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A clinical study of 980-nm diode laser enucleation of the prostate for the treatment of benign prostatic hyperplasia

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Corresponding Author:	Ming Dr. Liu Beijing Hospital Beijing, Beijing CHINA
Corresponding Author's Institution:	Beijing Hospital
Corresponding Author E-Mail:	liuming19731029@163.com
Order of Authors:	yaqun zhang
	chunlong fu
	Jinfu wang
	xin chen
	pengjie wu
	jianye wang
	Ming Dr. Liu
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Cover letter

Dear Editors:

We would like to submit the enclosed manuscript entitled "**A clinical study of modified 980nm diode laser enucleation of the prostate for the treatment of benign prostatic hyperplasia**", which we wish to be considered for publication in "JOVE". No conflict of interest exits in the submission of this manuscript, and manuscript is approved by all authors for publication.

I would like to declare on behalf of my co-authors that the work described was original research that has not been published previously, and not under consideration for publication elsewhere, in whole or in part. All the authors listed have approved the manuscript that is enclosed.

In this work, we evaluated **a novel technique in DiLEP which was feasible and facilitated in the procedure**. I hope this paper is suitable for "JOVE".

We deeply appreciate your consideration of our manuscript, and we look forward to receiving comments from the reviewers. If you have any queries, please don't hesitate to contact me at the address below.

We hope that this article can to be "in-press" at 11/30/2019

Thank you and best regards.

Yours sincerely,
M.D. Ming Liu

Corresponding author:
Name:Ming Liu
E-mail: liuming19731029@163.com

TITLE:

Enucleation of the Prostate for the Treatment of Benign Prostatic Hyperplasia Using a 980 nm Diode Laser

AUTHORS AND AFFILIATIONS:
Yaqun Zhang[1*], Chunlong Fu[1,2*], Jinfu Wang[1], Pengjie Wu[1], Xin Chen[1], Huiming Hou[1], Xinda Song[1], Wanli Cheng[1], Jianye Wang[1], Ming Liu[1,2]

[1]Urology, Beijing Hospital, National Center of Gerontology, Beijing Hospital, Beijing, China
[2]Graduate School of Peking Union Medical College, Beijing Hospital, Beijing, China

*These authors contributed equally

Corresponding Author:
Ming Liu (liuming19731029@163.com)

Email Addresses of Co-authors:
Yaqun Zhang (zhangyaqun@yeah.net)
Chunlong Fu (fuchunlong_pumc@163.com)
Jinfu Wang (doctorwang5127@163.com)
Pengjie Wu (wupengjiesan@163.com)
Xin Chen (18600405631@163.com)
Huimin Hou (Houhuimin0305@163.com)
Xinda Song (592483813@qq.com)
Jianye Wang (wangjy@bjhmoh.cn)
Ming Liu (liuming19731029@163.com)

KEYWORDS:
980 nm diode, benign prostatic hyperplasia, modified enucleation, large volume, laser, LUTS

SUMMARY:
Here, we present a protocol for modified 980 nm diode laser enucleation to treat large volume benign prostatic hyperplasia.

ABSTRACT:
In the aging male population, the occurrence of lower urinary tract symptoms (LUTS) caused by benign prostatic hyperplasia (BPH) is a common problem. Here, we introduce a new technique called 980 nm diode laser enucleation (DiLEP) to treat BPH[1]. Diode lasers can absorb both water and hemoglobin at the same time, so they are good for cutting and hemostasis[2]. The diode laser was approved by the FDA in 2007, and has been used in the treatment of BPH because of its effective cutting and hemostasis effect[3]. DiLEP presents several advantages over other techniques, such as TURP, HoLEP, and PVP. During the procedure, we define the boundary of a high-volume prostate and separate it into three lobes with a diode laser by burning two rings and one groove (like a Cupid's arrow). Compared to other procedures, mDiLEP has fewer

intraoperative complications, a shorter learning curve, and achieves more tissue resection.

INTRODUCTION:

Compared with traditional transurethral resection of the prostate (TURP), laser surgeries have gradually become more popular due to their better patient tolerance, lower amounts of intraoperative blood loss, efficacy, and shorter postoperative recovery[4,5].

In recent years, the fastest growing techniques have involved the use of lasers of various wavelengths. At present, many types of lasers with different characteristics can be used to complete prostate enucleation. Since the diode laser was approved by the US FDA for prostatic hyperplasia in 2007, its use has gradually increased in the treatment of BPH because of its outstanding cutting ability and hemostasis effect[6]. The laser wavelength determines the degree of absorption by water and hemoglobin. A diode laser with a wavelength of 980 nm provides the highest combined absorption rate of water and hemoglobin. The tissue penetration ability is 0.5 mm, and it can produce coagulation effects in deeper tissue, which makes it have a very good tissue ablation and hemostasis ability[7,8].

Many research centers have begun to use DiLEP for the treatment of benign prostatic hyperplasia. In practice, traditional DiLEP has a longer learning curve and presents no obvious advantages related to urinary sphincter protection[9]. Based on the above reasons, traditional DiLEP was modified in our center to improve the value of diode laser treatment in patients with BPH.

PROTOCOL:

All methods described here have been approved by ethics committee of Beijing Hospital. Indications for surgery are according to the European Association of Urology guidelines for nonneurogenic male LUTS. Contraindications include suspected prostate cancer or detrusor dysfunction.

1. Instruments for operation

1.1. Ensure the availability of diode laser (980 nm) equipment with a power including continuous mode (80–100 W).

1.2. Employ a laser fiber and 0.9% saline solution for intraoperative bladder irrigation.

1.3. Use a 26 F laser resectoscope to acquire good visualization and enhance efficiency.

2. Preparation for operation

2.1. Perform skin preparation on the day of the operation.

2.2. Provide an intravenous antibiotic preoperatively to all patients[10].

NOTE: Cefuroxime sodium (1.5 g in 100 mL of 0.9% sodium chloride) is provided 30 min before the operation.

2.3. Before anesthesia, make the patient lay down on the operating table.

NOTE: General anesthesia is effective and appropriate for this operation. The anesthetists should determine the mode of anesthesia depending on the patient's general condition.

2.4. Drape the patient in a sterile fashion in the dorsal lithotomy position.

3. Procedure steps

3.1. Observation

3.1.1. Directly observe the urethra, verumontanum, bladder neck, ureteral orifices, bladder mucosa, and trabecular hyperplasia by resectoscope (15–30°).

3.2. Design the range of enucleation (Cupid's arrow).

3.2.1. Circularly incise (depth to gland, width about 3–4 mm) the bladder neck mucosa with a laser (**Figure 1**).

3.2.2. Circularly incise (depth to gland, width about 3–4 mm) the prostatic urethra mucosa at the proximal end of the verumontanum with a laser (**Figure 2**).

NOTE**:** Confirm anatomical mark before incision in order to avoid injury of the bladder neck mucosa and sphincter urethrae. Use a laser power of 80–100 W during the operation except for hemostasis.

3.2.3. Connect the concentric circles of the bladder neck and the apex of the prostate in the posterior urethra at a 12 o'clock position.

3.2.4. Incise the left lobe and right lobe with the laser (**Figure 3**).

NOTE: Once the 12 o'clock position of the posterior urethra is pre-incised, retain the distal mucosa. The concentric circles formed at the neck of the bladder and the apex of the prostate are called Cupid's arrows.

