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Original Research Article

Pneumatic Lithotriptor vs Holmium: YAG Laser in management of Ureteral Calculus

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Abstract: Endoscopic management of ureteral calculi is one of the most important therapies in academic centers. Amongst these Laser and Pneumatic Lithotriptors are gaining popularity. This study was designed to study the efficacy and outcomes of both the available Lithotriptors. 200 patients presenting to the Urology OPD in our tertiary center were divided into 2 groups; first group being treated with pneumatic lithotripter and second group being treated with Holmium: YAG laser. Patients in both groups were compared in regards to mean operative time, successful fragmentation rate, mean hospital stay and occurrence of various complications in each procedure. Our study depicted results in favour of Holmium: YAG Laser which were substantiated by our data analysis.
Keywords: Lithotriptor, Laser, Pneumatic, Ureteral Calculus

INTRODUCTION

The Urinary stone disease is one of the most common afflictions of the modern society and it has been described since antiquity with the westernization of global culture. The patients symptoms and stone size are not good predictors for renal function loss. Furthermore, there is no clear time threshold for irreversible damage. Therefore, intervention should be strongly considered in any patient with ureteral obstruction unless close monitoring of renal function is available [1]. Technical advancement in endoscope design and miniaturization have allowed surgeons to access calculi throughout the collecting system and regards as a gold standard for management of ureteral stones [2]. Among various intracorporeal lithotripters, pneumatic lithotripter has become the widely used tool for the treatment of urinary stones. Recently the holmium: YAG laser has been used with a wide range of potential urological applications, including intracorporeal lithotripsy of urinary calculi. Pneumatic lithotriptor (PL) is preferred by many urologists because of its lower cost, easy instillation, and higher success rates [3] However higher rates of stone migration constitutes its disadvantage [4]. The holmium laser is one of safest, most effective and most versatile intracorporeal lithotripters . And become one of the most widely accepted for this purpose as compared to ultrasonic, pneumatic lithotripter [5]. Although laser lithotriptor (LL) is quite effective in the management of both proximal ureter stones, and impacted stones, it is more expensive relative to pneumatic lithotripter [6].

In our study we have compared the HO:YAG laser lithotripsy and pneumatic lithotripsy and evaluated the results of the two treatment modalities to assess effectiveness and complications.

MATERIALS AND METHODS

A randomized prospective study after taking an institute ethics committee clearance was conducted from January 2015 to December 2015 in the Department of Urology, Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan. The study included a total of 200 patients who presented with ureteral stones and were candidate for transuretral lithotripsy. The patients were randomly allotted in the two groups : Group A: patients who were to undergo transuretral lithotripsy using pneumatic lithotripter and Group B: patients who were to undergo transuretral lithotripsy using Holmium: YAG laser.

Patients were included in the study when they

had ureteral stone, which had not passed in 2 weeks, presence of hydronephrosis, and failed Extracorporeal Shock Wave Litotripsy (ESWL). Stones more than 1.5 cm was excluded.

Before the procedure, urine cultures were obtained, and appropriate antibiotic therapy was given if bacterial growth was detected. All patients underwent urinalysis, urine culture, KUB, ultrasonography, and intravenous pyelography.

All patients were given spinal anesthesia after receiving a single shot of uniform prophylactic antibiotic. Patients were then placed in lithotomy position. All procedures were done by a 9.5 F Karl Storz brand semirigid ureteroscope, and-under ureteroscopic guidance a guidewire was inserted through ureter in both Holmium: YAG and pneumatic lithotripsy groups.

In laser lithotripsy, holmium: YAG laser power ranged from 2.5 watt (0.5 J at 5 Hz) to 10 watts (1.0 J at 10 Hz), while for lithoclast lithotripsy, 1.0 mm probe was used to fragment the stone with both single and continuous pulses and pressure was set at 2 bars. Indwelling ureteral double J stent of 5-6Fr was placed when indicated and removed after 3 weeks. All the patients were re-evaluated by abdominal ultrasonography and plain abdominal X-ray (Kidney-ureter and bladder) after two weeks and four weeks postoperatively.

