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Chronic Dysuria Associated with Greenlight Laser Vaporization of the Prostate and its Prompt Resolution After Holmium Laser Ablation of Prostatic Fossa

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ABSTRACT

Intractable dysuria several months after Greenlight laser photo-selective vaporization of the prostate (PVP) is a well-known occurrence that may affect some men. We present a patient who suffered dysuria for four months after Greenlight vaporization but had prompt resolution after undergoing holmium laser ablation of the prostatic fossa. A possible explanation is discussed.

KEYWORDS
Benign Prostate Hyperplasia, Laser, Dysuria

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INTRODUCTION

The worldwide urologic community is embracing laser treatment for benign prostate hyperplasia (BPH). Notably, the potassium titanyl phosphate (KTP, Greenlight) and holmium lasers dominate many practices. An understanding of tissue responses to different laser wavelengths is crucial in understanding patient outcomes. Here, a case is presented and hypothesis generated about a patient who developed intractable dysuria after Greenlight PVP but had prompt resolution after holmium laser ablation of the prostatic fossa.

CASE REPORT

A 79-year-old man with history of diabetes was referred for obstructive voiding symptoms. He complained of decreased force of stream, nocturia, hesitancy, and incomplete emptying despite long-term medical therapy with terazosin. He denied dysuria, urgency, and hematuria. His American Urological Association (AUA) symptom score was 26, and a physical examination revealed normal external genitalia and a 40-gram prostate without nodules. Prostate specific antigen was within normal limits. His post void residual (PVR) was 157cc and urinalysis was negative. The terazosin was discontinued and tamsulosin started with good initial response. However, some bothersome symptoms returned, and the patient wished to have a laser treatment for his BPH in the hopes of finally discontinuing medication therapy. Flexible cystoscopy in the office revealed a normal anterior urethra, moderately obstructing lateral lobes of the prostate, and 1+ bladder trabeculation. Simple cystometrogram confirmed good detrusor function with normal sensation and bladder capacity.

After discussing various management options, the patient elected to pursue a Greenlight PVP. He underwent an uneventful laser procedure with 20 minutes of laser exposure and was discharged to home the same day with oral antibiotics and without a urine catheter. On two-week post-surgery followup, the patient complained of continued frequency, urgency, and dysuria. His urine flow and hesitancy were improved, and his PVR was only 19cc. Tolterodine and

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phenazopyridine were prescribed to alleviate his symptoms. A urine culture was negative. Four months later, the patient continued to have dysuria despite medical therapy and negative urinalyses and cultures. Flexible cystoscopy showed a generally open prostatic fossa with some residual apical prostatic tissue and an area of hyperemia at the trigone. Cytology was negative. Simple cystometrogram revealed a normal capacity bladder with good detrusor function.

The patient consented to bladder biopsy and per his wishes gave informed consent to undergo a laser removal of residual apical prostatic tissue. By this point, only a holmium laser was available for use at our facility.

Figure 1. The prostatic fossa 4 months after Greenlight PVP in patient with persistent dysuria

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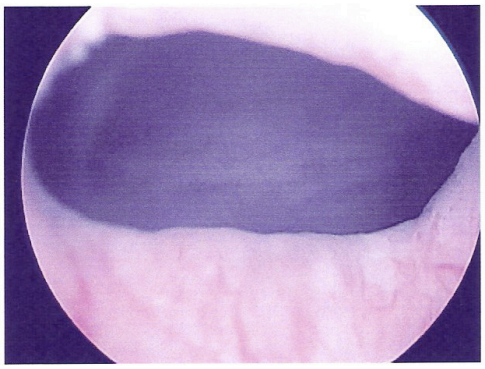

On formal cystoscopy, the prostatic fossa revealed no obstructing lobes after the Greenlight PVP four months prior (Fig. 1), except what was already noted in the apex. A holmium laser ablation of prostate (HOLAP) was performed to remove all apical tissue remnants as well as any tissue in the prostatic fossa (Fig. 2). A bladder biopsy was also obtained, which was eventually reported to be negative for carcinoma. The patient was discharged home the same day without a urine catheter. Two weeks postoperatively, he had marked improvement of his dysuria. At 6 months followup, he had mild urgency and frequency, but he continued to be symptom free from dysuria. His most recent AUA symptom score was 18 and PVR was 54cc.

DISCUSSION

Lasers are fast becoming a popular method to surgically manage BPH. The traditional indications for transurethral resection of the prostate are now being challenged by the laser due to its minimally invasive characteristics, fast recovery, and infrequent need for prolonged catheter drainage with continuous bladder irrigations. At our institution, more than 95% of patients are discharged home the same day and approximately 80% are catheter-free upon leaving.

