Nephro-Urol Mon. 2019 February; 11(1):e88677. doi: 10.5812/numonthly.88677.

Published online 2019 January 30. **Research Article**

Holmium: YAG Laser Incision of Bladder Neck Contracture Following Radical Retropubic Prostatectomy

Morteza Fallah Karkan [1, 2], Mohammad Reza Razzaghi [1, 2], Babak Javanmard [1, *], Ali Tayyebiazar [3, 4], Saleh Ghiasy [1] and Saeed Montazeri [1]

[1] Urology Department, Shohada-e-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2] Laser Application in Medical Science Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3] Infertility and Reproductive Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[4] Urology Department, Urmia University of Medical Sciences, Urmia, Iran

[*] *Corresponding author*: Urology Department, Shohada-e-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: drbabakjavanmard@gmail.com

Received 2019 January 04; **Accepted** 2019 January 06.

Abstract

Background: No consensus management is available for the bladder neck contracture (BNC) secondary to radical retropubic prostatectomy (RRP). We present our experience of a technique in which holmium: YAG surgical laser was utilized transurethrally to incise the stenotic area.

Methods: Incisions with holmium: YAG surgical laser were made in 34 subjects with BNC between January 2012 and May 2018. Medical charts were reviewed to evaluate related data including medical history, international prostate symptoms score, uroflowmetry, and recurrence of the stricture.

Results: The mean length of operation was 34 $\pm$ 4.06 minutes. No significant postoperative or perioperative complications were noted. The median length of hospital stay after surgery was two days. Five subjects (13.8%) required endoscopic holmium: YAG laser retreatment. After the first treatment with holmium: YAG surgical laser, the mean duration for recurrence was 4.3 months. In addition, significant improvements were observed in Qmax, residual urine volume, and the total IPSS score.

Conclusions: BNC after RRP is relatively frequent but it can be safely and effectively managed by transurethral holmium: YAG laser incision

Keywords: Prostate Cancer, Radical Retropubic Prostatectomy, Bladder Neck Contracture, Holmium: YAG Laser, Cold-knife Resection

1. Background

The most common solid organ malignancy in men of older than 65 years is prostate cancer (PCa) (1, 2). In the last two decades, the early detection of PCa has been improved by screening based on the evaluation of prostate-specific antigen (PSA). Radical retropubic prostatectomy (RRP) is a standardized, widely accepted, curative procedure for prostate cancers confined to the prostate (3).

A substantial increase in urinary incontinence, erectile dysfunction, and vesicourethral complications has occurred with the increased incidence rates of treatment for prostate cancer. Urethral or vesicourethral anastomosis site strictures are considered one of the most common postoperative complications of RRP (0.4% - 32%) (4-7). No consensus treatment is available for post-PR bladder neck contracture (BNC) (8). Treatment for the majority of these patients can be performed endoscopically although a subgroup of subjects may need open and complex surgical interventions to overcome this issue (9, 10). The incision for treatment of BNC can be carried out using numerous endoscopic techniques, including electrocautery, cold-knife, laser, loop, and hot-knife resection (11-13).

The advantages of holmium: YAG laser include clear vision, short duration of hospitalization, accurate incision of scar tissue, and less bleeding (14).

We present our experience of utilizing transurethral holmium: YAG laser to incise the stenotic area.

2. Methods

After acquiring approval from the review board, the charts of patients who had undergone RRP in Shohada-e-Tajrish Hospital (a referral center of reconstructive urology and the first center of laser application in urology in Iran), affiliated to Shahid Beheshti University of Medical Science, Tehran, Iran, were reviewed retrospectively.

The urethral stricture diagnosis was determined based on the patient's medical history, uroflowmetric study, International Prostate Symptom Score (IPSS), and urethroscopy (which would not allow the 17F rigid cystoscope to pass through the urethra). Perioperative and postoperative data including the duration of indwelling catheter use, length of operation, complications, postoperative hospitalization, and rates of recrudescence were also assessed. The effectiveness of treatment was evaluated using uroflowmety.

Perioperative ciprofloxacin prophylaxis (a 400-mg single dose) was administered to all subjects. All of the patients underwent spinal anesthesia. All surgical procedures were performed while patients were placed in the lithotomy position. A 550-μm end-firing laser fiber was passed through a rigid 22F endoscope to reach the affected areas using saline irrigation. Before deep incisions, ureteral orifices were identified if possible. Then, deep incisions were inflicted to the fibrotic tissue under direct vision as STAR like until the sparing healthy tissue was seen, thus allowing the free passage of a 22F scope easily into the bladder. A silicone 18F Foley catheter was inserted and remained for several days. Antibiotic therapy continued until catheter removal.

