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ORIGINAL ARTICLE

Ureteric Stones less than 1.5 Cm: Comparison of Laser Vs. Pneumatic Lithotripsy: A Single Center Study

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ABSTRACT

Background: Ureterorenoscopy (URS) and intracorporeal lithotripsy (ICL) is the first-choice treatment for ureteric stones less than 1.5 cm. Various options forintracorporeal lithotripsy exist such as pneumatic, Laser and Ultrasonic.
Aim: To assess the safety and efficacy of laser versus pneumatic lithotripsy in treating ureteric stones of less than 1.5cm via Ureterorenoscopy**.**
Methods: A total of 182 patients who underwent URS and intracorporeal in the department of UROLOGY LRH to were reviewed retrospectively from December 2021-December 2022 after ethical approval. Two groups were made on the basis of type oflithotripsy used (112 patients in the pneumatic lithotripsy (PL) group and 70 patients in the Laser lithotripsy (LL) group. Stone-free rate (SFR), mean operation time (MOT), mean hospital stay (MHS), and complications rate were evaluated for both groups.
Results: Mean age of LL Patients was 41.1±3.9 years and PL patients 38.2±4.5 years. 68.4% of the study participants were males. LL had more upper ureter stones 17 (24.4%). LL's drawbacks outweighed its benefits in treating proximal ureteral calculi. Table 2 outlines postoperative complications and efficacy. Comparing the complications more PL patients had ureteric perforations (4.4%), postoperative fever (2.9%) and mucosal injury (5.7%) with p-value ≥0.05%. Mean operation time and hospital stay were less in LL patients, an immediate stone-free rate more (93.3%) in LL patients while stone migration more in PL patients 20(28.6%) with a statistically significant (p-value ≤0.05).
Practical implication: Patients with renal stones will easily be treated with laser and pneumatic with less complications rate and short hospital stay than open surgery.
Conclusion: For the treatment of ureteral stones, the PL and LL methods were effective and safe. However, it's possible that the LL class' SFR was higher..
Keywords: Ureteric Stones, Laser Lithotripsy, Pneumatic Lithotripsy, Comparison

INTRODUCTION

Urolithiasis and especially ureteric stones are very common in our part of the globe. Patients usually present with severe flank pain, nausea and dysuria. Non-contrast CT KUB is the investigation of choice. There are various treatment modalities for ureteric stones such as medical expulsive therapy, Ureterorenoscopy (URS) and intracorporeal lithotripsy, Laparoscopic ureterolithotomy, open ureterolithotomy, percutaneous nephrolithotomy, and extracorporeal Shock wave lithotripsy (ESWL)[1]. Open surgery for ureteral stones was proposed in the middle of the 1980s, but it is now replaced by ureterorenoscopy and intracorporeal lithotripsy[2]. The fundamental advantage of ureteroscopic surgery is that it is minimally invasive and done through a natural orifice[3].

There are various options for intracorporeal lithotripsy during URS such as Laser, electrohydraulic, pneumatic, and ultrasonic lithotripsy. The most common laser used is the Ho: YAG laser[4]. The most commonly used modality is Pneumatic lithotripsy (PL) though both PL and Ho: YAG lithotripsy yields promising results. In Pneumatic lithotripsy a metal indicator oscillates through air energy to fracture the stones. Ho: YAG laser pulses generate heat by dissipating tiny bubbles. The fiber tip's bubble bursts, creating a shock wave that breaks the stones[5].

Both LL and PL are highly effective with few complications. There is always a debate amongst the urologist about the choice of lithotripsy used in URS. In this retrospective review we compared the safety and efficacy of LL and PL for ureteric stones less than 1.5cm.

METHODS

A total of 182 patients who underwent URS (9.5Fr WolfInc, Germany) and intracorporeal lithotripsy in the department of Urology, LRH reviewed retrospectively from December 2021-December 2022 after ethical approval. Two groups were made on the basis of the type of lithotripsy used (112 patients in the pneumatic lithotripsy (PL) group and 70 patients in the Laser lithotripsy (LL) group. Stone-free rate (SFR), mean operation time (MOT), mean hospital stay (MHS), and complications rate were evaluated for both groups. All patients had Urine cultures, renal functions tests and non-contrast CT KUB pre-operatively. A double J stent was passed in every patient. The patient was labeled as stone if there was no stone of more than 4mm in the ureter or in the kidney evident from X-ray KUB or NCCT KUB in case of radiolucent stone. Two weeks after the operation, the Double J stent was removed.

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RESULTS

Clinical and demographic data are in Table 1. The mean age of LL Patients was 41.1±3.9 years and PL patients 38.2±4.5 years. 68.4% of the study participants were males.

LL had more upper ureter stones 17(24.4%). LL's drawbacks outweighed its benefits in treating proximal ureteral calculi. Table 2 outlines postoperative complications and efficacy. Comparing the complications more PL patients had ureteric perforations (4.4%), postoperative fever (2.9%), and mucosal injury (5.7%) with p-value ≥0.05%.In LL patients, the average surgery time and hospital stay were shorter immediate stone-free rate more (93.3%) in LL patients while stone migration more in PL patients 20(28.6%) with a statistically significant (p-value≤0.05).Nearly all PL patients developed 1.5cm ureteral stones or edoema. Seven patients underwent adaptive ureteroscopy and LL at a different meeting, and 16 received ESWL prior to the removal of the Double J stent. Nine LL patients were retro-beaten by kidney particles.