3.3. Making a channel

3.3.1. Find the surgical capsule at the 5 and 7 o’clock positions of the apex of the prostate.

3.3.2. Find the surgical capsule at the 5 and 7 o’clock surgical capsule positions.

3.3.3. Connect the 5 and 7 o’clock surgical capsule positions with a laser (**Figure 4**).

3.3.2. At the 6 o’clock position of the apex of the prostate, separate the median lobe from the surgical capsule from the apex of the prostate to the bladder neck with a laser (**Figure 5**).

NOTE: If the volume of the prostate is >80 mL, the median and lateral lobes will be completely separated at the 5 and 7 o’clock positions of the apex of the prostate.

3.4. Enucleation of the left and right lobes

3.4.1. In a counterclockwise direction, enucleate the right lobe at 6 and 12 o'clock from the apex of the prostate to the bladder neck with a resectoscope (**Figure 6**).

3.4.2. In a clockwise direction, enucleate the left lobe at 6 and 12 o'clock from the apex of the prostate to the bladder neck (**Figure 7**).

3.4.3. Push all the glands into the bladder after enucleation.

NOTE: If the volume of the prostate is >80 mL, enucleate the median and lateral lobes in the proper sequence; then, push into the bladder.

3.5. Hemostasis

3.5.1. Use a lower laser power (50 W) to stop bleeding around the surgical site. Maintain an appropriate distance (i.e., 1–3 mm).

3.6. Morcellate the prostate tissue.

3.6.1. Morcellate the enucleated prostatic tissue into small pieces (as small as possible) with a morcellator and then remove the tissue from the bladder (**Figure 8**).

3.7. Catheterization

3.7.1. Remove the morcellator from the urethra.

3.7.2. Gently place a 22 F Foley catheter through the urethral orifice into the bladder cavity with 30 mL of water in the balloon after sufficiently lubricating the urethra with lidocaine gel.

3.8. Postoperative care[10]

3.8.1. Let the patient lay down on the bed for approximately 3 h postoperatively in the care unit until they completely wake up from anesthesia. Make sure that patient monitors and medical oxygen are available during this time.

3.8.2. Once the patient has completely woken up, return the patient to the ward. Let the patient begin to drink some water and eat some food. Record any urine output and pay attention to the color of the urine.

REPRESENTATIVE RESULTS:

A total of 40 patients with BPH who underwent DiLEP were included in one of our studies. An independent sample t-test was used as the statistical method. All patients successfully completed the operation. Almost all of the patients had the catheter removed within 5 days postoperative (**Table 1**). All patients returned to the hospital for follow-up examinations in the 1st, 3rd, and 12th months postoperatively. The International Prostate Symptom Score (IPSS)[11] and Quality of Life (QoL)[1] tools were used to screen for, rapidly diagnose, track the symptoms of, and guide the management of BPH. These can also be used to evaluate the efficacy of the BPH treatment. Compared to the baseline values, the International Prostate Symptom Score (IPSS) significantly decreased to 38.15%, 31.92%, and 18.70% at 1, 3, and 12 months postoperatively, respectively (all $p < 0.001$), and the QoL significantly decreased to 57.89%, 43.94%, and 20.78% (all $p < 0.001$, respectively). For objective parameters, compared to the baseline, the mean Q_{max} increased nearly 3x, and the mean postvoid residual during follow-up decreased nearly 4x. Compared to the preoperative values, postoperatively, the prostate volume decreased dramatically ($p < 0.001$) (**Table 2**).

The peri- and postoperative complications reported during this study are presented in **Table 3**. According to the modified Clavien Dindo classification system[12], a widely used and authoritative tool for grading surgical complications, no intraoperative patient had complications, and only four cases reported Grade 1 postoperative complications[12].

FIGURE AND TABLE LEGENDS:

Figure 1: Circularly incise the bladder neck mucosa with a laser.

Figure 2: Circularly incise the prostatic urethra mucosa at the proximal end of verumontanum with a laser.

Figure 3: Incise the left lobe and right lobe at the apex of the prostate at 12 o'clock.

Figure 4: Circularly incise the bladder neck mucosa with a laser.

Figure 5: Find the surgical capsule at the 5 and 7 o’clock positions of the apex of the prostate and connect the 5 and 7 o’clock surgical capsule positions with a laser.

Figure 6: In a counterclockwise direction, enucleate the right lobe at the 6 and 12 o'clock positions from the apex of the prostate to the bladder neck.

Figure 7: In a clockwise direction, enucleate the left lobe at the 6 and 12 o'clock positions from the apex of the prostate to the bladder neck.

Figure 8: Cut the enucleated prostatic tissue into small pieces using a morcellator and then remove the tissues from the bladder.

Table 1: Perioperative data of 40 patients with BPH who underwent DiLEP.

Table 2: Data at baseline and at 1, 3, and 12 months postoperatively parameters.

Table 3: Peri- and post-operative complications of 40 patients with BPH who underwent DiLEP.

DISCUSSION:

At present, the 980-mm diode laser is beginning to be used for the treatment of BPH[5]. Few reports have described related clinical studies. Compared to the effect of TURP in the treatment of BPH, many studies have shown that DiLEP causes less blood loss, achieves better urination function, and has shorter catheter retention times[9,13-15].

Here, we share our experiences with mDiLEP. In our study, compared with traditional DiLEP[9,16,17], we circularly incised the bladder neck mucosa and the prostatic urethra mucosa at the proximal end of the verumontanum with a laser before enucleation. Then, we connected the concentric circles of the bladder neck and the apex of the prostate at 12 o'clock. This is called a Cupid's arrow. Although this procedure seemed to increase the operation time, it did not increase the total operation time relative to results described in other studies. It also brings many benefits: First, the urethral sphincter is protected from injury because we circularly incised the prostatic urethra mucosa at the proximal end of the verumontanum[18]. The preserved urethral mucosa at the apex of the prostate can function like an anal cushion, allowing the urethral sphincter to work better, improving the prevention of urine leakage. For the above reasons, no patient reported stress urinary incontinence in this study. Second, surgeons can operate within a delimited surgical area by circularly incising the bladder neck mucosa with a laser, which can protect ureteral orifices from injury. These two steps are not performed in traditional operations. Some studies[11,19,20] have reported that the incidences of urethral sphincter and ureteral orifice injuries are relatively high, especially for inexperienced surgeons, and the occurrence of these complications is a heavy burden for doctors and patients. Third, the operator can define the scope of surgery by incising the bladder neck mucosa and the prostatic urethra mucosa at the proximal end of the verumontanum. This helps the surgeon find the prostate surgical capsule, reduces the occurrence of prostate capsule perforation, and facilitates the enucleation of the median and lateral lobes[21]. According to our experience, this operation involving a Cupid's Arrow was much easier to master and facilitates the promotion of this new technology.

Compared to existing procedures used in BPH treatment, DiLEP demonstrates satisfactory short-term clinical outcomes. In addition, this promising technique has obvious advantages in that it prevents urinary continence. However, more research is needed to demonstrate the long-term efficacy of this technique. Only in this way can this technique be developed into a blueprint for a prostate enucleation protocol in the future.

ACKNOWLEDGMENTS:

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DISCLOSURES:

The authors have nothing to disclose.

