



ORIGINAL ARTICLE

Ureteroscopic treatment of larger renal calculi (> 2 cm)

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Received 10 April 2012, Received in revised form 10 May 2012, Accepted 14 May 2012

Available online 19 July 2012

KEYWORDS

Kidney;
Calculi;
Ureteroscopy;
Lithotripsy

ABBREVIATIONS

PCNL, percutaneous nephrolithotomy; CRI, chronic renal insufficiency; UL, ureteroscopic lithotripsy; UAS, ureteric access sheath

Abstract Objectives: To evaluate the current status of ureteroscopic lithotripsy (UL) for treating renal calculi of > 2 cm, as advances in flexible ureteroscope design, accessory instrumentation and lithotrites have revolutionised the treatment of urinary calculi. While previously reserved for ureteric and small renal calculi, UL has gained an increasing role in the selective management of larger renal stone burdens.

Methods: We searched the available databases, including PubMed, Google Scholar, and Scopus, for relevant reports in English, and the article bibliographies to identify additional relevant articles. Keywords included ureteroscopy, lithotripsy, renal calculi, and calculi > 2 cm. Retrieved articles were reviewed to consider the number of patients, mean stone size, success rates, indications and complications.

Results: In all, nine studies (417 patients) were eligible for inclusion. After one, two or three procedures the mean (range) success rates were 68.2 (23–84)%, 87.1 (79–91)% and 94.4 (90.1–96.7)%, respectively. Overall, the success rate was > 90% with a mean of 1.2–2.3 procedures per patient. The overall complication rate was 10.3%, including six (1.4%) intraoperative and 37 (8.9%) postoperative complications, most of which were minor. The most common indications for UL were a failed previous treatment (46%), comorbidities (18.2%), and technical and anatomical factors (12.3%).

Conclusions: UL is safe and effective for treating large renal calculi. While several procedures might be required for total stone clearance, UL should be considered a standard approach in the urologist's options treating renal calculi of > 2 cm.

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Peer review under responsibility of Arab Association of Urology.



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Introduction

The treatment of urinary calculi has advanced considerably with the development of instruments and techniques. Most patients with renal and ureteric calculi presenting to a urologist require treatment. The cur-

rently available options include ESWL, percutaneous nephrolithotomy (PCNL), and ureteroscopic lithotripsy (UL). Open and laparoscopic surgery are reserved for rare, special cases [1,2].

Once the decision to treat the stone has been made there must be a decision on which technique to use. This is based on the success and the morbidity of any individual procedure, which in turn is based on the location and size of the stone, as well as the patient's comorbidities. While ESWL is the least invasive approach it is also generally the least successful [3]. Percutaneous approaches are typically used for treating large renal stones. PCNL is associated with a higher success rate but it also has a higher complication rate [4,5]. The success of UL within the ureter has been transferred to the kidney and become widely accepted [6,7]. It has had some limitations for large stones, which have been investigated more widely recently. Here we review previous reports to define the status of UL for renal calculi of > 2 cm in diameter.

Methods

We systematically reviewed reports in English using a search of the standard databases PubMed, Google Scholar and Scopus. Full-text papers between 1983 and 2012 were included. We also used our ongoing bibliography of pertinent reports. Keywords included 'ureteroscopy', 'lithotripsy', 'renal calculi', and 'calculi > 2 cm'. The articles retrieved were reviewed to consider the number of patients, the mean size of the stones, the success rate after one, two or three procedures, and the indications and complications if reported.

We accepted the authors' definition of success, whether it was stone-free or fragments of < 2, < 3, or < 4 mm. We also accepted their defining study of plain abdominal radiography, IVU, ultrasonography or CT, or a 'second look' ureteroscopy.

Results

Nine studies met the inclusion criteria [8–16]; collectively in these series, 417 patients were treated ureteroscopical-

ly for stones of > 2 cm in diameter. Some studies subdivided them further for stones of > 3 cm. Various reports presented the data in different forms, some of which could not be reformatted into the selected format. Different criteria for success were used in some papers and we did not subdivide them.

The success in clearing stones ureteroscopically varied by the number of procedures and by the size of the stones (Table 1) [8–15]. In each series the success increased as patients were treated in one to three episodes. The mean (range) success rate after one procedure was 88.2 (23–84)%. After a second procedure the success rate was 79–91%. All series reported a success rate of > 90% after three procedures. Overall, the mean success rate was 94.4% with a mean of 1.2–2.3 procedures per patient.

The definition of successful treatment also varied among studies. Most commonly success was defined as stone-free or residual fragments of < 3 mm. There was a wide variation in success rate related to this definition. Hyams et al. [13] showed that the defined success increased from 47% for stone-free to 66% for fragments of 0–2 mm and 83% if fragments of < 4 mm were acceptable.

The duration of the procedures is also summarised in Table 1 [9–15]. The range among the series reporting this information was 25–240 min, and the mean ranged from 66 to 135 min. In one series the duration of the procedure was separated into those for stones of 2–3 cm, which was 70 min, and those of > 3 cm, which was 135 min [9].

The overall complication rate was 10.3%, which included six (1.4%) intraoperative complications and 37 (8.9%) postoperative complications (Table 2) [8–16]. Although the vast majority of postoperative incidents were minor, five major complications were reported. This included one patient with haematuria requiring endoscopic treatment. Two patients developed obstructive pyelonephritis, again requiring treatment. One patient did not comply with the prescribed preoperative antibiotics and developed bacteraemia. Last, a cerebral vascular accident developed after surgery in one patient who had a strong history of vascular disease.

Table 1 UL for renal calculi; the success rate by procedure.

Reference	No. of patients	Stone size (cm)	Procedures, % success			Mean no. of procedures	Duration of procedure, min (range) {stone size, cm}
			1	2	3		
[8]	45 (renal)	> 2	76	91	93	1.2	–
[9]	30	> 2	77	ND	ND	1.0	70 (55–85) {2–3} 135 (75–160) {> 3}
[10]	13	2–4	77	84.6	92.3		66 (25–240) (47 min/stage)
[11]	15	2.0–2.5	66	93	93	2.3	83 (45–140)
[12]	22	> 2.5	23	86.3	90.1	1.82	72 (78–138)
[13]	120	2–3	84	NS	ND	–	74.3 (SD 20) {NS}
[14]	24	> 2	54	79	92	1.7	114 (50–215)
[15]	120	> 2	58.5	87	96.7	1.6	89 (60–140)
Mean%			68.2	87.1	94.4		

ND, not done; NS, not stated.

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