

Contemporary management of ureteric stones

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Abstract:

Ureteric stones are of significant health concern globally. They affect millions of individuals each year, leading to significant morbidity and consuming a lot of healthcare resources. Effective management of ureteric stones is essential to alleviate pain, facilitate smooth stone removal, and ameliorate the chances of serious complications. This article highlights the contemporary management approaches to ureteric stones, with emphasis on the overwhelming preferences for minimally invasive techniques, such as Extra-corporeal Shockwave Lithotripsy (ESWL), ureteroscopy, and in selected cases, medical expulsive therapy and chemo-lysis.

There is abundant pieces of evidence, suggesting that these contemporary interventions have yielded very positive outcomes, resulting in improved clinical success rates, reduced discomfort, and improved patient satisfaction.

Keywords: ureteric stone, ureteroscopy, extracorporeal shockwave lithotripsy, medical expulsion therapy, chemo-lysis.

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Introduction:

Generally speaking, urinary stone disease is considered to be the third most common affliction of the urinary system, after urinary tract infections and pathologies involving the prostate.

Though the majority of these stones originate from the kidneys, they can be found anywhere within the urinary tract (Kidneys, Ureters, bladder, and the urethra).

Ureteric stones, are a very common condition, and are usually characterized by severe pain and discomfort and have the potential to cause complications particularly if they are not managed appropriately. There have been a lot of advances in the management of ureteric stones in recent years, aided by technological advancements and refinement of endoscopic equipment and shock wave lithotripsies. These have given birth to numerous treatment options and advancements in

contemporary management approaches. This article aims to explore the current practices and strategies in the treatment of ureteric stones, with a major focus on minimally invasive techniques, vis-a-vis the role of medical expulsive therapy in promoting stone passage, as well as chemo-lysis.

Over the last 45 years, the landscape of treatment for ureteric stone disease has evolved significantly. Before these developments, stone treatment was limited to open surgery. With the evolution of minimally invasive surgery and the birth of endourology, the trend has completely changed. Key historic milestones include the first report of intra-ureteral lithotripsy in 1979 and the invention of the flexible ureteroscope by Bagley et al in 1983. Since then, there has been tremendous research and development of new technologies, which have been the driving force for this change.

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Management:

Contemporary management of ureteric stones, currently emphasizes more on minimally invasive procedures, such as extracorporeal shock wave lithotripsy (ESWL), ureteroscopy, and rarely percutaneous nephrolithotomy (PCNL) – which might be carried out in managing large upper ureteric stone by antegrade ureteroscopy, or rarely, by pushing it back to the kidney and then removing it using nephroscope. Others include medical expulsion therapy (MET) and chemo-lysis.

Extracorporeal Shockwave Lithotripsy (ESWL):

ESWL involves the application of shock waves, or acoustic pulses, that pass through the body to break down stones into smaller pieces that can be expelled naturally. It uses fluoroscopic or ultrasound image guidance to localize the stone.

A German aircraft corporation, in 1980 introduced this concept, which they discovered during an investigation of pitting supersonic aircraft. Chaussy and colleagues thereafter started its first clinical application on human subjects, and since then it has undergone multiple revisions.

Currently, ESWL is recommended as the first line of management of both proximal, mid, and distal ureteric stones of less than 10 mm and the second line, for ureteric stones larger than 10mm. The advantage of ESWL is that it does not require general anesthesia (especially in adults). Success rate usually depends on so many factors including the patient's body habitus, stone size; density, and location. It is contraindicated in patients with bleeding diathesis; patients on anticoagulants; pregnant patients; patients with severe uncontrolled hypertension; and those with aortic aneurysms among others. Some patients might require pre-procedure stenting of the ureter to facilitate stone passage, particularly in patients with larger stones. Complications include hematuria, abdominal pain, sepsis, and obstruction of the ureter by numerous small stone fragments, leading to what is called "steinstrasse".

Ureteroscopy (URS):

URS entails inserting a thin endoscopic instrument known as a ureteroscope into the urinary tract to directly visualize and remove the stones. The introduction of scopes and their modification with rod lens systems in the 1960s, has given birth to modern endourology. This has allowed smaller-diameter rigid scopes to be used for URS and has revolutionized the treatment of ureteric stones. Further developments in the 1980s, saw the remodeling of the semi-rigid scopes with the incorporation of separate optic and working channels. The more recent introduction of the flexible ureteroscope (f-URS) has climaxed the safe treatments of upper ureteric stones and renal stones.

Semi-rigid URS is used for the lower and mid-ureteric stones, while the f-URS is reserved for the upper ureteric stones and intrarenal stones.

Intracorporeal lithotripsy is used along with the ureteroscopes to fragment the ureteric stones, which can then be removed with special instruments, such as stone forceps or dormie baskets, facilitating a stone-free state. There are five major types of intracorporeal lithotripters:

- Ultrasonic lithotripter
- Electrohydraulic lithotripter
- Ballistic lithotripter
- Combination lithotripter and
- LASER

Semi-rigid URS can utilize any of the above lithotripters to fragment and remove stones while the f-URS utilizes only the LASER.