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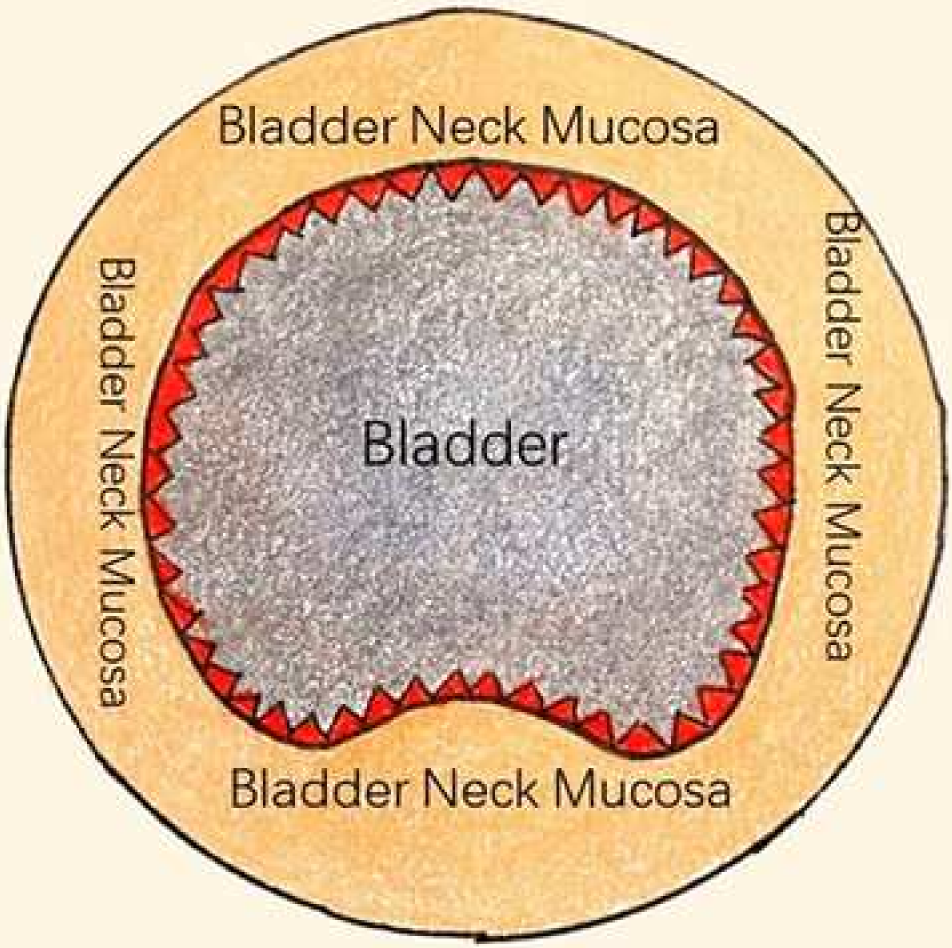
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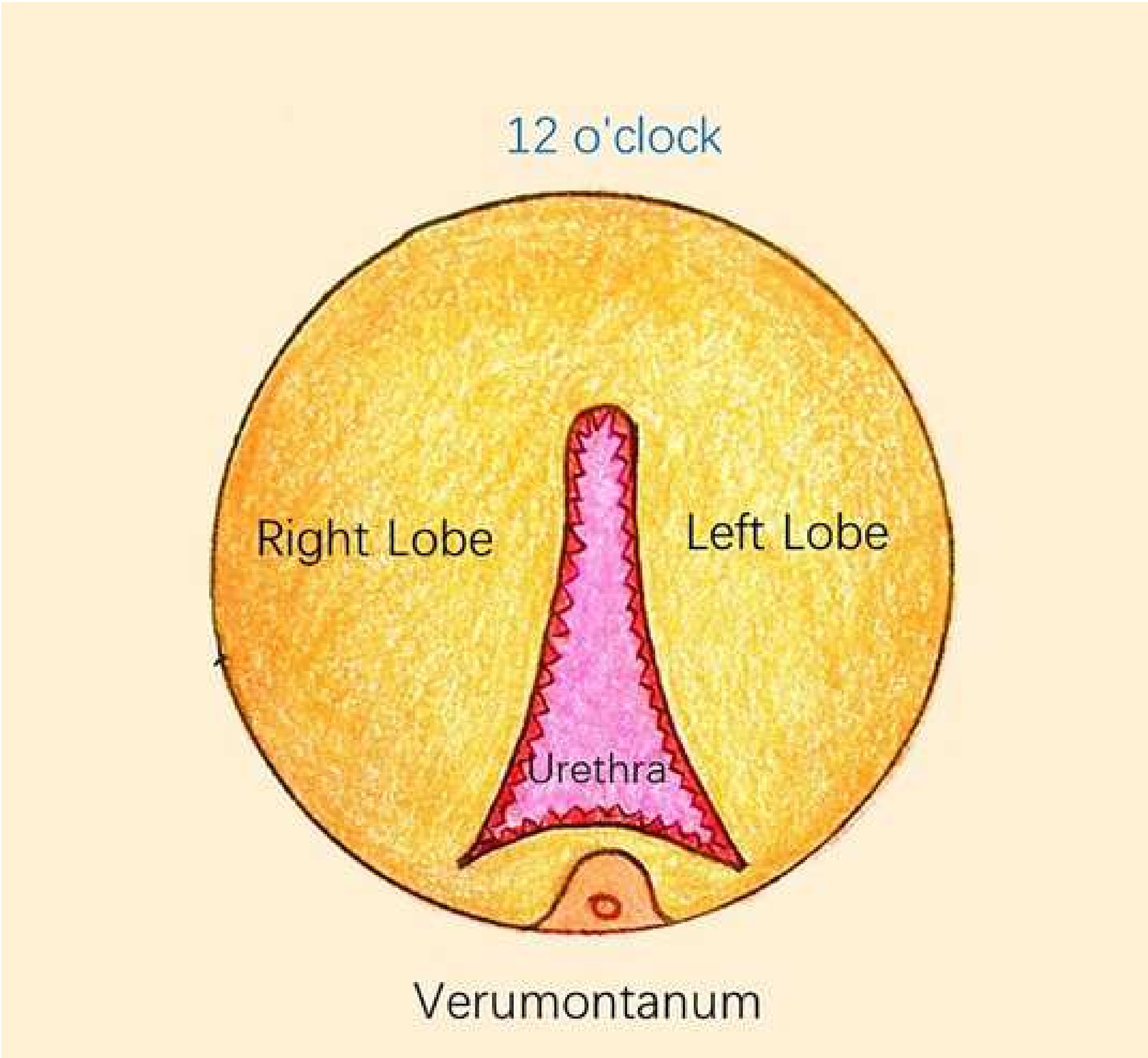