Four modified ureteroscopes and one ESWL removed renal pelvis or calyx particles. One ureteroscopic stone admissions were unrealistic. The ureteral hole was observed for 1.5 months by two

fold J stents. Patient PL required ureteral hole surgery. One LL and one PL patient received laser ureterotomy with a one-fold J stent for ureteral stenosis.

Table 1: Clinical and Demographic Data

Variables	LL(n=70)	PL(n=62)
Mean age ± SD	41.1±3.9	38.2±4.5
Male, No.(percentage)	46 (68.4)	36 (64.4)
Previous History of Intracorporeal Lithotripsy, No. (%age)	07 (9.8)	06 (9.3)
Stone location		
Knight side, No. (percentage)	53 (61.7)	36 (61.2)
Bilateral, No. (percentage)	3 (4.3)	03 (5)
Stone position		
Upper, No. (percentage)	17 (24.4)	09 (14.9)
Middle, No. (percentage)	13 (20.7)	16 (28.5)
Distal, No. (percentage)	36 (53.8)	32 (55.5)
Stone size, in millimeters	9.7±2.5(9-17)	9.0±2.2(8-13)
The length of the stone's impaction		
< 2 months, No. (percentage)	54 (81.8)	48 (84.3)
>2 months, No. (percentage)	13 (19.4)	09 (17.5)

P-value ≥ 0.05

Table 2: Complications and efficacy

Variables	LL (n=67)	PL (n=62)	P-value
Complications			≥0.05
1. Ureteric perforation, Number. (percentage)	1 (0.6)	5 (4.4)	
2. Postoperative fever, Number. (percentage)	1 (0.6)	4(2.9)	
3. Mucosal injury, Number. (percentage)	5(2.8)	7 (5.8)	
Efficacy			
1.(MOT ± SD, min)	15.4 ±3.05	11.01 ± 7.2	≤0.05
2. MHS ± SD, h	24.04 ± 2.2	27.2 ± 0.7	≤0.05
3.(immediate stone-free rate, number. (percentage)	113 (93.3)	39 (65.2)	≤0.05
4. Stone migration, Number. (percentage)	04 (7.6)	20 (28.6)	≤0.05

Statistical analysis: Statistical analysis used SPSS 24.0 was used to examine the statistics. Descriptive statistics (mean, standard deviation) and the Student's t-test were used to analyse quantitative results. The qualitative frequency and percentage data were assessed using the Fisher exact and chi-square tests. P 0.05 was considered significant.

DISCUSSION

The treatment of urinary calculi has substantially improved due to the advancement of technology[7]. Less intrusive procedures are currently used to treat urinary calculi. PL, a minimally invasive method, provides cost and security benefits. Another problem is stone movement[8]. Ho: The YAG laser is a versatile, safe, and safe lithotripter In comparison to other lithotripters, the holmium laser also produces smaller post-lithotripsy particles. The mild shockwave produced by the Ho: YAG laser lessens calculi or stone fragment resistance[9]. Ho: YAG LL may be guided by a wide range of ureteroscopes and is effective for stone discontinuity regardless of the piece's hardness. Laser lithotripsy surpasses PL in SFR, MHS, and retreatment rate because stone pieces are less prone to move in LL bunches. Devarajan et al[10] reported 300 lithotripsy patients using a holmium laser had a 91% success rate with 10 problems. Early calculi brought on more significant damage in the upper ureter. According to Jeon et al[11]. A lithoclast arm had an SFR of 36.1%, and a Ho: YAG laser arm had 95% (P 0.05). Ho: For MOT, YAG laser lithotripsy fared better than PL. Stones broke down more quickly into separable chunks in PL, but the fragments were too large to travel through unaided and had to be retrieved with a container or grasper[12]. Our findings agreed with those of the research listed. Ho: YAG laser shallow infiltration reduced ureter damage during lithotripsy. Because of the less severe ureter injury, LL MHS was more limited than PL. Our results were consistent with current research on the efficacy of ureteroscopic Ho: YAG laser lithotripters[13]. Over three months, ureteral stones with a polyp were discovered. In the PL group, polyps precluded ureteroscopic access. In the LL group, however, three polyps may be laser-treated, frequently providing ureteroscopic access[14]. This study has certain limitations, including that it was a review study and that experts carried out the procedure with diverse specialties, which might have influenced the findings. We also suggest doing a future randomized investigation to corroborate our findings[15].

CONCLUSION

Both the PL and the LL methods successfully treat ureteral stones, although the LL method had a much higher percentage of patients who were stone-free after treatment.The more serious ureteral calculi were protected from stone fragmentation by the LL procedure's decreased pushback rate compared to the PL method.

Conflict of interest: Nil

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