For HLU, the holmium laser (Iranian National Laser Center, Iran) set at the energy of 15 - 20 J (mean 14 J), a frequency of 12 - 16 Hz (mean 13 Hz), and overall power of 60 - 100 W was applied.

Regular follow-ups were carried out at three, six, and 12 months postoperatively. The intervention was considered successful if subjects did not declare any complaint of voiding, along with a maximum urinary flow rate of $\geq$ 12 mL/sec for a minimum voided urinary volume of 250 mL.

For the determination of statistical significance, Wilcoxon signed rank test was performed in all cases. P-values of less than 0.05 were considered statistically significant.

3. Results

We retrospectively reviewed the charts of 36 patients with a mean age of 65 years in the range of 45 to 76. The patients had a mean body mass index of 24.2 $\pm$ 2.01 kg/m2 when referred to our center for the evaluation of BNC after RRP between January 2012 and May 2018. The BNC occurred within three months of surgery in 21 subjects (58.3%), 4 to 12 months in 11 (30.5%), and >12 months in four (11.1%). Three patients were on hormonal therapy and two on adjuvant radiotherapy.

Eight of the patients had dilatation, six had cold knife direct visual internal urethrotomy, and one had transurethral resection of the BNC.

The median length of operation was 34 minutes (ranging from 13 to 53 minutes). No significant postoperative or perioperative complications were documented. The median time until the removal of urethral Foley catheter was seven days (range of four to 12 days). The median length of postoperative hospitalization was two days (ranging from one to three days). Five patients (13.8%) required repeated endoscopic treatment with holmium: YAG surgical laser. After the first treatment with holmium: YAG surgical laser, the mean recurrence time was 4.3 months (ranging from three to 12 months). However, one patient (0.02%) required a third episode of treatment five months later. The clinical characteristics of the patients are outlined in Table 1.

Table 1. The Patients' Clinical Characteristics Before and After Holmium: YAG Laser Treatment

Variable	Prior to Laser Therapy	Following Laser Therapy	P Value
Voided volume, mL	264.21 $\pm$ 25.05	273.09 $\pm$ 11.17	$\geq$ 0.05
Qmax, mL/sec	6.23 $\pm$ 3.56	13.38 $\pm$ 4.72	$\leq$ 0.05
Residual volume, mL	45.17 $\pm$ 31.54	17.61 $\pm$ 25.68	
Total IPSS score	22 $\pm$ 3	14 $\pm$ 3	

4. Discussion

Despite the growing number of patients treated for prostate cancer with either radiation or surgery, a relatively small proportion of patients develop BNC, warranting further procedural interventions (11, 15, 16). BNC is typically the result of scar tissue narrowing of the reconstructed bladder neck (17, 18). This narrowing may cause substantial BOO, which may result in urinary urgency and frequency, incomplete bladder emptying, and poor stream. Ultimately, it may cause acute urinary retention (5).

A less invasive treatment modality that is used as a surgical alternative for various medical indications is holmium: YAG laser. These indications include but not limited to transurethral prostate resection and incision, urinary stone lithotripsy, genital wart treatment, upper urinary tract tissue ablation, and neoplasm excision (12, 19-21).

In the present series, the BNC recurrence rate after holmium: YAG laser incision was 13.8%. In addition, significant improvements were observed in Qmax, residual urine volume, and the total IPSS score.

In a cohort study of 24 subjects with recurrent post-RP BNC, Eltahawy et al. designed an unprecedented technique of injecting triamcinolone (40 mg/mL, 2 mL) following holmium: YAG laser for BNC incision at the positions

of 3 and 9 o'clock. They reported that the success rate after one or two episodes of treatment courses was 17/24 and 7/24, respectively (8).

In a study by Surya et al. (22), the effectiveness of cold-knife incisions was only 62%. Furthermore, urinary incontinence was observed in all patients after incision of the stricture.

Similarly, Lagerveld et al. (23) in another case series reported 10 patients with vesicourethral anastomosis strictures after RP (including six patients formerly managed using clean intermittent catheterization, urethrotomy by cold-knife, and dilatation); with holmium: YAG laser treatment, their voiding pattern was without difficulty and they were not in need of re-treatment.

