Volume 4, Issue 2, February 2026 ISSN (E): 2938-3765

ENDOSCOPIC TREATMENT OF IMPACTED URETERAL CALCULI IN CHILDREN

1Nadjimitdinov Y. S.,
1 Kasimov S. S.
2 Jumayev B.Sh.
1Tashkent State Medical University
2"Republican Specialized Scientific and Practical Medical Center of Urology" of the Ministry of Health of the Republic of Uzbekistan, Tashkent

Abstract

Objective: to evaluate the results of treatment of children with impacted ureteral stones using ureterolithotripsy.

Material and methods: the treatment results of 73 children aged 5 to 18 years were retrospectively evaluated. The average stone size was 10.0 ± 0.6 mm in length and 5.5 ± 0.7 mm in width. Results: complete stone removal was achieved in 71 patients (97.2%). The total number of intraoperative complications was 24 (33.8%). Conversion from endoscopic intervention to open surgery was required in two cases (2.8%) (Grade III). Ureteral mucosal injury was observed in 6.8% of children (Grade I), and ureteral perforation in 1.4% of cases (Grade II a). Ureteral mucosal burns occurred in 4.1% of patients (Grade II a) during laser lithotripsy. Deformation of the tip of the metal guidewire occurred in 16.4% of cases (Grade I). Postoperative complications were observed in 23 pa-tients (31.5%). Elevated body temperature was noted in 8.2% of cases (Grade I), and hematuria in 9.6% (Grade I). Urinoma (Grade III b) and steinstrasse (Grade II a) were each observed in one child (1.4%). Systemic inflammatory response syn-drome was also reported in one case.

Conclusions: Ureteroscopic contact litho-tripsy for impacted ureteral stones in children is an effective and safe treatment method.

Keywords: Children, ureteral stones, contact ureterolithotripsy.

Introduction

The treatment of urolithiasis (UL) represents an important clinical problem in pediatric patients, given its high prevalence in certain regions of the world, such as Central Asia, the Middle East, South Asia, and North Africa. Nevertheless, epidemiological studies have shown that even in developed countries the incidence of urolithiasis in children is also increasing [2]. It should be noted that stone formation in pediatric patients tends to recur; therefore, minimally invasive surgical treatment methods should be used, which can be repeatedly applied if necessary. Moreover, these methods make it possible to render the child stone-free without disrupting the anatomical structure of the urinary tract and to reduce the potential negative impact of surgery on the growing organism.

In cases of ureteral stones, since spontaneous stone passage is unlikely and the risk of complications is high, an active treatment strategy using surgical methods is recommended in children [11].

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Licensed under a Creative Commons Attribution 4.0 International License.

Although the guidelines of the European Association of Urology and the European Society for Paediatric Urology state that both minimally invasive and conventional interventions can be used for the removal of ureteral stones, only a small proportion of children require open surgery. Nevertheless, every effort should be made to achieve complete stone removal, since postoperative residual fragments pass spontaneously in only 20–25% of cases [5].

Ureteroscopy is considered the treatment of choice in children with ureteral stones, especially in cases where the duration of the disease exceeds 2–3 months and the calculus is firmly adherent to the ureteral mucosa (impacted stone). In adults, impacted stones are defined as calculi that remain in the same position in the ureter for at least two months. During intravenous urography in such cases, contrast medium is not reliably visualized distal to the stone, and as a rule, it is not possible to pass a guidewire beyond the calculus into the pelvicalyceal system [7]. It should be emphasized that ureterolithotripsy for impacted stones requires specific surgical skills from the urologist, as the risk of ureteral wall injury with subsequent stricture formation is very high.

The aim of this study was to evaluate the treatment outcomes in pediatric patients with impacted ureteral stones using antegrade and transurethral ureterolithotripsy (TUULT).