Data analysis was performed using SPSS software (the Statistical Package for the Social Sciences, Version 19.0) through student's *t* test and chi-square test. A *p* value less than 0.05 were considered statistically as significant.

RESULTS

The study included 200 patients who presented to the Out Patient Department and were randomly divided into Group A (pneumatic lithotripter) and Group B (Holmium: YAG laser). Mean ages of the patients in the Group A, and Group B groups were 36.15±14.54, and 36.15±14.54 years, respectively.

From 100 patients on Group A, 79 cases were males and 21 cases were females, while from 39 patients on LL group, 82 cases were males and 18 cases were females. These had no statistical significance.

The mean operative time was longer in the pneumatic group (68 ± 40 minutes), in comparison to laser group (36 ± 26 minutes) a result which was statistically significant ($p = 0.033$).

Successful stone fragmentation occurred in 92 cases (92%) on Group A and in 98 cases (98%) on Group B, which was statistically significant.

The 4 weeks stone-free rate was found in 94 patients (94%) in Group A, while in Group B 98 patients (98.0%) and this result was statistically not significant ($p = 0.0732$).

Complications like Urosepsis, Mucosal Tear, Urinoma and Ureteral Perforation were not noted in either of the groups. Only complication noted was proximal stone migration, 6 cases in Group A and 1 cases in Group B, which was statistically significant.

DISCUSSION

With advent of time the management protocols of ureteric calculi have also progressed drastically with transureteric endoscopic management taking up the driving seat in the recent times. The invention of advanced ureteroscopes, lithotripsy devices, and other instruments has made the use of open surgery very rare [7]. A variety of lithotripters can be used through ureteroscope, pneumatic and holmium: YAG laser lithotripsies are commonly used in majority of urological centers.

Pneumatic lithotriptor fragments calculi in a mechanism similar to that of a jackhammer. Compressed air pushes a small projectile against the probe; hence, the probe oscillates back at a frequency of 12 cycles per second. Breakup occurs as the probe tip repetitively impacts the stone [8].

The Ho: YAG laser lithotripters have the capability of disintegrating all stones irrespective of their compositions into smaller fragments when compared with other lithotriptors, with a lower risk of stone migration into renal collecting system because of weaker shock waves [9]. European Association of Urology (EAU) recommends Ho: YAG laser lithotripsy as a gold standard procedure for ureteroscopic intracorporeal lithotripsy [10].

In our study we found out that Holmium: YAG laser lithotripsy had more advantages from the stand point of operation time as our results showed that the mean operative time was shorter for laser group (40 ± 26 min) in comparison to pneumatic group (60 ± 40 min). These results are inconsistent with results reported by Rozzaghi *et al.*, 2013 and Rozzaghi *et al.* [11, 12].

While comparing the stone free rate with pneumatic lithotripters, it was found to be 94% which is comparable to the study by Hong [13] where the corresponding rate was found to be 93.5%. Keshvari [14] and Abdel-Kader [15] reported a 100% success rate for PL in the endoscopic treatment of ureteral stones in pregnant women. These studies corroborate

with our claims of a sufficiently high stone free rate.

While the stone free rate with Ho:YAG Laser lithotripter in our study was 98 percent, a value that was not statistically significant, but it was comparable to the results published by Salvado *et al* [16] who expressed their success rate of laser lithotripsy in the management of ureteral stone as 96 percent.

In term of complications, such as, mucosal injury, ureteral perforation and postoperative fever, there was no statistical significance difference between the two groups. This was in accordance with results reported by Razhahe and Bhandari & Basnet [9, 11].

The mean operative time was longer in the pneumatic group (60 ± 40 minutes), in comparison to laser group (40 ± 26 minutes), hence less expected complications, higher immediate stone free rate, and less ureteral stent requirement.

CONCLUSION

Holmium: YAG laser is definitely a superior modality for ureteral calculus treatment with lesser operative time, shorter hospital stay and practically non-existent complications but the only weighing down anchor is the high cost and availability. In view of this limitation Pneumatic Lithotriptor come to light as an equally good alternative.