The Greenlight laser, currently owned by American Medical Systems, gained popularity throughout the urologic community due to its fast tissue ablation, minimal blood loss, and undeniable, sensational laser effect. Although published data show good results with minimal side effects, some patients continue to complain of dysuria and irritative voiding symptoms months after the procedure [1]. As in the case presented, the dysuria is sometimes intractable and refractory to most medical therapy.

A possible mechanism for post-PVP dysuria may be related to nerve fibers. More specifically, research has shown that the transient receptor potential subfamily vanilloid type 1 receptor (TRPV1) exists in the human nociceptive primary afferent nerve fibers that cause hyperalgesia [2]. TRPV1 has been associated with chronic painful diseases of the bowel, bladder, and vulva [3,4,5]. It is usually stimulated by heat > 43° Celsius, pH < 6, and the release of eicosanoids and leukotrienes during inflammation. Recently, TRPV1 was found in the human prostate, prostatic urethra, ejaculatory ducts, and periurethral acini [6]. Upon activation and upregulation of TRPV1 in the human prostate, patients feel a burning and painful sensation during or independent of spontaneous voiding [7].

A possible mechanism of dysuria after Greenlight laser PVP could be related to TRPV1. The Greenlight laser has a shorter laser wavelength (532nm) and thus deeper tissue penetration than the holmium laser. The Greenlight laser energy is absorbed by hemoglobin, leading to rapid vaporization of deeper prostatic tissue with increased intraprostatic temperatures. The Greenlight laser beam divergence also potentially causes coagulative necrosis of prostate stroma during tissue vaporization. Combined, the higher temperature and coagulative necrosis, leading to a greater degree of inflammation, may upregulate TRPV1 and cause persistent pain or dysuria.

The resolution of dysuria after HOLAP in the current patient was unexpected. In congruence with the hypothesis, however, it is possible that after ablating the prostatic fossa tissue

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Figure 2. Prostate fossa after immediate ablation with holmium laser

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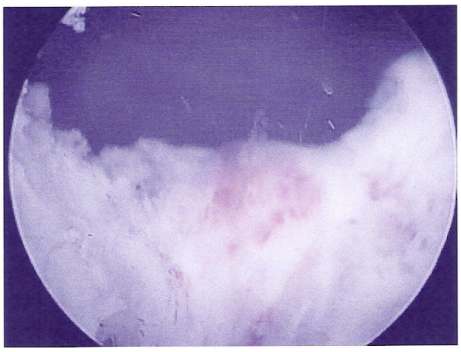

with the holmium laser, any areas of chronic inflammation and coagulative necrosed tissues were removed, thus downregulating TRPV1. The holmium laser is ideal for this since it has a 2100nm wavelength and a depth of penetration of only 0.4mm. This allows the surgeon to precisely cut or ablate only tissue that is visible. Furthermore, unlike the Greenlight laser, the energy from the holmium laser is absorbed by the irrigant, forming a vapor bubble. Tissue ablation occurs when the bubble explodes, releasing heat energy. This may lead to less burning pain symptoms because the tissue itself is not being overly heated, possibly leading to less upregulation of TPRV1.

Other possible explanations to account for the resolution of dysuria in our patient must not be overlooked. It is possible that the improvement in dysuria was due to the rigid scope itself and the dilatation of the prostatic urethra. However, if this was the case, his dysuria should have returned within several weeks after the tissue retracted to its baseline state. Another possibility is the placebo effect, but the chance of sudden improvement after 4 months of dysuria is remote. Lastly, and rather unlikely, it is possible that his dysuria resolved spontaneously during the days leading to his procedure, coincidentally improving his dysuria after HOLAP.

This case describes resolution of dysuria after HOLAP in a patient who previously underwent Greenlight PVP. The improvement in irritative symptoms was unanticipated and several explanations may account for the outcome. However, recent studies on the TRPV1 receptor in the prostate may explain this phenomenon. The pathophysiology of 'dysuria' involves a complex interaction of neurotransmitters and chemical mediators with hosts of receptors, resulting in a cascade of signal transduction in various nerve fibers. In this case, it is possible that ablating chronically inflamed prostatic urethral tissue downregulated the TRPV1 receptor, thus improving the chronic burning sensation. Further research must be pursued to confirm or refute this hypothesis. It is well established that TRPV1 is intimately associated with chronic pain disease states in other organs.

CONFLICT OF INTEREST

Holmium Laser Preceptor

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