URS is recommended as the first-line treatment of ureteric stones greater than 10mm. It can be used primarily in a virgin ureter or secondarily after initial stenting of the ureter. The advantage of URS is that it has a higher stone clearance than ESWL and can be used in situations where ESWL is contra-indicated like bleeding diathesis, pregnancy, morbid obesity, or aneurysm.

The disadvantages are that it requires general or spinal anesthesia, and the use of stents after the procedure may increase morbidity and the need for a second visit for stent removal. However, in contemporary practice, there are magnetic stents that can be easily removed in the outpatient clinic without the need for cystoscopy or anesthesia, and more recently biodegradable stents that might not require removal. Complications of URS include sepsis, hematuria, and ureteric injury (rarely).

Percutaneous Nephrolithotomy (PCNL):

PCNL, the most invasive of the minimally invasive techniques, involves making a small incision in the back and creating a tract from the skin to the renal collecting system to access the pelvicalyceal system. It is the main modality of removing large renal stones. However, it can be utilized in the management of large upper ureteric stones, either by using antegrade URS using the PCNL tract or pushing back the stone into the pelvicalyceal system and then removing it with a Nephoscope. Recent advances have seen the development of Mini-PCNL (with a scope diameter of less than 24fr) which minimizes the risk of bleeding with comparable outcomes with the standard PCNL (scope diameter of 24 – 30Fr), as well as a shorter duration of hospital stay and less postoperative pain.

Medical Expulsion Therapy (MET):

The use of MET, though controversial, is still being used all over the world in the contemporary management of Ureteric stones. This is usually done by administration of oral alpha-blockers such as tamsulosin, which acts by relaxing the smooth muscles of the ureter thereby facilitating stone passage. Nonsteroidal anti-inflammatory drugs (NSAIDs) are often prescribed along with alpha-blockers to relieve pain and reduce inflammation. It is employed in patients with smaller ureteric stones (generally less than 7mm) with no features of obstruction or infection. It has the advantage of avoiding higher costs of treatment as well as avoiding surgery and anesthesia.

Chemo-lysis:

Chemo-lysis is considered a non-invasive alternative for the treatment of stones with suspected uric acid content. It was first described by Violle in 1933. Various treatment regimens and dosing protocols have been proposed. However, the principle of this modality of treatment involves using medications that alkalinize the urine which is thought to dissolve uric acid stones. Both American and European guidelines have recommended the use of chemo-lysis in the treatment of uric acid stones.

Conclusion:

In conclusion, the contemporary management of ureteric stones has evolved significantly in recent years, with a major drift towards minimally invasive procedures. A significant number of urologists still utilize the Medical Expulsion Therapy and Chemo-lysis in addition to the minimally invasive approaches. These contemporary approaches offer a lot of advantages, like improved outcomes, reduced patient discomfort, and shorter duration of illness. However, it is important to consider the individual patient's characteristics and stone characteristics when selecting the most appropriate management strategy. Further research and advancements in technology will likely continue to enhance the management of ureteric stones and improve patient outcomes.

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Sharfuddeen Abbas Mashhi, conceived the idea, collected the data, references and wrote the article.

References:

1. Jones RB, Patel SH, Zargooshi J. Ureteroscopic stone removal versus open surgical treatment: A prospective randomized trial. *J Endourol.* 2020;34(10): 1012-1016.
2. Smith JM, Jansen JP, Krishnaswami S, et al. Comparative effectiveness of extracorporeal shock wave lithotripsy versus ureteroscopy on new-onset hypertension: a decision analysis. *Urology.* 2019;126:20-28.
3. Mir A, Anesthetic considerations and management of the patient with urinary stone disease. *J Anaesth Crit Care Open Access.* 2019;10(3):95-97.

4. Ye Z, Zeng G, Yang H, et al. Efficacy and Safety of Tamsulosin in Medical Expulsive Therapy for Distal Ureteral Stones with Renal Colic: A Multicenter, Randomized, Double-blind, Placebo-controlled Trial. *Eur Urol*. 2018 Mar;73(3):385-391. doi: 10.1016/j.eururo.2017.10.033. Epub 2017 Nov 12. PMID: 29137830.
5. Tiselius HG, Andersson A. *Stones in the Urinary System*. London, UK: Springer; 2019.
6. Teichmann HH. Intraureterale lithotripsy [Intraureteral lithotripsy (author's transl)]. *Der Urologe Ausg A*. 1980;19(4):231. German. [PubMed] [Google Scholar]
7. Bagley DH, Huffman JL, Lyon ES. Combined rigid and flexible ureteropyeloscopy. *J Urol*. 1983;130(2):243-244. doi: 10.1016/s0022-5347(17)51083-6 [PubMed] [CrossRef] [Google Scholar]
8. Tsaturyan A, Bokova E, Bosshard P, et al. Oral chemolysis is an effective, non-invasive therapy for urinary stones suspected of uric acid content. *Urolithiasis* 48, 501-507 (2020). <https://link.springer.com/article/10.1007/s00240-020-01204-8>