Cho et al. (3) in another prospective study performed urethrotomy with holmium: YAG surgical laser in 11 subjects after high-intensity focused ultrasound treatment for prostate cancer or with prostatic urethral or bladder neck strictures. They demonstrated that holmium: YAG laser therapy made statistically significant differences in Qmax and IPSS. They concluded that treatment with holmium: YAG laser provided an effective, safe, and unaggressive treatment for urethral or bladder neck strictures arising secondary to prostate cancer treatment.

4.1. Conclusion

BNC after RRP is relatively frequent but it can safely and effectively be managed by transurethral holmium: YAG laser incision. Treatment with holmium: YAG laser results in negligible peripheral tissues trauma. It also helps preserve the continence mechanism.

4.2. Limitation and Recommendation

Larger cohort studies with prospective nature and prolonged follow-up period are required to compare holmium: YAG surgical laser and other therapeutic methods to confirm these findings.

Acknowledgments

We gratefully appreciate Laser Application in Medical Science Research Center for their contribution.

Footnotes

Conflict of Interests: The authors confirm that no conflict of interests is present.

Ethical Considerations: Review board of Shohada-e-Tajrish Hospital.

Funding/Support: None declared.

References

1. Javanmard B, Yousefi M, Yaghoobi M, Hasanzadeh Hadad A, Amani M, Fadavi B, et al. Ureteral reimplantation or percutaneous nephrostomy: Which one is better in management of complete ureteral obstruction due to advanced prostate cancer? *Int J Cancer Manag*. 2017;**10**(9). doi: 10.5812/ijcm.6074.
2. Abedi AR, Fallah-Karkan M, Allameh F, Ranjbar A, Shadmehr A. Incidental prostate cancer: A 10-year review of a tertiary center, Tehran, Iran. *Res Rep Urol*. 2018;**10**:1–6. doi: 10.2147/RRU.S146159. [PubMed: 29392121]. [PubMed Central: PMC5768285].
3. Cho WJ, Kim TH, Lee HS, Chung JW, Lee HN, Lee KS. Treatment of urethral/bladder neck stricture after high-intensity focused ultrasound for prostate cancer with holmium: Yttrium-aluminium-garnet laser. *Int Neurourol J*. 2013;**17**(1):24–9. doi: 10.5213/inj.2013.17.1.24. [PubMed: 23610708]. [PubMed Central: PMC3627995].
4. Hisasue SI, Takahashi A, Kato R, Shimizu T, Masumori N, Itoh N, et al. Early and late complications of radical retropubic prostatectomy: Experience in a single institution. *Japan J Clin Oncol*. 2004;**34**(5):274–9. doi: 10.1093/jjco/hyh042.
5. Besarani D, Amoroso P, Kirby R. Bladder neck contracture after radical retropubic prostatectomy. *BJU Int*. 2004;**94**(9):1245–7. doi: 10.1111/j.1464-410X.2004.05151.x. [PubMed: 15610098].
6. Allameh F, Azghandi S, Karkan MF. Is chemotherapy related with erectile dysfunction in non-urologic cancer patients? *Iran J Cancer Prev*. 2016;**9**(3). e6233. doi: 10.5812/ijcm.82529.
7. Tomschi W, Suster G, Holtl W. Bladder neck strictures after radical retropubic prostatectomy: Still an unsolved problem. *Br J Urol*. 1998;**81**(6):823–6. doi: 10.1046/j.1464-410x.1998.00660.x. [PubMed: 9666764].
8. Eltahawy E, Gur U, Virasoro R, Schlossberg SM, Jordan GH. Management of recurrent anastomotic stenosis following radical prostatectomy using holmium laser and steroid injection. *BJU Int*. 2008;**102**(7):796–8. doi: 10.1111/j.1464-410X.2008.07919.x. [PubMed: 18671784].
9. Kovell RC, Terlecki RP. Management strategies for post-prostatectomy bladder neck contractures. *Curr Urol Rep*. 2015;**16**(9):65. doi: 10.1007/s11934-015-0536-4. [PubMed: 26224157].
10. Geary ES, Dendinger TE, Freiha FS, Stamey TA. Incontinence and vesical neck strictures following radical retropubic prostatectomy. *Urology*. 1995;**45**(6):1000–6. doi: 10.1016/S0090-4295(99)80121-6. [PubMed: 7771001].
11. Simhan J, Ramirez D, Hudak SJ, Morey AF. Bladder neck contracture. *Transl Androl Urol*. 2014;**3**(2):214–20. doi: 10.3978/j.issn.2223-4683.2014.04.09. [PubMed: 26816768]. [PubMed Central: PMC4708160].
12. Razzaghi MR, Fallah Karkan M, Ghiasy S, Javanmard B. Laser application in Iran urology: A narrative review. *J Lasers Med Sci*. 2018;**9**(1):1–6. doi: 10.15171/jlms.2018.01. [PubMed: 29399302]. [PubMed Central: PMC5775947].
13. Giannarini G, Manassero F, Mogorovich A, Valent F, De Maria M, Pistolesi D, et al. Cold-knife incision of anastomotic strictures after radical retropubic prostatectomy with bladder neck preservation: Efficacy and impact on urinary continence status. *Eur Urol*. 2008;**54**(3):647–56. doi: 10.1016/j.eururo.2007.12.013. [PubMed: 18155824].
14. Kural AR, Coskuner ER, Cevik I. Holmium laser ablation of recurrent strictures of urethra and bladder neck: Preliminary results. *J Endourol*. 2000;**14**(3):301–4. doi: 10.1089/end.2000.14.301. [PubMed: 10795623].
15. Borboroglu PG, Sands JP, Roberts JL, Amling CL. Risk factors for vesicourethral anastomotic stricture after radical prostatectomy. *Urology*. 2000;**56**(1):96–100. doi: 10.1016/S0090-4295(00)00556-2. [PubMed: 10869633].

