THE PUBLISHING HOUSE
OF THE ROMANIANACADEMY

Supplement 1/2015, 4th ISAA

THE TREATMENT OF PROSTATIC HYPERPLASIA AND BLADDER STONE, WITH THULIUM LASER.

Marc VLAD[1,2] and Raduta CODRUT[1]

[1] *"Victor Babes"* University of Medicine and Pharmacy, Timisoara, Romania
[2] *"Pius Brinzeu"* Hospital, Departament of Urology County, Timisoara, Romania
Corresponding Author: Marc VLAD, E-mail: marc_vlad2002@yahoo.com

Accepted November 16, 2015

The thulium vaporesection is a modern alternative to classic prostate resection. Thulium laser became a must have in modern urology. A 58 years old male patient arrived at the emergency room accusing complete urinary retention. The patient has been having moderate lower urinary tract symptoms (LUTS) for 3 years. Comorbidities: heart stroke in historical background (15.01.2015), high blood pressure, kidney stone disease. Ultrasound examination revealed an enlarge prostate 4.713.9/4.5 cm, volumes 45 mL; bladder distension with 1200ml volume and a bladder stone of 1,5/1 cm. Thulium laser vaporesection (THUVARP) of the prostate was performed for the enlarged prostate and thulium fiber laser lithotripsy for the bladder stone. Cvintall TM 120 Thulium fiber laser device with a wavelength of 1940nm was used for the both procedures, using the 550 microns fibre. For the prostate we used the SOFT TISSUES MODE, 60-80W intensity and continuous wave. For the bladder stone we used the LITHO mode (trains of pulses) and a 100-120W. The vaporesection procedures had a duration of 25 minutes. During the procedure there was no bleeding in the operative filed. The stone fragmentation procedure had a duration of 10 minutes. No post operative hematuria, the bladder catheter was removed after 24 hours and the patient had physiological mictions.

Keywords: BPH, Prostate, Vaporesection, Thulium, Lithotripsy

INTRODUCTION

According to the European Association of Urology (EAU) guidelines, transurethral resection of the prostate (TURP) and suprapubic prostatectomy are still considered the gold standard for surgical treatment of the lower urinary tract symptoms (LUTS) caused by BPH[1]. The thuium vaporesection is a modern alternative to classic prostate resection. The use of lasers in surgery has been a mirage for decades. The main points of attraction were the precise cut and hemostasis induced by the lasers. The major drawbacks were the risk of perforation and deep necrosis of the tissues. These were encountered with the first lasers used in urology: ruby lasers, Nd:YAG, and diode lasers. A major breakthrough occurred when lasers generated through elements of the Lanthanide series, namely Holmium (Ho), Thulium (Tm), Erbium (Er) were studied with regard to their application in surgery. The wavelength is around 2 microns for Holmium and Thulium. The theory behind the use of such wavelengths in surgery is the high water absorption coefficient[2-4].
The laser energy is best absorbed in a small volume of tissue by the water present in the tissues and in the blood. The higher absorption coefficient, the smaller volume of tissue in which the laser energy is absorbed. In physics terms: the higher the absorption coefficient, the higher the laser energy density. The result is a precise cut of the tissues and concomitant perfect hemostasis. The use of Lanthanide lasers is of particular interest in urology, mainly endoscopy, as a water or saline irrigation is used in the endoscopy lines[2]. The laser energy is absorbed also in the irrigation fluid therefore there is a risk of overheating of this fluid with subsequent thermal destruction of the urothelium and also the risk of lack of effectiveness, as just little of the laser energy actually reach the tissues intended to be cut or vaporized[4]. The higher the absorption coefficient in the tissue the lesser is the depth penetration in the tissue. The underneath necrosis is just 0.4 mm for Holmium wavelength and 0.2 mm for Thulium (The Thulium water absorption coefficient is about 2 times higher than Holmium one)[4].

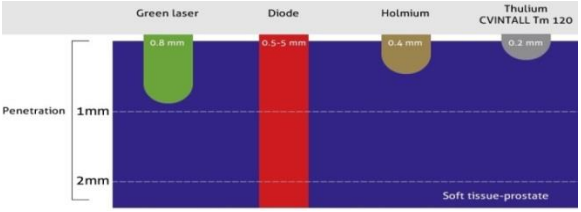

Figure 1. Laser depth penetration in the prostatic tissue

Another important issue regarding the biological effects of the lasers in how the laser beam 01 is conditioned: continuous or pulsed wave. If the laser beam is a continuous wave (cw) the effect on the tissues is similar to a thermal vaporization/cut, very precise and with perfect blood coagulation. The effect on the urinary calculi is just thermal, resulting in local calcinations of the stones. If the laser beam is pulsed, then a micro bubble of water vapors is formed before the tissue or stone. As the bubble is approaching the target it is expanding and a micro explosion occurs at the impact of the tissue/stone (cavitations effect)[4,5].

