THE SHORT-TERM EFFICACY AND SAFETY OF TRANSURETHRAL THULIUM LASER PROSTATECTOMY IN THE TREATMENT OF BENIGN PROSTATIC HYPERPLASIA

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ABSTRACT

Objective: *To analyse the short-term efficacy and safety of transurethral thulium laser prostatectomy (TmLRP) in the treatment of benign prostatic hyperplasia (BPH).*

Methods: *A total of 125 patients with BPH were selected from January 5, 2015 to January 5, 2016. Then, 120 patients were randomly divided into two groups: 65 patients underwent TmLRP and 55 patients underwent transurethral resection of the prostate (TURP). The time of operation, the change of electrolytes, bladder washing duration, indwelling catheter duration, the days of hospitalisation and complications were measured and recorded. The changes of IPSS, Qmax and PVR were followed up for 1 month.*

Results: *There were no significant differences in IPSS, QOL and Qmax between the two groups before operation (P>0.05). One month after the operations, the IPSS, QOL and Qmax of the two groups were significantly lower than the values before operation (P<0.05). The bladder flushing, catheterisation and hospitalisation duration of the TURP group were significantly higher than those of the TmLRP group (P<0.05). There were no significant differences in Na^+, K^+, Cl^- and haemoglobin change between the two groups before operation (P>0.05). Changes in Na^+, K^+, Cl^- and haemoglobin in the two groups after operation were significantly lower than those before operation (P<0.05). The number of complications after the operations in the TmLRP group was significantly higher than in the TURP group (P<0.05).*

Conclusion: *TmLRP is a simple, effective, minimally invasive, highly safe, and ideal surgical method with good clinical application prospects and fewer complications.*

Keywords: *Thulium laser prostatectomy for benign prostatic hyperplasia.*

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Introduction

Benign prostatic hyperplasia (BPH) is one of the most common diseases among middle-aged and elderly men. With the ageing of the global population, the incidence of this disease is gradually increasing[(1)]. BPH incidence also increases with age, and there are not necessarily clinical symptoms in patients with BPH. Transurethral resection of the prostate (TURP), which has been used for many years, is considered the "gold standard" for surgical treatment of BPH[(2)]. At present, the application of lasers in the treatment of BPH is increasing gradually. In recent years, the clinical application of lasers has been characterised by rapid vaporisation cutting, good haemostasis effect and low penetration. The thulium laser is a new type of surgical laser. Its centre wavelength can be adjusted between 1.75-2.22μm and a pulsed or continuous wave mode can be selected. The thulium laser is characterised by accurate and efficient cutting[(3)].

Moreover, it is believed that thulium laser has the advantages of high resection efficiency, less intraoperative bleeding and fast postoperative recovery in the treatment of BPH. In recent years, few reports have been published on thulium laser prostatectomy (TmLRP) for BPH.

The purpose of the present study was to investigate the short-term efficacy and safety of transurethral TmLRP in the treatment of BPH.

Materials and methods

General information

From January 5, 2015 to January 5, 2016, 125 patients with BPH were admitted to our hospital.

Inclusion criteria

According to published research on thulium laser and TmLRP in the treatment of symptomatic BPH, patient age is less than 85 years old, maximum urine flow is less than 15ml, residual urine volume is less than 150ml and prostate volume is less than 100ml due to drug treatment failure and transrectal ultrasound.

Exclusion criteria

Prostate volume is less than 30ml, and the volume of prostate cancer, neurogenic bladder, bladder stone, diverticulum, urethral stricture and maximum bladder volume are more than 500ml[4]. The patients were divided into two groups: the TmLRP group and the TURP group.

There was no significant difference in age and prostate grading between the two groups.

Methods

TmLRP group

Continuous epidural anaesthesia, cutting stone position. The perfusate was normal saline and the flushing pressure was 40-60cm H_2O. The thulium laser was set in continuous wave mode with 50W of energy. First, the resected endoscope was inserted into the bladder and the internal structure of the bladder was observed. The position of the ureteral orifice was the marker for prostatectomy[5].

