High power diode laser vaporization of the prostate: preliminary results in benign prostatic hyperplasia treatment


ABSTRACT

Background: The criterion standard in benign prostatic hyperplasia (BPH) treatment has been transurethral resection of the prostate. However, in the last few years, alternative treatments have been developed to remove prostate tissue. One of these procedures is prostatectomy with laser vaporization of the tissues that provides instantaneous tissue reduction. The preliminary results of photovaporization with the diode laser in obstructive prostatic hyperplasia treatment are presented.

Aims: To prolectively evaluate the effectiveness of high power vaporization with a 980 nm diode laser for the treatment of urinary tract obstruction secondary to BPH, affecting the exit of urine.

Material and methods: A total of 15 patients were enrolled in the study. Inclusion criteria were a maximum flow of 12 mL per second or less, an emptying volume of 150 mL or more, a score of 12 or more using the International Prostate Symptom Score, and a

RESUMEN

Introducción: El estándar de oro en el tratamiento de la hiperplasia prostática benigna (HPB) ha sido la resección transuretral de próstata, sin embargo, en los últimos años se han desarrollado tratamientos alternativos para la remoción del tejido prostático. Uno de estos procedimientos es la prostatectomía con láser con vaporización de los tejidos, cuyo resultado es una reducción instantánea del tejido. Se presentan los resultados preliminares de la fotovaporización con láser diodo, en el manejo de la hiperplasia prostática obstructiva.

Objetivo: Evaluar prolectivamente la eficiencia de vaporización de alto poder con láser diodo de 980 nm, para el tratamiento de la obstrucción del tracto urinario de salida, secundaria a HPB.

Material y métodos: Se incluyeron un total de 15 pacientes en el estudio. Los criterios de inclusión fueron un flujo máximo de 12 mL por segundo o menos, con un volumen de vaciamiento de 150 mL o más, con calificación en la escala internacional de síntomas prostáticos de 12 o
INTRODUCTION

Clinically, the term benign prostatic hyperplasia (BPH) can refer to any of the following conditions: microscopic hyperplasia detection (stroma and epithelium proliferation), prostate enlargement detected through ultrasound or digital rectal examination (DRE), and the group of clinical symptoms associated with BPH and defined as “lower urinary tract symptoms”. The prevalence of BPH increases linearly with age in all ethnic groups. Surgical management of prostatic hyperplasia is indicated in those patients that present with urinary tract complications or in patients with moderate to severe urinary symptoms that do not respond to medical treatment.1 In the United States surgery for prostatic hyperplasia holds second place in patients over 65 years of age and in Mexico it represents 53% of the surgeries performed on men.2

The criterion standard for the surgical treatment of BPH has been transurethral resection of the prostate (TURP). However, in the last few years, alternative treatments have been developed for prostate tissue removal. The focus of these techniques has been on improving the not-so-insignificant secondary effects of TURP, such as blood loss, retrograde ejaculation, and urinary incontinence.3,4 One of these procedures is laser prostatectomy with tissue vaporization that results in instantaneous tissue reduction. Depending on the longitude of the wavelength, the power, and the action mode (continuous or in pulses), the effects of prostate tissue coagulation can possibly be avoided. These effects are thought to be responsible for the irritative symptoms experienced after laser intervention. The neodymium yttrium aluminum garnet (Nd-YAG) laser emits a 1 064 nm ray and can penetrate up to a depth of 10 mm.5 More recently, the potassium-titanium-phosphate (KTP) laser, that operates with a 532 nm wavelength, has been used for prostate vaporization,6 and is absorbed by hemoglobin but not by water, and penetrates to a depth of 0.8 mm. The diode laser functions with a 980 nm wavelength and penetrates to a depth of 0.5 mm, is highly absorbed by both water and hemoglobin, and has been proposed for high power tissue ablation with good hemostasis.7

These characteristics also provide the possibility of working in pulse mode, allowing for the development
of the lifting and rolling technique. The laser has been studied at energy operational levels of 30 to 120 W in *ex vivo* studies.