Materials and Methods

From January 2019 to December 2024, the outcomes of treatment in 73 children aged 5 to 18 years with impacted ureteral stones were retrospectively evaluated. The study included children whose first episode of renal colic occurred 30-40 days prior to presentation at the clinic, but for various reasons, surgical intervention had not been performed. Multislice computed tomography (MSCT) with contrast of the urinary tract revealed a ureteral stone in these patients, with preserved renal function. All patients had ureterohydronephrosis, and tortuosity of the ureter proximal to the stone was visualized. Patients with urinary tract developmental anomalies, strictures of the ureteropelvic or ureterovesical junctions, or ureteral strictures were excluded from the study.

Before the intervention, all patients underwent clinical and laboratory examintions of urine (with bacteriological testing if necessary) and blood, as well as ultrasonographic and radiographic evaluation of the urinary tract. In cases of pyuria and bacteriuria (positive culture), urinary tract sanitation was performed. The parents of the children were informed about the planned surgical procedure, potential complications, and the possibility of additional interventions. The study was aproved by the Ethics Committee of the Republican Scientific and Practical Medical Center of Urology, where the research was conducted (protocol No. 1, dated Janary 23, 2023).

Results

The mean age of the children was 13.3 ± 2.7 years (range 5–18 years); some demographic characteristics of the patients are presented in Table 1. Of the patients, 48 (65.8%) were boys and 26 (34.2%) were girls. The mean stone size was 10.0 ± 0.6 mm in length and 5.5 ± 0.7 mm in width. Stones were located in the distal ureter in 35 (47.9%) children, in the mid-ureter in 24 (32.9%) cases, and in the proximal ureter in 14 (19.2%) patients. Regarding laterality, 28 (35.4%) stones were in the left ureter and 45 (64.6%) in the right ureter.

Previously, one patient had an unsuccessful attempt at extracorporeal shock wave lithotripsy (ESWL) in another center, while in other cases the stone had not been removed using ureteroscopy.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Licensed under a Creative Commons Attribution 4.0 International License.

Table 1 Some demographic characteristics of the patients (n=73)

Characteristic	Age (years)			
	5-7	8-10	11-14	15-18
Number of patients	11 (15%)	26 (36%)	24 (33%)	12 (16%)
Boys / Girls	6/5	19/7	16/8	7/5
Duration of disease (days, mean ± SD)	41,9±6,8	42,7±7,2	41,9±6,9	41,3±7,4
Unsuccessful ESWL	1 (1,4%)	-	2 (2,7%)	-
Unsuccessful TUULT		1 (1,4%)		
Stone length (mm, mean ± SD)	9.3±1,0	9,9±1,3	10,4±0,8	10,5±0,7
Stone width (mm, mean ± SD)	5,3±0,9	5,4±0,8	5,5±0,7	5,6±0,7
Hospitalization (days)	4,1±0,8	4,2±0,9	4,3±0,8	4,0±0,7

TUULT was performed in cases where the stone was located in the distal and mid-ureter, whereas antegrade ureterolithotripsy was used for stones located in the proximal ureter. Complete removal of stones and their large fragments was achieved in 71 (97.2%) patients. In two cases (2.8%), the endoscopic procedure was converted to open surgery due to the inability to visualize the stone, associated with pronounced edema and hypertrophy of the ureteral mucosa at the stone site (Table 2). Ureteral resection was performed at the site of the stone in one patient, with formation of a uretero-ureteroanastomosis; in another child, a ureterocystoanastomosis (Grade III) was performed.

Ureteral mucosal injury occurred in 6.8% of children (Grade I), and ureteral perforation in 1.4% of cases (Grade II-a), during which the stone migrated extraluminally; these complications were observed in children under 7 years of age. Ureteral mucosal burns were observed during laser lithotripsy in 4.1% of patients (Grade II-a). The tip of the metal guidewire was deformed during attempts to retrogradely pass it past the stone in 16.4% of cases (Grade I), and the guidewire was subsequently replaced.

Thus, the total number of intraoperative complications was 24 (33.8%) cases. Following surgery, children were monitored in the intensive care unit for 6-8 hours and then transferred to the ward after stabilization of their condition.

