CYBER TM 150W 2010nm THULIUM:YAG CONTINUOUS WAVE VAPORESECTION FOR BENIGN PROSTATIC HYPERPLASIA

A Single Institution Experience and Description of Surgical Technique

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OBJECTIVES

To evaluate a new technique for treatment of benign prostatic hyperplasia (BPH) by VapoResection of the median and lateral lobes using the Cyber TM 150 W 2010 nm Thulium:YAG laser system with an 800 micron end-fire fiber.

METHODS

40 cases of BPH have been treated using the VapoResection technique described herein, between May 2010 and June 2012, for indications including voiding symptoms (n=27) and urinary retention (n=13). Age ranged between 53-89 years, median 67 years.

The setting was a tertiary referral practice at University College Hospital, London, for patients requiring surgical treatment for voiding dysfunction due to BPH. The majority of patients had failed medical treatment, and had declined or been unsuitable for transurethral resection of prostate (TURP) on account of significant co-morbidities. Evaluation included pre- and post-operative IPSS symptom score, Prostate-Specific Antigen (PSA), digital rectal examination, maximum uroflow (Qmax), post-void residual, and prostate volume assessment by transrectal ultrasound or magnetic resonance imaging. Two-tailed Student's t-test was used for statistical analysis.

CYBER TM

The Cyber TM Thulium:Yag laser (Quanta System, Milan, Italy) provides continuous laser energy at a wavelength of 2010 nm and 150 W power through am 800 micron end-fire fiber, a combination that is highly effective for simultaneous vaporization, cutting and hemostasis without need for power switching.

Safety is assured with no danger from "overshoot" owing to high absorption of laser energy by water, and tissue penetration is no more than 0.2 mm, for the same reason, avoiding the risks of deep tissue injury. Tissue carbonization is not a characteristic of Cyber TM 150 owing to its ample power, while simultaneously avoiding excessive bubble effect. The laser is operated while wearing near clear view goggles.

The laser fiber is handled like a soft brush, for cutting or for surface vaporization. Its tip is drawn along the incision line, on the tissue surface, without burying. Hovering, like using low power, is ineffective: it can increase carbonization and tissue will not be vaporized. Either an end-fire, reusable fiber or a side-fire fiber can be used, without damage from prostatic calculi.

VAPORESECTION TECHNIQUE: Median Lobe

The operation begins by making a 6 o'clock channel by VapoResection (A). Bladder neck incisions are made at 5 and 7 o'clock marking the boundaries of the median lobe, before engaging the lobe itself. The proximal limits of these two incisions are positioned at a safe distance from the ureteric orifices. The incisions are each developed as postero-lateral planes, until the surgical capsule is reached, identified from the transverse fibers at the bladder neck and texture of the prostatic tissue. The base of these trenches define the depth and slope of the trajectory to be followed when subsequently releasing the median lobe. The incisions also define the proximal limit of the resection on the trigone, and thereby provide guides to avoid inadvertent encroachment on the ureteric orifices or undermining of the bladder neck.

The incisions are joined just above the verumontanum (A). The median lobe is then resected, working upwards and cranially, between the trenches, proceeding from verumontanum to bladder neck, along the posterior capsular plane. While releasing the median lobe, the dissection should not extend deeper than the trenches to avoid undermining of the bladder neck or trigone. A small median lobe can sometimes be resected as a single piece of tissue, and a larger lobe is VapoResected as several pieces.

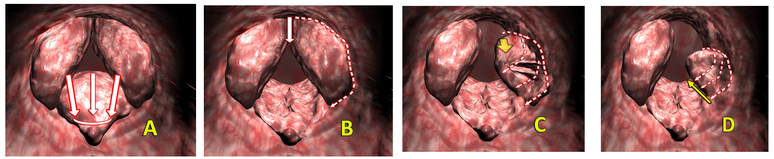
VAPORESECTION TECHNIQUE: Lateral Lobes

A marking incision is made at 12 o'clock on the anterior bladder neck and then a line is drawn around the distal limit of the lateral lobe, meeting the 6 o'clock channel adjacent to the verumontanum (B). This incision is deepened anterolaterally, along the capsular plane (C). The lateral lobe progressively prolapses posteriorly, and the prolapsed segment is then released from the plane of the surgical capsule by VapoResection rather than physical dissection, and similarly divided into smaller tissue fragments (D).

