Journal of Lasers in Medical Sciences

J Lasers Med Sci 2019 Spring;10(2):104-107

Original Article

http://journals.sbmu.ac.ir/jlms

doi 10.15171/jlms.2019.17

Experience of 138 Transurethral Urethrotomy With Holmium:YAG Laser

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Published online February 25, 2019

Abstract

Introduction: Many valid option modalities are available for the management of urethral stricture disease (USD), such as internal urethrotomy which has the success rates of 33%–60%. The aim of this study was to assess the outcome of holmium: YAG (Ho: YAG) laser urethrotomy (HLU).

Methods: One hundred thirty-eight patients with urethral stricture with the mean age of 48±3.03 years old treated by HLU from March 2011 to August 2017. The main purpose of this investigation was to evaluate mean operation time, stricture recurrence rate and post-operation Qmax and complications of transurethral HLU.

Results: The most common cause of USD was trauma in 82 (59.4%) patients. Mean laser operation time, mean hospital stay and mean postoperative duration of catheterization were 23.08 ± 9.1 minutes, 19.02 ± 10.7 hours and 10.3 ± 1.05 days respectively. The mean Qmax was 8.3 ± 2.07 mL/s before surgery and 16 ±3.1 mL/s afterward. At the end of 12 months follow-up, a total of 37 (26.8%) patients developed recurrence of the stricture. Patients with posterior, longer urethral strictures and previous history of interventions have more recurrence rate of the stricture.

Conclusion: HLU is minimally invasive and seems to be an effective and safe management option for primary, short, urethral strictures. The hospital stay is remarkably short and complications are negligible.

Keywords: Urethral stricture; Internal urethrotomy; Holmium: YAG laser; Laser urethrotomy.

Introduction

Urethral stricture disease (USD) is the narrowing of the urethra from scar tissue, related to genitourinary tract infections, inflammatory skin conditions, traumatic urethral injury, pelvic radiation, and urinary tract instrumentation. It has an estimated prevalence rate of 0.6%.[1-3] USD is a common and challenging problem for urologists.[4] Many valid option modalities are accessible for the management of USD, such as urethral dilatation (UD), internal urethrotomy (IU), urethral stent placement, and urethroplasty.[5] Since 1974, Sachse's IU has been considered the treatment of choice for USD which is fast and simple to carry out and is associated with short recovery time. The success rates are 33%–60%.[6,7]

Bulow et al in 1979 introduced the laser for IU.[8] Afterward, few investigations have been reported on the use of lasers in USD with different techniques.[9] The types of lasers used in USD treatment consisted of a diode, argon, Nd: YAG, and the most frequent one: holmium: YAG (Ho: YAG) [10]. The obvious dominance of Ho: YAG are clear vision, less bleeding, precise incision and ablation of scar tissue and short hospital admission,[9] however, most literature assessing the adequacy of the laser in contrast to cold-knife urethrotomy show no difference in final results.[4]

The aim of this investigation was to assess the efficacy, safety, complications, and results of Ho: YAG laser urethrotomy (HLU) performed in our hospital for the management of USD.

Methods

Four hundred and fifty-one male patients from March 2011 to August 2017 were hospitalized; In Shohada-e-Tajrish Hospital (referral center of reconstructive urology and the first center of laser application in urology in Iran), Shahid Beheshti Medical University, Tehran, Iran; with diagnosis of USD that 153 case with mean age of 48±3.03 years (range 11–86) and with a mean USD of 13.1 months

Please cite this article as follows: Fallah Karkan M, Razzaghi MR, Karami H, Ghiasy S, Tayyebiazar A, Javanmard B. Experience of 138 transurethral urethrotomy with holmium: YAG laser. *J Lasers Med Sci*. 2019;10(2):104-107. doi:10.15171/jlms.2019.17.