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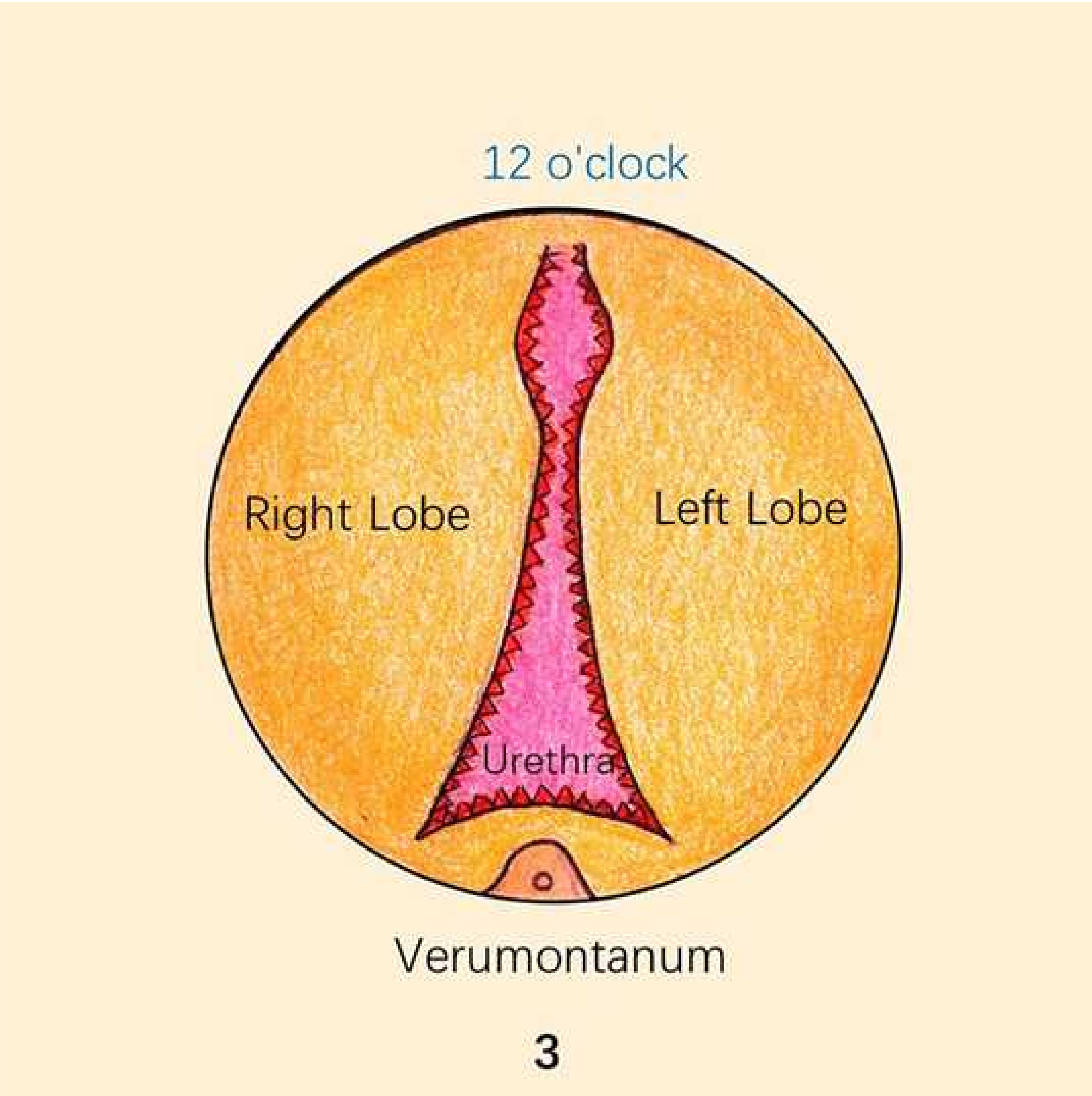
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Left Lobe
Urethra
Verumontanum
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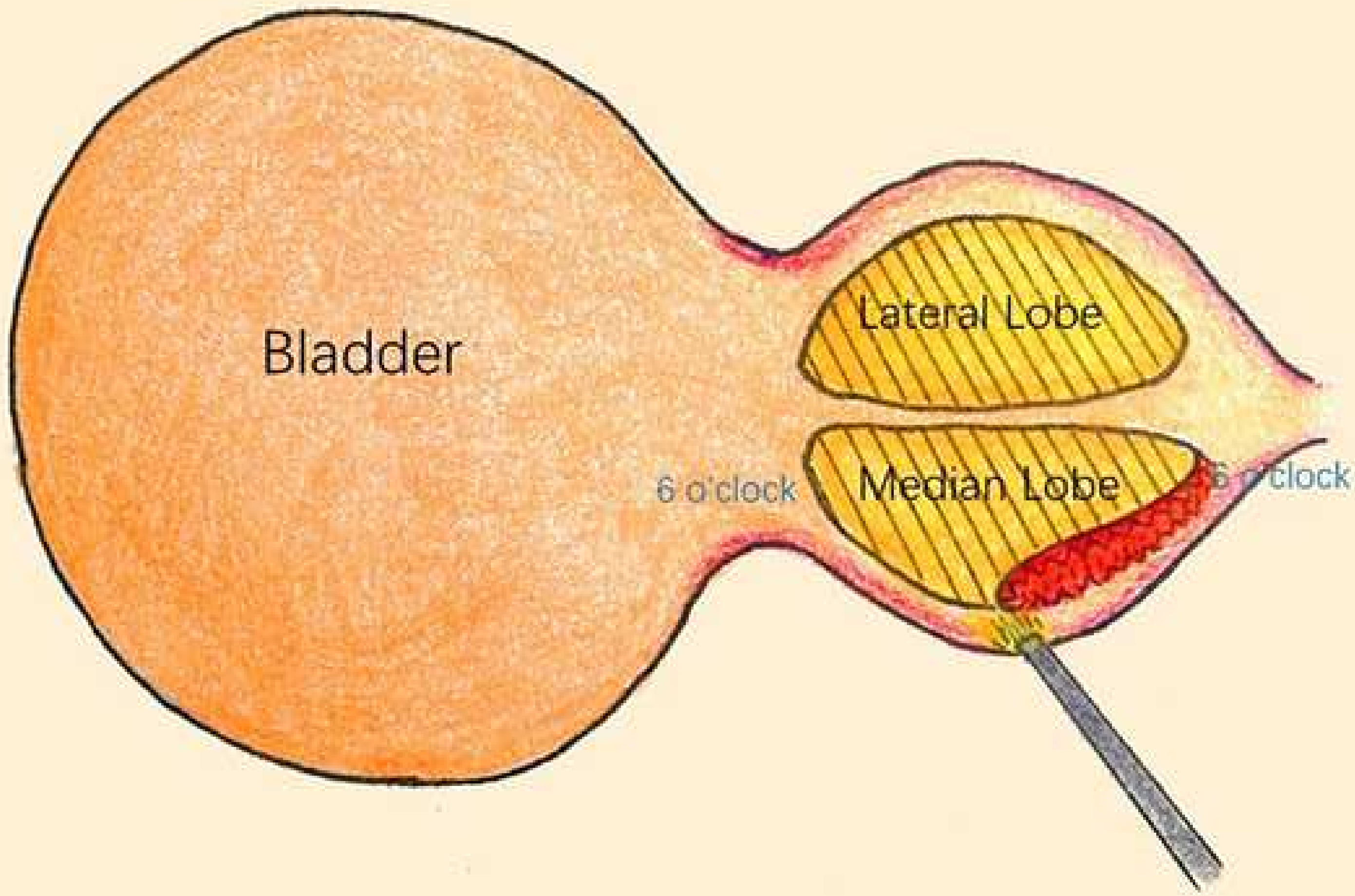