First, the middle lobe of the prostate was removed and the orange peel was peeled according to the boundary to remove the left and right lobes. The laser blade was then moved rapidly to smooth the wound and repair the tip of the prostate. After resection, the prostate tissue was cleaned or clamped, and a three-chamber catheter was inserted.

TURP group

A 26FStorz electric cutting mirror and ring electric cutting ring were used with an electric cutting power of 160W, electric coagulation power of 60W, and a flushing liquid (4% mannitol)[6].

Simultaneously, the middle, left and right lobes of the prostate and the apex of the prostate were removed by a high-frequency electrotome. During the operation, electrocoagulation was used to stop bleeding, a prostatectomy was performed and a three-lumen catheter was inserted.

Test standard

The operation time, indwelling catheter time, bladder washing time, hospitalisation time and postoperative complications were compared between the two groups.

Statistical method

SPSS11.0 statistical software was used, and a paired t-test was utilised for the comparison of averages. Differences were considered statistically significant at $P<0.05$.

Results

IPSS, QOL and Qmax scores of the two groups before and 1 month after operation

There were no significant differences in the IPSS, QOL and Qmax values between the two groups before operation ($P>0.05$).

One month after the operations, the IPSS, QOL and Qmax values of the two groups were significantly lower than those before operation ($P<0.05$) (see Table 1).

Group	IPSS		QOL		Qmax	
	Preoperative	1 month after operation	Preoperative	1 month after operation	Preoperative	1 month after operation
TmLRP	18.0±802	7.0±1.5	4.0±0.6	1.0±0.2	7.0±3.2	20.0±7.8
TURP	19.1±7.2	7.8±2.6	4.2±0.7	1.2±1.1	7.8±3.8	22.5±8.0
t	0.568	22.865	0.587	15.426	0.974	20.265
P	0.325	0.014	0.094	0.022	0.087	0.015

Table 1: Comparison of IPSS, QOL and Qmax scores of the two groups before the operations and 1 month after ($\bar{x}\pm s$).

Operation time, bladder washing time, retention time, hospitalisation time and complications of the two groups

The bladder washing time, catheterisation time and hospitalisation time in the TURP group were significantly higher than those of the TmLRP group ($P<0.05$) (see Table 2).

Group	Cases	Operative time	Bladder flushing time	Catheter time	Length of stay
TmLRP	65	50.6±12.8	5.4±1.4	2.3±0.4	4.6±1.3
TURP	55	55.3±15.1	20.2±7.6	5.6±1.0	6.5±2.1
t		4.550	40.685	20.532	13.205
P		0.120	0.045	0.020	0.023

Table 2: Operation time, bladder washing time, catheterisation time, hospitalisation time and complications of the two groups.

Comparison of electrolyte changes before and after thulium laser prostatectomy

There were no significant differences in the changes of Na^+, K^+, Cl^- and haemoglobin between the two groups before operation (P>0.05).

Changes in Na^+, K^+, Cl^- and haemoglobin between the two groups after operation were significantly lower than before operation (P<0.05), while the changes of Na^+, K^+, Cl^- and haemoglobin in the two groups after operation were significantly lower than that before operation (P<0.05) (see Table 3).

Group	Na^+ (mmol/L)	K^+ (mmol/L)	CL^- (mmol/L)	Haemoglobin (g/L)
Preoperative	141.5±4.1	4.5±0.4	108.1±4.1	120.0±8.5
Postoperative	140.2±2.0	4.2±0.2	106.5±2.0	116.8±8.2
t	0.494	5.051	2.639	2.008
P	0.034	*P*<0.001	*P*<0.001	0.038

Table 3: Comparison of electrolyte changes before and after thulium laser prostatectomy.

The postoperative complications of the two groups

The postoperative complications of TmLRP group were fewer than those of the TURP group, and this difference was statistically significant (P<0.05) (see Table 4).