(3–28 months) treated by HLU. The diagnosis of USD was based on medical history, retrograde urethrography-voiding cystourethrography (RUG-VCUG) and uroflowmetry (UF). Patients with lower than one-year follow-up or unavailable UF report in the file was excluded from the study and finally, 138 cases data were analyzed. Subjects visited for the first time for USD treatment were considered as primary, while those who had undergone intervention for the management of USD before referring to us was considered as secondary.

All subjects were assessed by medical history and physical examination, urine culture test (urinary tract infection was positive in 18 [13%] cases that initially treated with antibiotics according to antibiogram preoperatively), UF, and concomitant RUG-VCUG. Through a measuring scale on RUG-VCUG, the length of stricture was assessed.

Perioperative ciprofloxacin prophylaxis (400 mg single dose) administered for all subjects. All subjects were placed in lithotomy position and underwent spinal anesthesia.

Laser incision by a 22 Fr cystoscope with zero degrees lens and 550-nm Ho: YAG laser fiber, the stricture site was incised according to the star-like method (cutting off the scar based on the pattern of fibrotic tissue) while sparing healthy mucosa, under the guidance of guidewire. Thereafter, urethroscopy was done, an 18F silicone Foley catheter was indwelled. Antibiotic was continued until catheter removal.

For HLU, the holmium laser (Iranian National Laser Center, Iran) at the energy of 15-20 J (mean17 J) with a frequency of 10-15 Hz (mean 12 Hz) and overall power from 5.0-30.0 W (mean 14 W) were used.

Follow-ups were done at regular intervals at 3, 6, and 12 months postoperatively. If the subject did not mention any voiding complaints and had a maximum urine flow rate ≥15 mL/s for a voided volume of at least 250 mL, the intervention was considered successful.

We used SPSS software version 18.0 for data analysis in all steps. Quantitative data were indicated as mean and standard deviation and qualitative variables as frequency and percent. The *P* value less than 0.05 were considered as statistically significant.

Results

The etiology of USD was primary in 82 (59.4%) patients and single stricture occurred in 112 (81.1%) patients. The stricture length and site mentioned in Table 1. Thirty-one (22.4%) of the subjects had a history of previous IU follow by 17 UD and 8 end-to-end urethroplasty. The most frequent cause of USD in this study was trauma in 82 (59.4%) patients.

Mean laser operation time, mean hospital stay and mean postoperative duration of catheterization were 23.08 ± 9.1 minutes (range 14-35), 19.02 ± 10.7 hours and 10.3 ± 1.05 days (range 7-15 days) respectively.

Table 1. Subjects Clinical Characteristics

Variable		N (138)	Recurrence rate No. (%)
Site of stricture	Penile	9	1 (11.1)
	Bulbar	108	26 (24)
	Bulbomembranous	21	10 (47.6)
Length of stricture	<1 cm	17	3(17.6)
	1-2 cm	94	10 (10.6)
	2.1-2.5 cm	25	24 (96)
Etiology	Iatrogenic	16	2 (12.5)
	Trauma	82	23 (28)
	Idiopathic	33	11 (33.3)
	Inflammatory	7	1 (14.2)

The most common complication was gross hematuria in 24 cases (managed by vessel coagulating immediately with the laser, no blood transfusion was needed in any case) and burning sensation of the penis in nine subjects.

All cases were able to void acceptably after discharged the catheter. The mean Qmax was 8.3 ± 2.07 mL/s,16.05 ±3.1 mL/s, 15.8 ±1.07 mL/s and 15.2 ±1.02 mL/s before, 3, 6 and 12 months after surgery respectively (Table 2).

At the end of 12 months follow-up, a total of 37 (26.8%) subjects evolved recurrence of stricture at the previous site which was less severe than the primary stricture length. Fourteen managed by HLU, 6 had end-to-end urethroplasty and 17 patients were treated by self-intermittent Nelaton dilatation. As mention in Table 1, the recurrence rate of USD was frequent in the subjects with posterior, longer USD and with a history of previous interventions.