**METHODS**

A total of 15 consecutive patients that underwent prostate photovaporization with the 980 nm diode laser within the time frame of January 2011 and June 2011 were included in the study. Preoperative evaluation included the patient’s past medical history, physical examination emphasizing neurologic status, and digital rectal examination (DRE). Inclusion criteria were a maximum flow of 12 mL per second or less, a micturition volume of 150 mL or more, a score of 12 or more on the International Prostate Symptom Score (I-PSS), and a score of three or more in reference to Quality of Life. Patients with a past medical history of neurogenic bladder dysfunction, chronic prostatitis, prostate cancer and/or bladder cancer were excluded from the study. Preoperative maximum flow and quality of life were compared three months after the surgery. Complications associated with the procedure were recorded. All surgical procedures were performed by the same surgeon, with the patient under peridural block or general anesthesia. All patients received prophylactic antibiotics before the surgery and continued taking them for four weeks. The suspension of anticoagulation medication is recommended one week before surgery unless there is a contraindication. A 23 F continuous flow laser cystoscope with saline solution irrigation was used. A 980 nm diode laser generator was employed, with an energy configuration between 80 and 132 W in continuous mode during the entire vaporization procedure and a fiber optic with a 70° deviation angle for light transmission. Vaporization was begun at the bladder neck level with the bladder full of saline solution. Then the lateral lobes in the zone between the one and the 11 radii were vaporized. The energy was reduced to 80 W at the level of the bladder neck and the sphincter zone. A urethral catheter was placed and then removed the day after surgery. All of the patients except two were released from the hospital on the third day. Statistical analysis was carried out using the Student’s *t* test and there was statistical significance when *p*<0.05.

**RESULTS**

The mean age of the patients was 65 years (60-75 year range). The procedure was carried out on all patients with no intraoperative complications. No blood transfusions were necessary. The mean surgical duration was 60 minutes and the mean energy employed was 242 J. One fiber was used for each procedure. The mean days of urethral catheter use was one day. Table 1 shows the parameters measured at three months after the procedure and their comparison with the preoperative values. The I-PSS had a statistically significant decrease from a mean preoperative score of 21 to a score of 11 at the third postoperative month. Similarly, maximum flow increased from a preoperative value of 8 mL/sec to 17 mL/sec at three months after the procedure. The quality of life evaluation improved from a preoperative score of 4 to a score of 2 at the third postoperative month.

**DISCUSSION**

The search for other management alternatives to TURP, the criterion standard in BPH treatment, is stimulated after analyzing the results related to its morbidity and mortality. TURP-related morbidity has been reported in up to 18% of patients, mortality in up to 0.2%, and transfusion requirements in 3%. Likewise, there is a 10 to 15% probability of a repeat intervention in 10 years. These data justify the search for the most minimally invasive procedures possible in the surgical treatment of hyperplasia. In the 1990s the use of Nd-YAG was a good alternative, however its use was discouraged due to postoperative irritative symptoms.

High power diode laser vaporization of the prostate has risen in importance in the last few years because, not only does it offer an excellent means of prostate tissue vaporization, it also provides adequate hemostasis and there are fewer postoperative irritative symptoms. The results of the present study in relation to quality of life, the I-PSS, and uroflowmetry maximum urinary flow were similar to those reported in the medical literature.

**CONCLUSIONS**

High power diode laser vaporization of the prostate offered significant improvement in the International Prostate Symptom Score and in maximum flow and had lower morbidity and these results represent the first clinical study of high power diode laser vaporization of the prostate to be reported in the Mexican medical literature.

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Table 1. Follow-up at three months for patients that underwent diode laser vaporization of the prostate

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Preoperative mean</th>
<th>Mean at three months</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-PSS</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Quality of life index</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Maximum flow</td>
<td>8 mL/sec</td>
<td>17 mL/sec</td>
</tr>
</tbody>
</table>

I-PSS: International Prostate Symptom Score

REFERENCES