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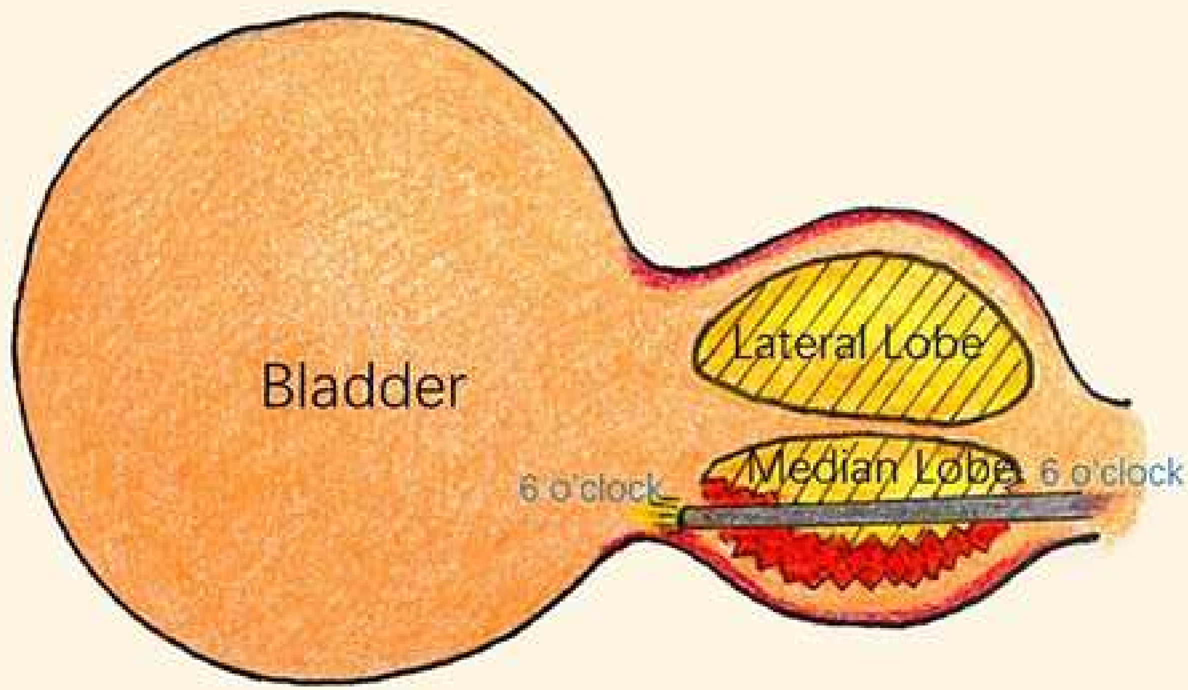

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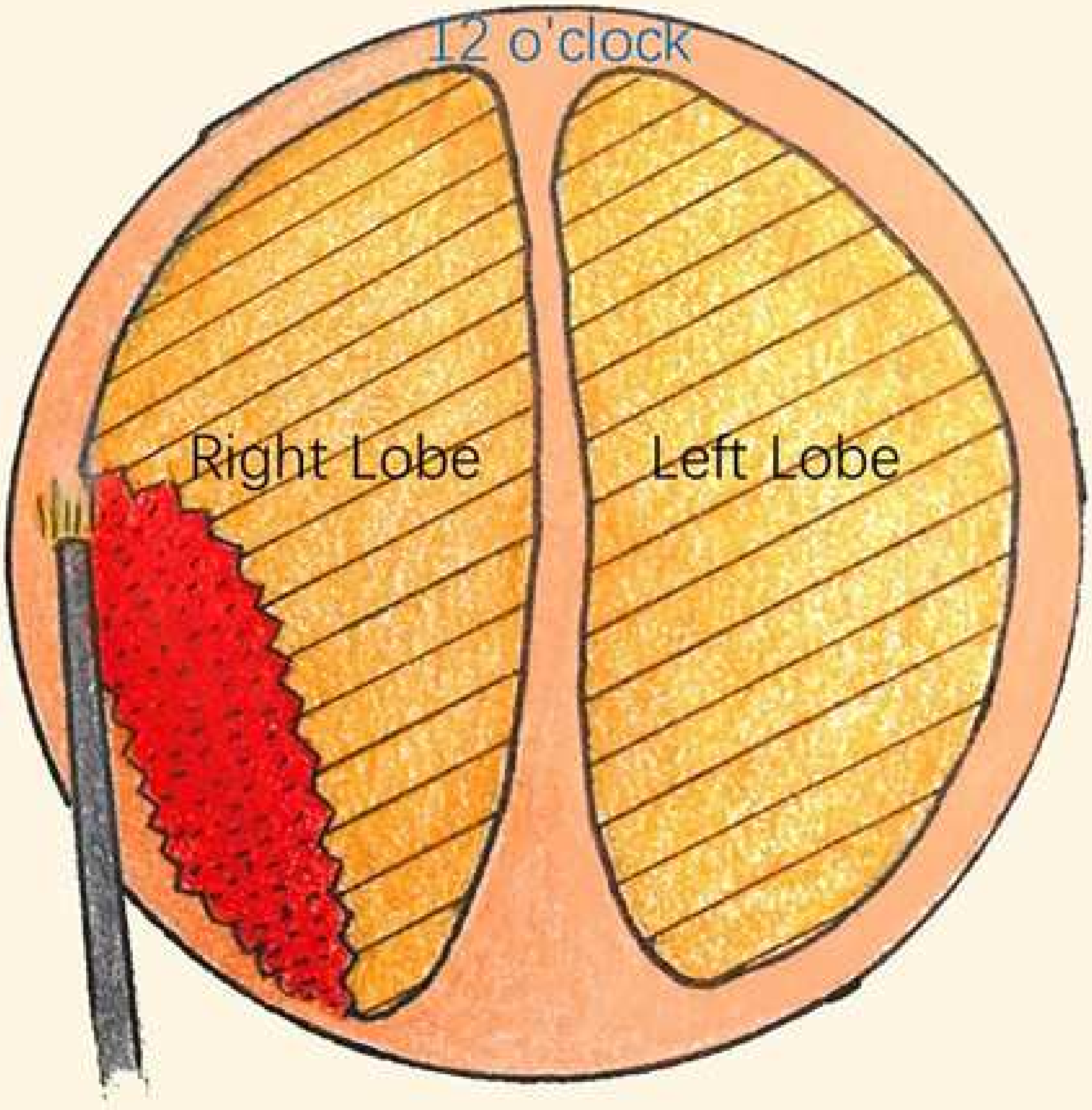