Discussion

USD is among the most complex urological problems that have always been a challenge for urologists.[11] The preferred

Table 2. Pre-intervention and Post-intervention Uroflowmetry Characteristics

Uroflowmetry Parameters	Follow-up Intervals (mon)	Mean SD	Range (Min-Max)
Qmax	Before	8.3 ± 2.07	0.0-13.0
	3	16.05 ±3.1	0.0-42.0
Flow (mL/s)	6	15.8 ±1.07	0.0-36.0
	12	15.2 ±1.02	0.0-31.0
Qave (mL/s)	Before	2.7 ± 1.87	0.0- 6.0
	3	6.59 ±4.03	0.0-19.0
	6	6.50 ±4.9	0.0-21.0
	12	5.01 ±4.07	0.0-16.0
PVR (mL)	Before	79 ± 8	0.0-108
	3	21 ±6.2	0.0-52
	6	28 ±9.4	0.0-70
	12	39 ±0.8	0.0-83

Abbreviations: Qmax, maximum flow rate; Qave, average flow rate; PVR, postvoid residual.

USD treatment technique is based on the stricture site, length, grade of spongiofibrosis, and urologist experience. However, endoscopic techniques are performed more commonly than urethroplasty.[12]

Today, Ho: YAG lasers broadly used in urological surgery include urolithiasis,[13-15] benign prostatic hyperplasia,[16] urinary tract strictures,[17] bladder malignancies or lesions of the external genitalia.[10,18]

IU is a kind of transurethral intervention in which the stricture is incised by cold-knife or thermal energy incision.[4] The dominant benefits of laser treatments consist of decreased blood loss and hospital admission.[19] Matsuoka et al[20] stated using of Ho: YAG laser for incisions of different stricture lengths and mentioned that the lasers can melt scar tissue by vaporization while having the minimal thermal injury to healthy tissue.

Our practice reveals that endoscopic HLU could be used as the first management in USD subjects. According to our experience, the site and length of stricture remain the major risk factor of recurrent stenosis. All postoperative complications in our cases were minor. This was parallel with the Kamp et al study.[21]

In our research, satisfactory outcomes were seen in 101 out of 138 (73.1%) patients at 12 months. Kamp et al[21] reported excellent conclusions in 70% of their patients at 27 months follow-up, while Dogra et al[22] presented 74% favorable outcomes at the mean follow-up of 30 months. Matsuoka et al[20] mentioned restenosis in 11 (35%) subjects after HLU. Kural et al[23] in their survey on 13 cases reported a 69% success rate. Xiao et al[24] were done HLU on 38 tolerant with USD and after 18 months of follow-up in 32 of those cases, recurrence was noted in 6 patients, thus giving a success rate of 84%. Atak et al[25] in a randomized clinical trial showed the supremacy of HLU in contrast to cold knife IU (81% vs. 53% success rate at 12 months, $P=0.04$). Our findings confirmed the results echoed in the previous literature.

Hossain et al[26] calculated the outcomes of treating 30 patients with USD ≤2 cm by HLU after 12 months. They established that in 27 (90%) subjects, Qave exceeded 16 mL/s and the urethral caliber was proper.

In another study, Futao et al[27] by applied Ho: YAG laser in endoscopic IU, and achieved satisfactory results in 25 cases (of 28 patients) without complications.

Conclusion

HLU is minimally invasive treatment and seems to be an effective and safe management option for primary, short, urethral strictures. The less bleeding, short hospital admission and the possibility of treatment as a day-clinic under local anesthesia and negligible complications are other advantages.

Limitation and Recommendation

Limitations of this study included, retrospective nature without a control arm, and the second limitation was short-term follow-up and finally small sample size. A randomized clinical trial study for comparison of the laser with cold-knife IU with long term follow-up is necessary for making a final comment.

Ethical Considerations

The ethical committee of Shohada-e-Tajrish Hospital approved this study and permitted us to review patients' medical data.

Conflict of Interests

The authors declare no conflict of interest.

Acknowledgments

The authors are thankful for the assistance of Urology ward staff due to their invaluable help throughout this study. We would like to express our sincere gratitude to Dr. Saeed Montazeri for valuable assistance in manuscript English editing.

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