CASE REPORT

A 58 years old male patient arrived at the emergency room accusing complete urinary retention and a bladder catheter was mounted with evacuation of 1200 ml of clear urine. The patient had moderate lower urinary tract symptoms (LUTS) for 3 years and failed for the medical treatment. Comorbidities: heart stroke (15.01.2015), high blood pressure, kidney stone disease. Digital rectal examination revealed no signs of malignity the IPSS score: 28, PSA: 2,1 ng/ml. Ultrasound examination from the hospital admission revealed an enlarge prostate 4.7/3.9/4.5 cm, volume ≈ 45 mL; bladder distension with 1200mL volume and a bladder stone of 1,5/1 cm (Figure 2).

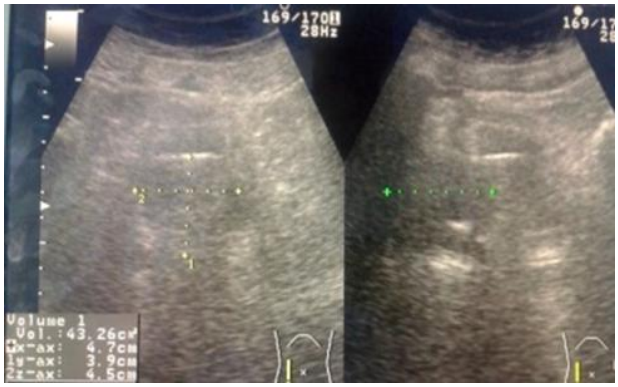

Figure 2. Ultrasound examination

Under spinal anesthesia, thulium laser vaporesection (THUVARP) of the prostate was performed for the enlarged prostate using the Cvintall TM 120 Thulium laser device, we used a 550 microns dedicated working fiber, using a Storz laser compatible 26 Ch working element. For minimizing the risk of metabolic complications we used saline irrigation with an irrigation pressure of 40–60 cm. SOFT TISSUES MODE and 60-80W intensity continuous wave were used during the THUVARP.

Resection of the median lobe The resectoscope was placed into the bladder and the range between bladder neck and verumontanum was etimated, and the size and configuration of the prostate. The first incisions were made at the bladder neck directly at the 5 and 7 o'clock position the depth of the incision was sufficiently to expose the surgical capsule. The tow incisions divide the median lobe into one pieces of the capsule. Next, we joined the incision from 5 and 7 o'clock positions at the level just proximal to the verumontanum and sweep the laser fiber in a transverse cutting motion. Resections will develop deep along the plane of the surgical capsule toward the bladder neck, as the resection took along the resected prostatic tisue was pused in the blader.

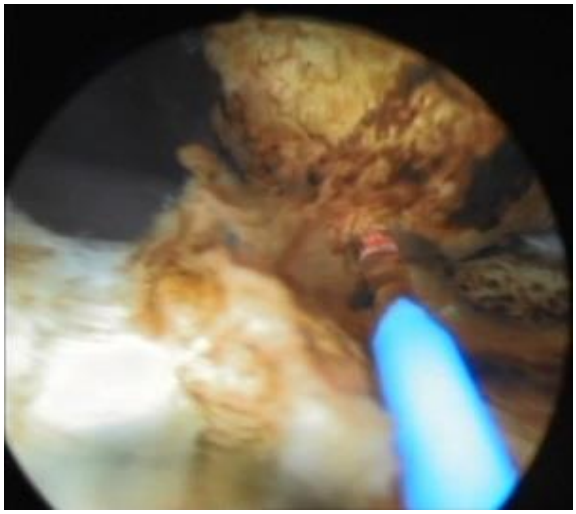

Figure 3. Laser vaporesection of the prostate

Resection of the lateral lobes. Due to the size of the prostate it wasnt necesarly to make incisions at 1,3 o clock and 9,11 o' clock , we made 2 incisions at 9 o' clock and 3 o' clock, the incisions were made at the same depth as the first one, all the way to the surgical capsule , the 3 o' clock and 9 o' clock incisions were joind with the 6 o' clock incision and with the same motion as for the medial lobe the tisue was resected and vaporised simultaneousy. The speed of sweeping motion through the tissue determines the degree of vaporization. The left and right lobe were vaporesected from the capsule and pushed in the bladder, the pieces are sufficiently smal to be evacuated through the resectoscope sheath. The cutting surface of the prostate was smoothen and all the pices of resected prostate were pushed in the bladder and evacuated trough the resectoscope sheath (Figure 3 and 4).

For the bladder stone we used the same equipment, the Cvintall TM 120 in with the LITHO mode (trains of pulses) lasting 10 milliseconds at a 100-120 W power, the fragmentation of the stone, with this laser is possible due to the cavitation effect. When the laser beam is pulsed, a micro bubble of water vapors is formed before the stone and before approaching the bubbles expand and a micro explosion occurs at the impact with the tissue (Figure 5).