Group	Postoperative rebleeding	Infected	Dysuria	Bladder spasm	Incidence of adverse reactions
TmLRP	0 (0.00)	1 (0.80)	2 (1.60)	1 (0.80)	4 (3.20)
TURP	2 (1.60)	3 (2.40)	4 (3.20)	3 (2.40)	12 (9.60)
t					4.273
P					0.038

Table 4: Comparison of postoperative complications between the two groups [n (%)].

Discussion

The incidence of BPH is related to many pathogenic factors. Old age and functional testicles are very important for the development of BPH. The incidence of BPH-related pathological changes in 51 to 60-year-old men is 75%.

Nearly all men over 80 years old exhibited BPH pathological changes, and none of the adolescent patients exhibited BPH after resection. Moreover, the effective rate of castration treatment can reach more than 70%, suggesting that Panwan with normal function is closely related to the development of BPH. It is a common disease in urology. Transurethral resection of the prostate is a "classic" endourological treatment technology. However, the selection of indications, surgical techniques and prevention and treatment of complications remain inconsistent. In recent years, based on transurethral electrovaporisation of the prostate, we have attempted to improve the process of the conventional operation to expand indications and reduce complications. In the field of BPH, TURP-which has been used for many years-is considered to be the "gold standard" for the surgical treatment of BPH. However, there remains a risk of bleeding and electrosurgical syndrome during the operation, which has resulted in TmLRP becoming the ideal operation method in recent years.

The thulium laser is a new type of surgical laser that has been used in the clinic since January 2004. It can be selected to operate in a continuous wave or pulse wave mode[7]. The continuous wave mode has high cutting efficiency and is mainly suitable for prostate operations, while the pulse wave mode is mainly suitable for ureteral stenosis, urethral stenosis and other fine operations. By adjusting the energy and pulse, a laser can produce effective tissue coagulation and vaporisation, which has a good haemostasis effect. Since the haemostasis effect is good, operations are carried out without nearly no bleeding[8].

Simultaneously, since its energy can be absorbed by water, any heat damage is mainly present in the surface structure, which limits the penetration depth of the structure so that tissue can be precisely vaporised[9]. The thulium laser is mainly absorbed by water molecules in tissues, and the actual wavelength can be adjusted according to clinical needs[10].

The advantages include high cutting efficiency and accuracy (formed by a tmy: yag solid diode with a wavelength of approximately 2 μm, close to the suction value of water molecules, which can be effectively absorbed by the water molecules in the tissue, resulting in shallow damage depth and no damage to surrounding tissues[11]), wide application range, and pulse/continuous mode (can be switched according to clinical needs). The thulium laser can cut accurately in pulse mode but can stop bleeding and cut rapidly in continuous wave mode[12].

It also has a small beam diameter, promotes tissue preservation during operation, is a small piece of laser equipment, uses quartz fibre, and involves simple equipment maintenance[13].

In this study, two groups of postoperative micturition-related indicators improved significantly (P<0.05), but no significant differences were observed between the two groups in this improvement (P>0.05), which indicates that TmLRP and TURP

had the same effect. In prostatectomy, thulium laser coagulation blocked blood vessels, thereby resulting in less postoperative bleeding and shorter bladder flushing times. In this study, since the haemostasis effect in operations is not as good as that of the laser group, the TURP group had to continue to flush the bladder[14]. Postoperative patients require a period with an indwelling catheter to inhibit bleeding. Compared with the TURP group, the intubation time of the TmLRP group was significantly shorter.

However, due to the good haemostasis effect, minimal damage and accurate operation, irritation symptoms were reduced after urethral withdrawal. In the TURP group, the symptoms of urinary tract stimulation-such as frequency of urination and urgency of urination-were obvious, and the haemostasis effect was poor[15].

In conclusion, using a thulium laser has a good haemostatic effect since it can result in reduced bleeding in the treatment of BPH, keep ureter for a short time and more rapid postoperative recovery. Compared to other types of laser, the optimal combination of efficient cutting and rapid vaporisation of a thulium laser continuous wave[16] is safer and more effective in the treatment of tissue thermal injury; however, the long-term effect remains to be observed.

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