Table *2* Intraoperative complications according to the modified Satava classification (n = 73)

Grade	**Injury**	Number of patients
Grade I	Minimal ureteral mucosal injury	5 (6,8%)
	Malfunction or breakage of endoscopic equipment	12 (16,4%)
Grade II a	Traumatic ureteral mucosal injury (thermal injury)	3 (4,1%)
	Extraueteral migration of the stone, requiring ureteral stent placement	1 (1,4%)
	Ureteral perforation, requiring ureteral stent or nephrostomy placement and repeat ureteroscopy	1 (1,4%)
Grade III	Inability to access the ureter or the stone, necessitating conversion to open surgery	2(2,8%)

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Licensed under a Creative Commons Attribution 4.0 International License.

Hematuria without blood clots occurred in 9.6% of patients (Grade I) who underwent antegrade ureterolithotripsy. The use of hemostatic agents and increased diuresis resolved the bleeding. All children received nonsteroidal anti-inflammatory drugs (NSAIDs) during the first two postoperative days. However, in 9.6% of cases (Grade II-a), prolonged use of these drugs for more than three days was required due to discomfort caused by nephrostomy drainage.

A small urinary leak (Grade III-b) in the lower pole of the kidney was detected by ultrasonography in one patient (1.4%) after percutaneous access to the ureter. The urinoma resolved spontaneously by the fifth postoperative day without any additional interventions.

A "stone trail" (Grade II-a) in the distal ureter was observed in one patient (1.4%). This complication occurred because, during pneumatic lithotripsy, fragments of a stone located in the mid-ureter migrated into the renal pelvis and subsequently returned to the ureter after the procedure. Administration of an alpha-blocker allowed the patient to pass the stone fragments successfully.

Systemic inflammatory response syndrome (SIRS), characterized by hyperthermia up to 38°C, chills, pulse 120 bpm, respiratory rate 28/min, and leukocyte count of 16,000/μL, was observed in one child. The patient was transferred to the intensive care unit. Appropriate treatment, including infusion therapy and additional antibiotics, successfully controlled the sepsis.

Out of 73 patients, follow-up examinations within 12 months were performed in 70 cases. No recurrent stone formation was observed in any patient. However, in one case, a clinically insignificant ureteral stricture was detected in the mid-ureter (where the original stone was located) on intravenous urography. Renal parenchymal thickness remained within age-appropriate norms, and renal function was preserved.

Discussion

For the first time, Ritchey M. et al. (1988) published a case report describing the removal of a stone located in the distal ureter of a child using ureteroscopy with a laser lithotripter [10]. Nevertheless, due to the lack of small-caliber endoscopes, pediatric urologists were for many years skeptical about using lithotripsy for ureteral stones. Over the past decade, this hesitation has been overcome. Pediatricians' concerns about damaging the urinary tract during endoscopic correction of ureteral and renal pathology have been addressed through the development and clinical implementation of small-caliber instruments. The availability of lasers for stone fragmentation has made ureterolithotripsy the first-line treatment for children with ureteral stones.

However, despite the progress achieved in lithotripsy for children with "uncomplicated" ureteral stones, the issue of choosing a treatment method for so-called impacted stones remains. Ghoneim I.A. et al. [6] consider extracorporeal shock wave lithotripsy (ESWL) to be an effective treatment for impacted stones of the proximal ureter smaller than 2 cm. It should be noted that due to the lack of space for stone expansion after fragmentation in the ureteral lumen, ESWL in such cases is ineffective [9]. Bres-Niewada E. notes that patients generally do not become stone-free after a single ESWL session, and repeated interventions or additional procedures are often required, thereby reducing the patient's quality of life [3]. In our series, an attempt at ESWL was performed in one patient, but the stone was not successfully removed. Ureteroscopy revealed that the stone had fragmented; however, ureteral mucosal edema prevented fragment migration along the ureteral lumen.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Licensed under a Creative Commons Attribution 4.0 International License.

There are numerous publications on the treatment of impacted stones in adult patients; however, we found only one report presenting results of ureterolithotripsy in similar cases in children. Adanur S. et al. [1] successfully achieved complete stone clearance in 93.75% of patients using a semi-rigid endoscope and laser lithotripsy, with a complication rate of 15.6%. Additionally, ESWL was used when stones migrated to the renal pelvis. In our study, we did not use ESWL; however, in two cases, traditional open surgery was required to remove the stone. Furthermore, the authors used the Clavien-Dindo classification to systematize intraoperative complications, whereas we applied the Satava classification for this purpose.