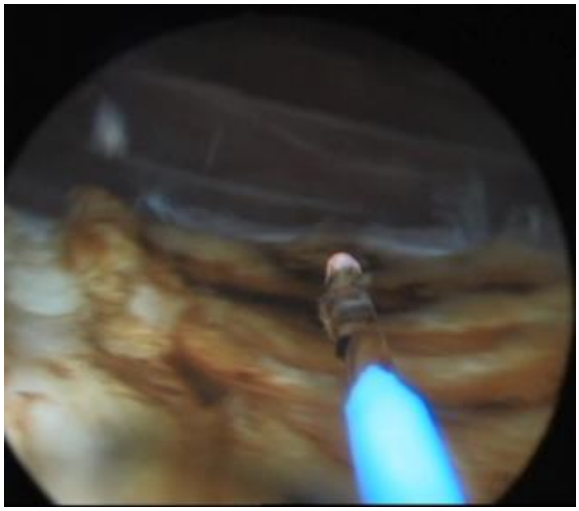

Figure 4. The smoothen of the cutting surface

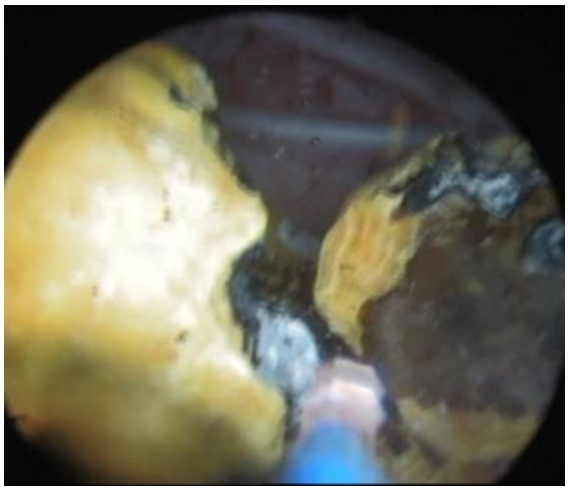

Figure 5. Thulium laser lithotripsy for bladder stone

DISCUSSIONS

Bleeding was minimal to inexistent during the intervention due to the simultaneous vaporization and hemostatic properties of the Thulium laser in continuous wave mode. In postoperative care we administrated 500 mg of levofloxacin before the operation and every day for 5 days . The bladder catheter was removed the next day due to the clear non hemorrhagic color of the urine.
The vaporesection procedure had a duration of 25 min. There was no bleeding during the procedure in the operative field, the hemostasis and coagulation were perfect, the risk of metabolic complication was reduced by using the saline irrigation, it was a bloodless procedure, no hematuria after the procedure.
The stone fragmentation procedure had a duration of 10 min. and was performed with the same device and the same fiber, which has been possible due to the versatility of the device.
The bladder catheter was removed after 24 hours and the patient had physiological mictions, a flow evaluation was made at the discharge from the hospital Qmax=15,7 mL/sec, and the ultrasound examination revealed no post-void residual bladder volume. The characteristics of Thulium Laser Cvintll TM 120 device provide efficient vaporization with perfect hemostasis and no deep thermal tissue damage through high absorption in water.

CONCLUSIONS

The THUVARP procedure is superior to TURP procedure for symptomatic BPH with less morbidity. Overall the Thulium laser has several advantages over the Holmium as well including the quality of the beam, the depth penetration in the tissue and the possibility of continuous wave and Lito mode.

Acknowledgement *"This work was co financed from the European Social Fund through Sectoral Operational Programme – Human Resources Development 2007-2013", project nr. POSDRU//1871.5/S/155605, entitled "Scientific excellence, knowledge and innovation through doctoral programs in priority areas", Beneficiary – University of Petrosani*

REFERENCES

1. Roman Szlauer, Robert Gotschl, Aria Razmaria, Ljiljana Paras, Nikolaus T. Schmeller Endoscopic Vaporesection of the Prostate Using the Continuous-Wave 2-mm Thulium Laser: Outcome and Demonstration of the Surgical Technique, European urology, 2009, 55, 368–375
2 Shu-Jie Xia, Two-micron (thulium) laser resection of the prostate tangerine technique: a new method for BPH treatment, Asian Journal of Andrology, 2009, 11: 277–281
3. Bach T, Netsch C, Haecker A, Michel M-S, Herrmann T, Gross A. Thulium: YAG laser enucleation (VapoEnucleation) of the prostate: safety and durability during intermediate-term follow-up. World J Urol, 2010; 28:39–43.
4. Bach T, Herrmann TRW, Haecker A, Michel MS, Gross A. Thulium: yttrium-aluminium-garnet laser prostatectomy in men with refractory urinary retention. BJU Int., 2009; 104:361–4.
5. Bach T, Herrmann TR, Ganzer R, Burchardt M, Gross A. RevoLix vaporesection of the prostate: initial results of 54 patients with a 1-year follow-up. World J Urol. 2007; 25:257–262.
6. Bach T, Herrmann TR, Ganzer R, Blana A, Burchardt M, Gross AJ. Thulium:YAG vaporesection of the prostate. First results [in German]. Urologe A., 2009; 48:529–534.