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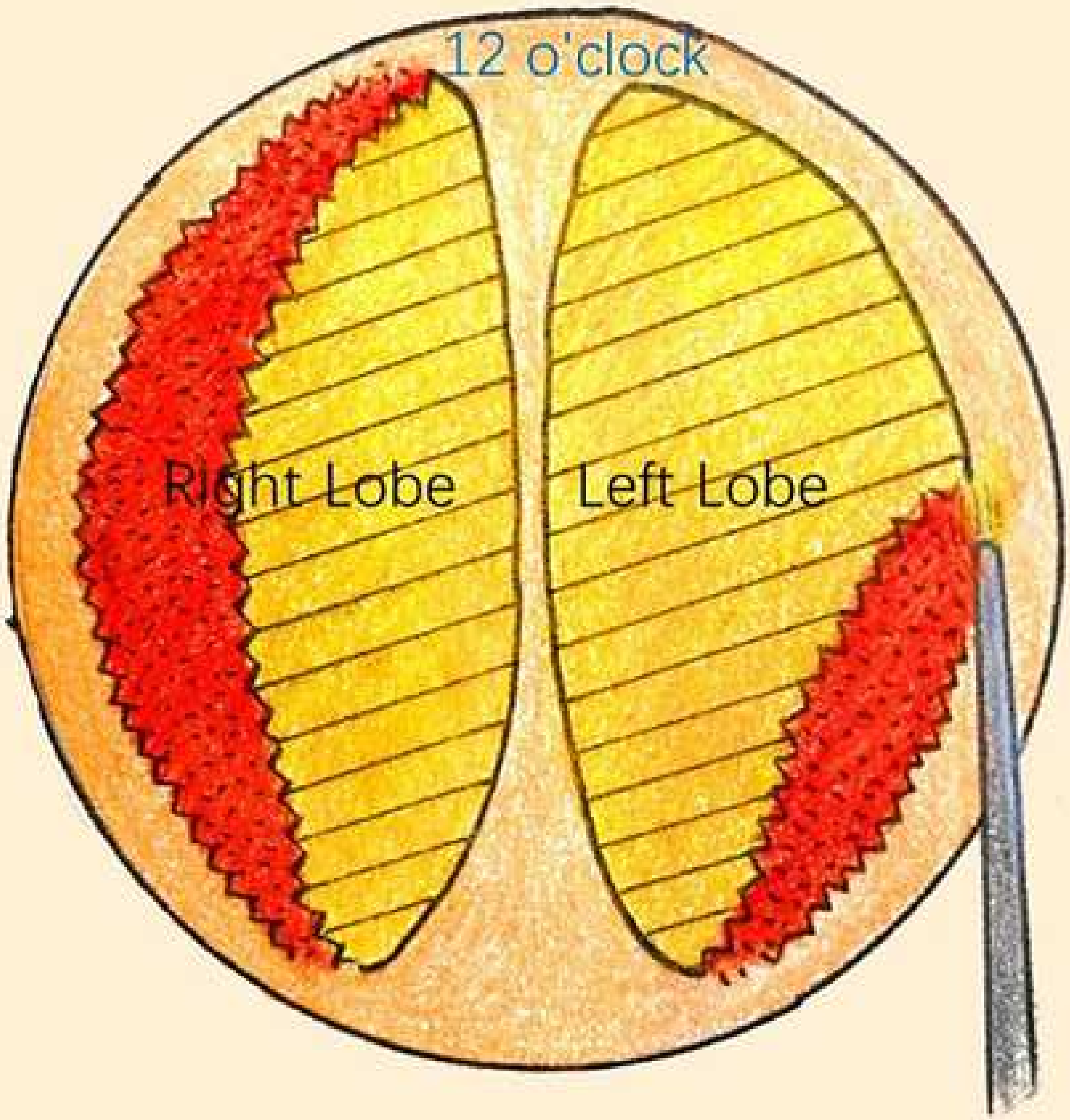

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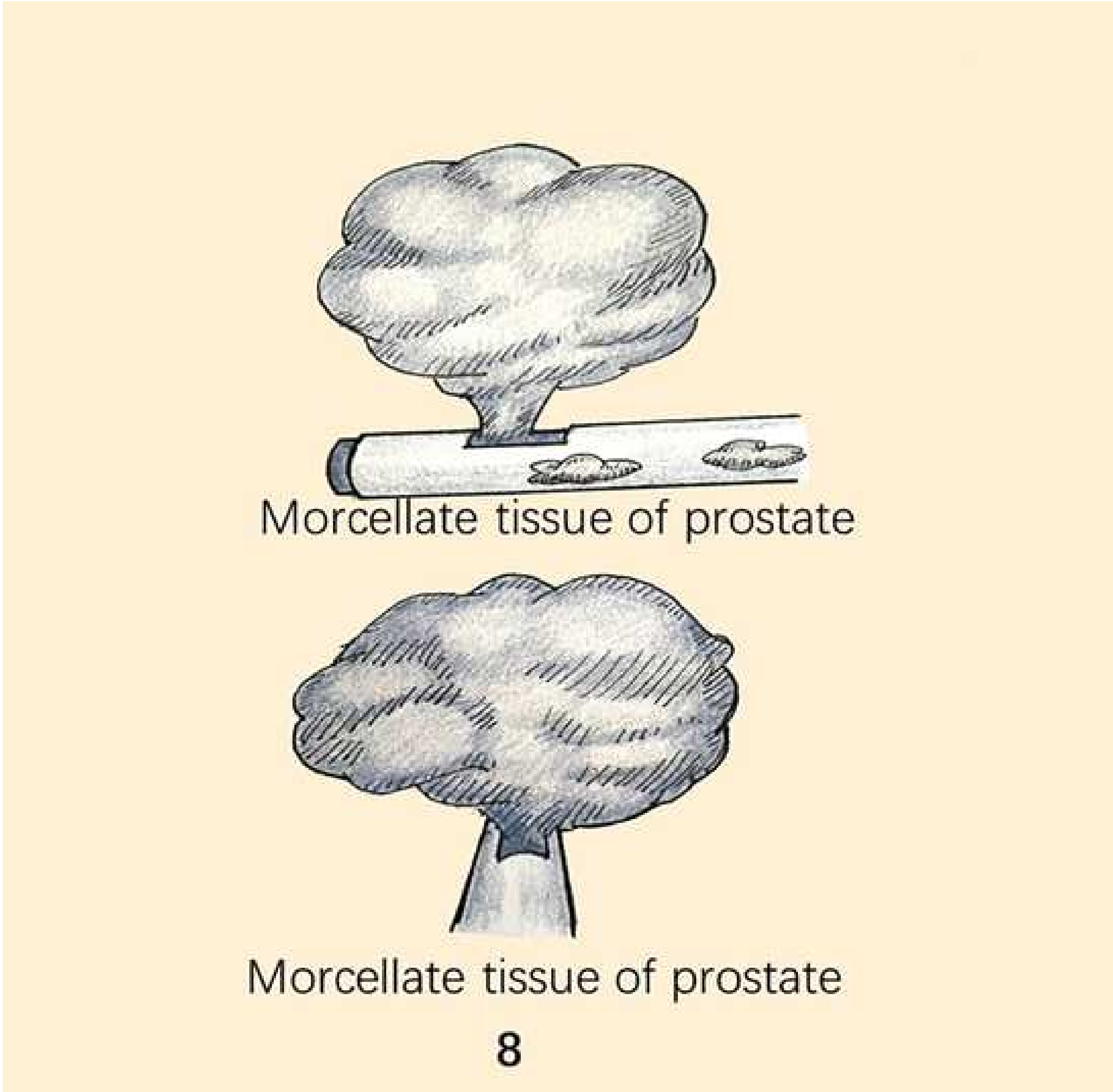
Morcellate tissue of prostate
Morcellate tissue of prostate
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Tabl

Parameters
Age (y)
Prostate volume (ml)
Operative time (min)
Perfusion fluid volume (L)
Postoperative irrigation tim
Decrease in hemoglobin (g/L)
Catheter duration (d)
Hospital stay (d)
Follow-up time(m)

