

Pulsed Dye Laser Lithotripsy for Ureteric Calculi

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Laser has proven to be an effective and safe method of treating ureteral stones. When the electromagnetic energy of a laser pulse is selectively absorbed by stone, a plasma forms at the surface. This plasma, which is composed of ions and electrons, continues to absorb laser energy reaching very high pressure and generating a shock wave that fragments the stone. The degree of stone fragmentation is directly related to the composition and crystal lattice structure of the calculus. The damage to the ureteric wall is negligible.

Patients, Methods and Results

A study was done on 120 stones in 115 patients. The indications for treatment were ureteric colic and haematuria. In all cases the diagnosis of ureteric calculi was confirmed by intravenous urography. The ureteric stones, larger than 2 cm resulting in a non-functioning kidney were excluded from the study. The CANDELA laser lithotripter was used. It is capable of generating a higher level of laser energy and therefore, a high rate of successful stone fragmentation. A 200 μ m fibre was used to deliver 40-80 mJ of energy at a wave length of 504 nm. Ureteric access was achieved by means of 7.2 F rigid ureteroscope. A plain abdominal radiograph was done for all patients in the post-operative and follow-up periods. Success was defined as complete stone fragmentation and a stone free state on follow-up. There were 80 males and 35 females. Majority of patients were between 30-49 (average age 36 years). Most common presenting symptoms were ureteric colic followed by haematuria (Figure).

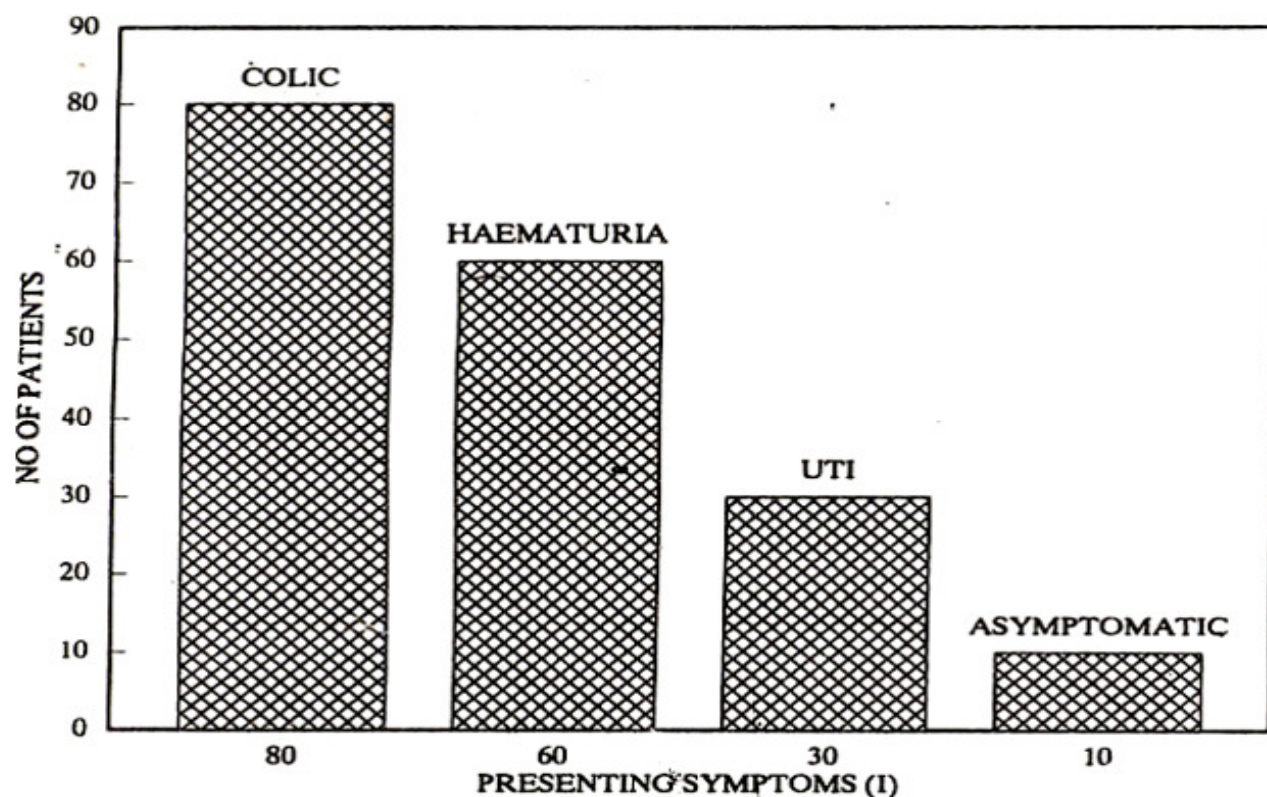


Figure. Most common presenting symptoms.

Majority of stones were found in lower 1/3 ureter (85), remainder were evenly distributed in the upper and middle 1/3 ureter. General anaesthesia was used in all 115 patients and all cases were treated as day surgery except one, who suffered perforation of ureter. Stone diameter ranged from 3 mm to 20 mm. In majority of patients the procedure took 30 minutes or less. The longer duration was due to difficulty in gaining ureteric access because of the tangential situation of ureteric orifices (Table).

Table. Distribution of patients by operating time.

Duration of operation (min)	No. of patients
1-30	80
30-45	25
45-60	10

There were minor complications, like pain (10%), haematuria (7%) and infection (0.5%). Out of three failures, one was due to perforation of ureter and in two ureteric stones were pushed back into renal pelvis because of the high pressure of irrigating water and were not visible by ureteroscope. These stones were fragmented by Extracorporeal Shockwave Lithotripsy (ESWL). Several factors were analysed and it was found that stone burden, as indicated by stone diameter, influenced the chances of success of stone fragmentation by laser. The best results are shown by stones less than 10 mm in diameter.

Lower ureteric stones are the ideal ones for fragmentation by laser.

Comments

Ureteric laser lithotripsy offers significant advantages over all other modes of lithotripsy. Majority (98%) of the patients were admitted as day surgery cases and therefore, hospital stay was very short. Ultrasonic and electrohydraulic lithotripsy requires the use of larger ureteroscopes which usually require ureteric orifice dilatation, leading to local damage and high incidence of ureteric reflux². The laser fibre, however, delivered through 7.2F semi-rigid or rigid miniureteroscope, can be passed through ureteric orifice and fragmentation performed with great margin of safety. At the operating wavelength of 504 nm, the laser energy is maximally absorbed by stones and minimally by ureteric tissue. Therefore, the local damage to ureteric wall is negligible. In this study, the frequency of minor complications was low (15%), with one ureteric perforation. Failure rate was 2.5%³. Bolton et al⁴ have reported a series in which general anaesthesia was not given, but in the author's opinion, general anaesthesia is safe and decreases the chances of ureteric perforation. Begley et al⁵ had a stone fragmentation rate of 100% in the treatment of 70 ureteric calculi with the Technomed Pulsolithotripter. In their series, the 400um laser fibre was used, thereby delivering a higher level of laser energy, 200 rnj. Size and site of stone in ureter effects the likelihood of a successful outcome with laser lithotripsy. Success rate with lower 1/3 ureter is almost 100%. pulsed dye laser lithotripsy is a major technological advance in the treatment of ureteric stones. It is relatively atraumatic and safe procedure with low morbidity and a high success rate⁶.

References

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