REFERENCES

1. Hemal AK, Goel A, Goel R. Minimally invasive retroperito- neoscopic ureterolithotomy. J Urol. 2003;169:480-2.
2. Osti AH, Hofmockel G, Frohmüller H. Ureteroscopic treatment of ureteral stones: only an auxiliary measure of extracorporeal shockwave lithotripsy or a primary therapeutic option?. Urologia internationalis. 1997 Jul 1;59(3):177-81.
3. Harmon WJ, Sershon PD, Blute ML, Patterson DE, Segura JW. Ureteroscopy: current practice and long-term compli- cations. J Urol. 1997;157:28-32.
4. Yin X, Tang Z, Yu B, Wang Y, Li Y, Yang Q, Tang W. Holmium: YAG laser lithotripsy versus pneumatic lithotripsy for treatment of distal ureteral calculi: a meta-analysis. Journal of Endourology. 2013 Apr 1;27(4):408-14.
5. yiu MK, Liu PL, Yiu TF, Chan AY. Clinical experience with Ho:YAG Laser lithotripsy of ureteral calculi. Laser Surg Med. 1996;19:103-6.
6. Sun Y, Wang L, Liao G, Xuch, Yang Q, Qian S. Pneumatic lithotripsy versus laser lithotripsy in the Endoscopic treatment of ureteral calculi, J Endourol. 2002;15:587-8.
7. Aridogan IA, Zeren S, Bayazit Y, Soyupak B, Doran S. Complications of pneumatic ureterolithotripsy in the early postoperative period. Journal of endourology. 2005 Jan 1;19(1):50-3.
8. Robert M, Bennani A, Guiter J, Averous M, Grasset D. Treatment of 150 ureteric calculi with the Lithoclast. Eur Urol. 1994;26:212-5.
9. Bhandari BB, Basnet RB. Comparison of Holmium Laser and Pneumatic Lithotripsy in Treatment of Ureteral Stones. JGPEMN, 17-20.
10. Lam JS, Greene TD, Gupta M. Treatment of proximal ureteral calculi: holmium:YAG laser ureterolithotripsy versus extracorporeal shock wave lithotripsy. J Urol. 2002;167:1972-6.
11. Razzaghi MR, Razi A, Mazloomfard MM, Taklimi AG, Valipour R, Razzaghi Z. Safety and efficacy of pneumatic lithotripters versus holmium laser in management of ureteral calculi: a randomized clinical trial. Urology journal. 2013 Jan 1;10(1):762.
12. Razzaghi MR, Razi A, Mazloomfard MM, Mokhtarpour H, Javanmard B, Mohammadi R. Trans-Ureteral Ureterolithotripsy of Ureteral Calculi: Which is the Best; Pneumatic or Holmium Laser Technique?. Journal of Lasers in Medical Sciences. 2011 Apr 1;2(2):59.
13. Hong YK, Park DS. Ureterescopic lithotripsy using Swiss Lithoclast for treatment of ureteral calculi: 12-years experience. J Korean Med Sci. 2009;24:690-4
14. Keshvari Shirvan M, Darabi Mahboub MR, Rahimi HR, Seyedi A. The evaluation of ureteroscopy and pneumatic lithotripsy results in pregnant women with urethral calculi. Nephrourol Mon. 2013;5:874-8.
15. Abdel-Kader MS, Tamam AA, Elderwy AA, Gad M, El-Gamal MA, Kurkar A, Safwat AS. Management of symptomatic ureteral calculi during pregnancy: Experience of 23 cases. Urology annals. 2013 Oct 1;5(4):241.
16. Salvadó JA, Mandujano R, Saez I, Saavedra A, Dell'oro A, Dominguez J, Trucco C. Ureteroscopic lithotripsy for distal ureteral calculi: comparative evaluation of three different lithotriptors. Journal of Endourology. 2012 Apr 1;26(4):343-6.