Data are shown as mean ± SD
deviation

e 1: Perioperative data of 40 patients with BPH who underwent DiLEP

Data
73.35±7.84
106.40±19.01
71.18±16.55
28.02±13.80
13.47±1.83
2.62±1.24
4.25±0.08
4.60±0.77
12.45±1.75

,BPH: Benign prostatic hyperplasia, diode laser enucleation of the prostate, SD: Standard

Table 2: Data at Baseline and at 1, 3, and 12 Months Postoperatively Paramet

Parameters	Pre-operative	1m	3m	12m
Qmax (ml/min)	7.12±2.94 $^{\alpha,\beta,\gamma}$	21.19±2.18	22.24±2.02	19.73±1.80
PVR(ml)	113.22±33.56 $^{\alpha,\beta,\gamma}$	27.30±3.98	25.05±4.21	31.10±6.65
IPSS	23.15±7.44 $^{\alpha,\beta,\gamma}$	8.37±2.49	7.37±1.94	4.33±1.79
QOL	3.80±0.88 $^{\alpha,\beta,\gamma}$	2.20±0.89	1.67±0.65	0.79±0.66
PV(ml)	106.40±19.01	——	——	22.08±4.28

Qmax = maximum flow rate; PVR = postvoid residual; IPSS = International Prostate Sympton = quality of life;PV=prostate volume

α:Significant differences between pre- and post-operative 1 month groups; β:Significant differences betwee pre- and post-operative 3 months groups; γ:Significant differences between pre- and post-operative 12 mor ers

P-value
<0.001
<0.001
<0.001
<0.001
<0.001

n Score; QoL

en
nth ;

Table 3: Peri- and post-operative complications of 40 patients

Complications	Patients, n (%)	Grade
Intraoperative		
Prostate capsule perforation	0	3b
Blood transfusion	0	2
TURP syndrome	0	4
Bladder wall injury	0	2
Ureteric orifce injury	0	2
Urethra sphincter injury	0	2
Postoperative		
Bladder convulsion	2 (5%)	1
Urge urinary incontinence	2 (5%)	1
Stress urinary incontinence	0	2
Re-place the catheter	0	1

Complications were graded according to the modifed Clavien-Dindo

Name of Material/Equipment	Company	Catalog Number
HU Diode Laser	Beijing L.H.H.Medical Science Development Co., Ltd	HU-150
Optical Fiber	Beijing L.H.H.Medical Science Development Co., Ltd	YYGX600
Morcellator System	Beijing L.H.H.Medical Science Development Co., Ltd	PXQ-01

Comments/Description

Wavelength: 980nm
Maximum Power: 150W
Operation Mode: Continuous and pulsed
Fiber core diameter：600μm
Fiber length：2m

Rotate Speed：100-3000rpm
MAX. Vacuum Pressure: -80KPa
Rated Output Torque: 12mNm
Blade Size: ϕ5.0*390mm; ϕ3.5*390mm
Blade Work Mode: Corotation alternates reversal

TITLE:

Enucleation of the prostate for the treatment of benign prostatic hyperplasia using a 980-nm diode laser

AUTHORS AND AFFILIATIONS:

Yaqun Zhang[1*] ,Chunlong Fu[1,2*], Jinfu Wang[1], Pengjie Wu[1], Xin Chen[1],Huiming Hou[1], Xinda Song[1],Wanli Cheng[1],Jianye Wang[1],Ming liu[1,2]

[1]（Urology）Beijing Hospital ,National Center of Gerontology

[2] Graduate School of Peking Union Medical College, Beijing Hospital, Beijing, China

*These authors contributed equally

Correspondence author: Ming Liu （liuming19731029@163.com）

Yaqun Zhang zhangyaqun@yeah.net
Chunlong Fu fuchunlong_pumc@163.com
Jinfu Wang doctorwang5127@163.com
Pengjie Wu wupengjiesan@163.com
Xin Chen 18600405631@163.com
Huimin Hou Houhuimin0305@163.com
Xinda Song 592483813@qq.com
Jianye Wang wangjy@bjhmoh.cn
Ming Liu liuming19731029@163.com

KEYWORDS:

980-nm Diode; benign prostatic hyperplasia; modified enucleation; large volume; laser; LUTS

SUMMARY:

Here, we present a protocol for modified 980-nm diode laser enucleation to treat large-volume benign prostatic hyperplasia.

ABSTRACT:

In the aging male population, a common problem is the occurrence of lower urinary tract symptoms (LUTS) caused by benign prostatic hyperplasia (BPH), especially large-volume benign prostatic hyperplasia. Although it is not a life-threatening disease, BPH causes problems that seriously impact patient quality of life. Here, we introduce a new technique called 980-nm diode laser enucleation (DiLEP) to treat BPH. This procedure presents several advantages over other techniques, such as TURP, HoLEP, and PVP. During the procedure, we defined the boundary of high-volume prostate and separated it into three lobes with a diode laser by burning two rings and one groove (just like a Cupid's arrow). Compared to other procedures, mDiLEP has fewer intraoperative complications and a shorter learning curve and achieves more tissue resection.

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INTRODUCTION:

Transurethral resection of the prostate (TURP) is still considered the gold standard in benign prostatic hyperplasia (BPH) surgical treatment. TURP significantly improves lower urinary tract symptoms (LUTS) in most patients with BPH, but its complications during and after surgery also make it a source of concern. Laser surgeries have gradually become more popular due to their better patient tolerance, lower amounts of intraoperative blood loss, satisfactory efficacy, and shorter postoperative recovery[1,2].

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In recent years, the fastest growing techniques have involved the use of lasers of various wavelengths. At present, many types of lasers with different characteristics can be used to complete prostate enucleation. Since the diode laser was approved by the US FDA for prostatic hyperplasia in 2007, it has gradually increased in use in the treatment of BPH because of its good cutting ability and hemostasis effect[3]. The laser wavelength determines the degree of absorption by water and hemoglobin. The wavelength of 980-nm diode laser just provides the highest combined absorption rate of water and hemoglobin. The tissue penetration ability is 0.5mm, and it can produce coagulation effect on deeper tissue, which makes it have a very good tissue ablation and hemostasis ability[4,5].

Many research centers have begun to use DiLEP for the treatment of benign prostatic hyperplasia. In practice, traditional DiLEP has a longer learning curve and presents no obvious advantages related to urinary sphincter protection[6].

Based on the above reasons, traditional DiLEP was modified in our center to improve the value of diode laser treatment in patients with BPH.

PROTOCOL:

All methods described here have been approved by ethics committee of Beijing Hospital. Indications for surgery are according to the European Association of Urology guidelines for nonneurogenic male LUTS. Contraindications include suspected prostate cancer or detrusor dysfunction.

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Commented [A6R5]: There are special filters in the resectoscope, which can ensure that the laser will not hurt the eyes. So the surgical staff do not wear eye protection.

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1. Instruments for operation

1.1. Ensure the availability of diode laser (980 nm) equipment with a power including continuous mode (80-100 W).

1.2. Employ a laser fiber and 0.9% saline solution for intraoperative bladder irrigation.

1.3. Use a 26-F laser resectoscope to acquire good visualization and enhance efficiency.

2. Preparation for operation

2.1. Provide an intravenous antibiotic (cefuroxime sodium 1.5 g with 100 mL 0.9% sodium chloride) preoperatively (30 min before the operation) to all involved patients[7].