According to our results, 71 (97.2%) children achieved a stone-free status following treatment; however, the complication rate was higher. Intraoperative complications were observed in 33.8% of patients, while postoperative complications occurred in 31.5% of cases. This situation may be explained by a longer duration of obstruction in our patients, the use of a larger-caliber rigid endoscope, and the use of a pneumatic lithotripter.

Conclusion

Thus, ureteroscopic contact lithotripsy for impacted ureteral stones in children is an effective and safe treatment method. For stones located in the mid and distal ureter, transurethral ureterolithotripsy (TUULT) is recommended, whereas for stones in the proximal ureter, antegrade ureterolithotripsy should be preferred.

References

1. Adanur S., Aydin H.R., Ozkaya F., Ziypak T., Polat O. Holmium laser lithotripsy with semi-rigid ureteroscopy: a first-choice treatment for impacted ureteral stones in children? Med Sci Monit 2014; 21(20): 2373-2379. doi: 10.12659/MSM.891173.
2. Bowen D.K., Tasian G.E. Pediatric stone disease. Urol Clin North Am. 2018;45:539-5350
3. Bres–Niewada E. Is there a place for ESWL in the treatment of complicated proximal ureteral stones? Cent European J Urol.2013 Nov 18; 66(3): 314-315. doi: 10.5173/ceju.2013.03.art15.
4. Dogan H.S., Onal B., Satar N., Aygun C., Piskin M., Tanriverdi O., Gurocak S., et al. Factors affecting complication rates of ureteroscopic lithotripsy in children: results of multi-institutional retrospective analysis by pediatric stone disease study group of turkish pediatric urology society. The journal of urology 2011; 186: 1035-1040.
5. El-Assmy A., El-Nahas A.R., Harraz A.M., et al. Clinically insignificant residual fragments: is it an appropriate term in children? Urology 2015;86:593-598. doi.org/10.1016/j.urology.2015.06.017.
6. Ghoneim I.A., El-Ghoneimy M.N., El-Naggar A.E., Hammoud K.M., El-Gammal M.Y., Morsi A.A. Extracorporeal shock wave lithotripsy in impacted upper ureteral stones: a prospective randomized comparison between stented and non-stented techniques. Urology 2010; 75(1):45-50. doi: 10.1016/j.urology.2009.06.071.
7. Morgentaler A., Bridge S.S., Dretler S.P. Management of the impacted ureteral calculus. J Urol 1990; 143: 2630-2666.
8. Nagata M., Unno T., Takayama T., Suzuki K., Fujita K. Endoscopic management of impacted ureteral stones using a small caliber ureteroscope and a laser lithotripter. J Urol 2000: 64 (2): 329-331.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Licensed under a Creative Commons Attribution 4.0 International License.

9. *Pettenati C., Benchikh El.F.A., Hupertan V., Dominique S., Ravery V. Double J stent reduces the efficacy of extracorporeal shock wave lithotripsy in the treatment of ureteral lumbar Stones. Cent Eur J Urol 2013; 66:309-313. doi: 10.5173/ceju.2013.03.art14.*

10. Ritchey M., Patterson D.E., Kelalis P.P., Segura J.W. A case of pediatric ureteroscopic lasertripsy. J Urol 1988; 139: 1272-1274. doi: 10.1016/s0022-5347 (17) 42890-4.3

11. Tekgül S., Stein R., Bogaert G., Nijman R.J.M. Quaedackers J., Hoen L., Silay, M. S., Radmayr C., Doğan H.S. European Association of Urology and European Society for Paediatric Urology Guidelines on Paediatric Urinary Stone Disease. E uropeanurology focus. 2022; 8: 833-839. doi:10.1016/j.euf.2021.05.006.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Licensed under a Creative Commons Attribution 4.0 International License.