16. Ghiasy S, Abedi AR, Moradi A, Hosseini SY, Karkan MF, Sadri G. Is active surveillance an appropriate approach to manage prostate cancer patients with Gleason Score 3+3 who met the criteria for active surveillance? *Turk J Urol*. 2018. doi: 10.5152/tud.2018.72920. [PubMed: 30461380].
17. Webb DR, Sethi K, Gee K. An analysis of the causes of bladder neck contracture after open and robot-assisted laparoscopic radical prostatectomy. *BJU Int*. 2009;**103**(7):957–63. doi: 10.1111/j.1464-410X.2008.08278.x. [PubMed: 19076148].
18. Kostakopoulos A, Argiropoulos V, Protogerou V, Tekerlekis P, Melekos M. Vesicourethral anastomotic strictures after radical retropubic prostatectomy: The experience of a single institution. *Urol Int*. 2004;**72**(1):17–20. doi: 10.1159/000075267. [PubMed: 14730160].
19. Larizgoitia I, Pons JM. A systematic review of the clinical efficacy and effectiveness of the holmium:YAG laser in urology. *BJU Int*. 1999;**84**(1):1–9. doi: 10.1046/j.1464-410x.1999.00096.x. [PubMed: 10444114].
20. Fallah Karkan M, Ghiasy S, Ranjbar A, Javanmard B. Evaluation of 200 Mm, 365 Mm and 500 Mm fibers of Ho: YAG laser in transurethral lithotripsy of ureteral: A randomize control trial. *J Lasers Med Sci*. 2018;**9**(1):69–72. doi: 10.15171/jlms.2018.14. [PubMed: 29399315]. [PubMed Central: PMC5775959].
21. Javanmard B, Fallah Karkan M, Razzaghi MR, Ghiasy S, Ranjbar A, Rahavian A. Surgical management of vesical stones in children: A comparison between open cystolithotomy, percutaneous cystolithotomy and transurethral cystolithotripsy with holmium-YAG laser. *J Lasers Med Sci*. 2018;**9**(3):183–7. doi: 10.15171/jlms.2018.33.
22. Surya BV, Provet J, Johanson KE, Brown J. Anastomotic strictures following radical prostatectomy: Risk factors and management. *J Urol*. 1990;**143**(4):755–8. doi: 10.1016/S0022-5347(17)40082-6. [PubMed: 2313800].
23. Lagerveld BW, Laguna MP, Debruyne FM, De La Rosette JJ. Holmium: YAG laser for treatment of strictures of vesicourethral anastomosis after radical prostatectomy. *J Endourol*. 2005;**19**(4):497–501. doi: 10.1089/end.2005.19.497. [PubMed: 15910265].