and considerable patient discomfort during treatment. Moreover, the stone-free rate achieved by minimally invasive surgery is not 100%. Compared to surgical intervention, non-surgical management yields a lower stone-free rate; however, it offers advantages such as lower cost, reduced pain, and minimal risk. Despite this, few studies have investigated or reported on the efficacy of non-surgical treatments in clinical practice. Therefore, we conducted a retrospective analysis of non-surgical management of 6–15 mm ureteral stones at our institution (Tianjin Jizhou District People's Hospital), excluding cases treated with minimally invasive surgery. From these retrospectively reviewed data, we focused on and discussed the therapeutic outcomes of non-surgical management for 6–15 mm ureteral stones accompanied by obstruction, pain, and infectious fever.

In many clinical settings in China, conservative management is considered a reasonable and first-line treatment option for urinary stones smaller than 10 mm [5]. Hence, for stones smaller than 10 mm, conservative treatment may also be preferentially adopted in clinical practice. We hope to provide more data to support non-surgical management. In this study, non-surgical treatments were applied for upper ureteral stones. The results indicated that Group C (extracorporeal shock wave lithotripsy, ESWL) exhibited a higher stone expulsion rate. Regarding the treatment of lower ureteral stones, Group A (medication-only) had the lowest stone expulsion rate. Although the expulsion rate in Group B (ureteral double-J stent insertion plus oral medication) was lower than that in Group C, a certain disparity was observed between the two groups. It should be noted that all patients in Group B presented with obstructive fever, severe infection, pain, and other symptoms, necessitating active treatment. Although Group C demonstrated a higher stone expulsion rate, once patients developed complications such as obstructive fever, severe infection, or pain, both minimally invasive surgery and ESWL had to be suspended, and priority was given to managing these complications. Therefore, the advantage of ESWL over medication and stent insertion lies primarily in its applicability in cases without complications.

In this retrospective study, we also reviewed and analyzed the management strategies for ureteral stones larger than 10 mm that failed to be expelled with medication, ureteral double-J stent insertion plus oral medication, or ESWL. Ultimately, all these patients underwent minimally invasive surgery, which yielded satisfactory outcomes with nearly complete stone clearance. Postoperative analysis revealed that the most effective approach was ureteral double-J stent insertion plus oral medication, indicating that this combination provides better subsequent therapeutic effects and higher stone-free rates for conservatively managed ureteral stones.

According to our statistical results, the stone size expelled in Groups A, B, and C was predominantly $\leq$10 mm, while expulsion of stones larger than 10 mm was relatively rare. Additionally, ureteral double-J stent insertion plus oral medication was more suitable for upper ureteral stones smaller than 10 mm. Regarding the overall expulsion rates across the three groups, the rate for lower ureteral stones was significantly higher than that for upper ureteral stones. Thus, medication-based treatment can be a viable clinical alternative for lower ureteral stones, although it is not the first choice. For cases involving ureteral double-J stent insertion plus oral medication, if patients experience intractable pain, infectious fever, edema, or other complications (which cannot

be resolved by minimally invasive surgery), this approach may be considered as a primary treatment option.

5. Conclusion

Therefore, in clinical practice, for patients requiring non-surgical management and presenting without any complications, ESWL should be the first-line treatment for ureteral stones smaller than 10 mm. If patients present with obstructive edema, refractory pain, or fever, the preferred option is ureteral double-J stent insertion plus expulsion therapy, followed by medication-only treatment. To date, our hospital's accumulating experience with medication and ureteral double-J stent insertion has demonstrated that appropriate and effective management of ureteral stones can be achieved through thorough evaluation of stone and patient-related data [6–7]. This approach not only alleviates patient suffering but also reduces their financial burden.

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