GENERAL POINTS

VapoResection is carried out with a 24 or 26F metal-tip continuous flow irrigating sheath, and saline irrigation. Bleeding is minimal, owing to the simultaneous vaporization and hemostatic properties of the continuous wave. As the adenoma is dislocated, it is rendered avascular, and simultaneously vessels within the surgical capsule are sealed within a narrow coagulation zone. A large amount of prostatic tissue can thereby be removed in a non-vascular field, and an excellent visual field maintained. With VapoResection, a small lobe will mostly vaporize. A larger lobe requires debulking of the partially dislocated adenoma, to avoid the need for morcellation. Typically, a 16F two-way catheter is placed at the end of the procedure and removed the following day.

When VapoResecting, fragments should be modelled to be sufficiently small for evacuation with an Ellick Evacuator, before being released into the bladder. Tissue can then be sent for histological examination. With pure vaporization, tissue is not available for histology.



RESULTS

Pre-operative prostate volume measured 21-250 cc, median 61.4 cc (n=39). When post-operative volume was measured, mean reduction was 25 cc, from a mean of 59 cc to 34 cc, (n=11). In patients without retention, preoperative PSA was 0.6 – 6.7 ng/ml, median 3.2 ng/ml. Also, see Table below.

Energy delivery ranged from 17 – 508 kJ, median 203 kJ; laser time 1.9 - 49.6 minutes, median 23 minutes; and power delivery 8.9 $\pm$ 1.9 SD kJ/min, at 150W. The technique maintains a hemostatic operative field, avoids the need for morcellation, and minimises the risk of metabolic complications by using saline irrigation.

There were no significant complications, defined as Clavien 2 or higher. Patients can be advised that few experience dysuria: it was reported infrequently, settled within a few weeks, was minimal in degree and did not require medication. Two patients were readmitted, one on account of an uncomplicated lower urinary tract infection, and the other for clot retention after secondary bleeding; neither required further invasive treatment. There were no cases of urethral stricture, bladder neck stenosis, ureteric orifice injury, blood transfusion or metabolic complication.

One patient having surgery for retention and post-operative normal PSA had histology suspicious for prostate cancer which was later confirmed by needle biopsy. One patient subsequently had a subsequent staged TURP, having had a limited VapoResection clearing the median and one lateral lobe only.

CONCLUSION

The laser characteristics of Cyber TM 150 W Thulium:YAG provide efficient and hemostatic vaporization for precise VapoResection, Vaporization, VaporCut and VaporEnucleation, without carbonization or excessive bubble effect, and simultaneous excellent coagulation, with the option of a reusable end-fire or a single-use side-fire fiber. It avoids danger from "overshoot" or deep thermal tissue damage through high absorption in water.

The technique described here for VapoResection is reproducible irrespective of prostate volume. It enables enucleation to be carried out without the need for morcellation, and has a short learning curve for a urologist with endoscopic experience. The surgeon has excellent vision, using near clear view goggles, and maintaining a hemostatic operative field.

Many patients with BPH can benefit from laser treatment, warranting prospective evaluation of outcomes, particularly in a controlled randomised setting.

DECLARATION OF INTERESTS

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	PATIENTS VOIDING PRE-OPERATIVELY (n=27)					PATIENTS UNABLE TO VOID (IN RETENTION) (n=13)	
		FOLLOW-UP				FOLLOW-UP	
		Evaluated			Unevaluated	Evaluated	Unevaluated
	PRE-OP		Difference	t-test			
IPSS Symptom Score	21.7 (n=6)	7.9 (n=8)	-14.5	p<0.001	9 discharged, 5 pending follow-up, 1 subsequent TURP, 1 diagnosed with prostate cancer, 2 had neurological disease, 1 bladder cancer	5.8 (n=4)	2 follow-up pending; 6 discharged, and 1 on ISC for poorly contractile detrusor
Qmax (ml/sec)	9.2 (n=14)	17.8 (n=16)	8.1	p<0.001	5 discharged, 3 pending follow-up, 1 subsequent TURP, 2 neurological disease	14.9 (n=6)	2 follow-up pending; 3 discharged, 1 on ISC for poorly contractile detrusor and 1 further VapoResection for 250 ml prostate
Post-Void Residual (ml)	164.2 (n=15)	59.1 (n=17)	-101.9	p<0.05	5 discharged, 3 pending follow-up, 1 subsequent TURP, 1 neurological disease	82.0 (n=7)	1 follow-up pending; 3 discharged, 1 on ISC for poorly contractile detrusor and 1 further VapoResection for 250 ml prostate