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2.2. Before inducing anesthesia, make the patient lay down on the operating table.

Note: General anesthesia is effective and appropriate for this operation. The anesthetists should determine the mode of anesthesia depending on the patient's general condition.

2.3. Drape the patient in a sterile fashion in the dorsal lithotomy position. Do not perform any skin preparation.

3. Procedure steps

3.1. Observation

3.1.1. Directly observe the urethra, verumontanum, bladder neck, ureteral orifices, bladder mucosa and trabecular hyperplasia by resectoscope (15-30 degrees).

3.2. Design range of enucleation (Cupid's arrow)

3.2.1. Circularly incise the bladder neck mucosa with a laser (Figure 1).

3.2.2. Circularly incise the prostatic urethra mucosa at the proximal end of the verumontanum with a laser (Figure 2)

Note: Confirm anatomical mark before incision in order to avoid injury of the bladder neck mucosa and sphincter urethrae. Use a laser power of 80-100 W during the operation except hemostasis.

3.2.3. Connect the concentric circles of the bladder neck and the apex of the prostate at 12 o'clock.

3.2.4. Incise the left lobe and right lobe (Figure 3).

Note: Once the 12 o'clock position of the posterior urethra is pre-incised, retain the distal mucosa. The concentric circles formed at the neck of the bladder and the apex of the prostate are called Cupid's arrows.

3.3. Making a channel

3.3.1. Find the surgical capsule at the 5- and 7-o'clock positions of the apex of the prostate and connect the 5- and 7-o'clock surgical capsule positions with a laser (Figure 4).

3.3.2. At the 6-o'clock position of the apex of the prostate, separate the median lobe from the surgical capsule from the apex of the prostate to the bladder neck (Figure 5).

Note: If the volume of the prostate >80 ml, the median and lateral lobes will be completely separated at the 5- and 7-o'clock positions of the apex of the prostate.

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3.4. Enucleation of left and right lobes

3.4.1. In a counterclockwise direction, enucleate the right lobe at 6 and 12 o'clock from the apex of the prostate to the bladder neck (Figure 6).

3.4.2. In a clockwise direction, enucleate the left lobe at 6 and 12 o'clock from the apex of the prostate to the bladder neck (Figure 7).

3.4.3. Push all the glands into the bladder after enucleation

Note: If the volume of the prostate >80 ml, enucleate the median and lateral lobes in the proper sequence; then, push into the bladder

3.5. Hemostasis

3.5.1. Use a lower laser power (50 W) to stop bleeding around the surgical site. Maintain an appropriate distance (1-3 mm).

3.6. Morcellate tissue of prostate

3.6.1. Cut the enucleated prostatic tissue into small pieces (the smaller, the better) with a morcellator and then remove the tissue from the bladder (Figure 8).

3.7. Catheterization

3.7.1. Remove the Morcellator from the urethra.

3.7.2. Gently place a 22-F Foley catheter through the urethral orifice into the bladder cavity with 30 mL of water in the balloon after sufficiently lubricating the urethra with lidocaine gel.

3.8. Postoperative Care[7]

3.8.1. Let the patient lay down on the bed for approximately 3 h postoperatively in the care unit until they completely wake up from anesthesia. Make sure that patient monitors and medical oxygen are available during this time.

3.8.2. Once the patient has completely woken up, return the patient to the ward. Let the patient begin to drink some water and take some food. Record any urine output and pay attention to the color of the urine.

REPRESENTATIVE RESULTS:

A total of 40 patients who underwent DiLEP were included in one of our studies. Independent sample t-test is used as the statistical method. All patients successfully completed the operation.

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Commented [A28]: Which glands? And why are you pushing them into the bladder?

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Remove the Morcellator from the urethra.

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Commented [A35R34]: Apply lidocaine gel evenly on the surface of the catheter as far as possible

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Commented [A38]: Please describe all the suturing and wound closure steps. Mention type of sutures used, and suture styles.

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Almost all of the patients had the catheter removed within 5 days postoperative (Table 1). All patients returned to the hospital for follow-up examinations in the 1st, 3rd and 12th months postoperatively. The International Prostate Symptom Score (IPSS) and Quality of Life (QoL) tools were used to screen for, rapidly diagnose, track the symptoms of, and suggest management of the symptoms of BPH. These can also be used to evaluate the efficacy of BPH treatment. Compared to baseline values, postoperatively, IPSS significantly decreased to 38.15%, 31.92%, and 18.70% at 1, 3, and 12 months postoperatively, respectively (all P < 0.001), and the QOL significantly decreased to 57.89%, 43.94% and 20.78% (all P < 0.001, respectively). For objective parameters, compared to the baseline, the mean Qmax increased nearly 3-fold, and the mean postvoid residual during follow-up decreased nearly 4-fold. Compared to the preoperative values, postoperatively, the prostate volume decreased dramatically (P<0.001) (Table 2).

The peri- and postoperative complications reported during this study are presented in Table 3. According to the modified Clavien Dindo classification system, which is a widely used and authoritative tool for grading surgical complications, no intraoperative patient had complications, and only 4 cases reported Grade 1 postoperative complications.

FIGURE AND TABLE LEGENDS:

Fig 1: Circularly incise the bladder neck mucosa with a laser.
Fig 2: Circularly incise the prostatic urethra mucosa at the proximal end of verumontanum with a laser.
Fig 3: Incise the left lobe and right lobe at the apex of the prostate at 12 o'clock.
Fig 4: Circularly incise the bladder neck mucosa with a laser.
Fig 5: Find the surgical capsule at the 5- and 7-o'clock positions of the apex of the prostate and connect the 5- and 7-o'clock surgical capsule positions with a laser.
Fig 6: In a counterclockwise direction, enucleate the right lobe at the 6- and 12- o'clock positions from the apex of the prostate to the bladder neck.
Fig 7: In a clockwise direction, enucleate the left lobe at the 6- and 12- o'clock positions from the apex of the prostate to the bladder neck.
Fig 8: Cut the enucleated prostatic tissue into small pieces using a morcellator and then remove the tissues from the bladder.

DISCUSSION:

At present, the 980-mm diode laser is in an early stage in the treatment of BPH[2]. Few reports have described related clinical studies. Compared to the effect of TURP in the treatment of BPH, many studies have shown that DiLEP causes less blood loss, achieves better urination function, and has shorter catheter retention times[6,8-10].

Here, we share our experiences with mDiLEP. Compared to traditional DiLEP[6,11,12], in our study, before enucleation, we circularly incised the bladder neck mucosa and the prostatic urethra mucosa at the proximal end of the verumontanum with a laser. Then, we connected the concentric circles of the bladder neck and the apex of the prostate at 12 o'clock, which is called a Cupid's arrow. Although this procedure seemed to increase the operation time, it did not

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Commented [A51R50]: L have added references increase the total operation time over the results described in other studies. At the same time, it brings many benefits. First, the urethral sphincter is protected from injury because we circularly incised the prostatic urethra mucosa at the proximal end of the verumontanum[13]. The preserved urethral mucosa at the apex of the prostate can function like an anal cushion, allowing the urethral sphincter to work better, improving the prevention of urine leakage. For the above reasons, no patient reported stress urinary incontinence in this study. Second, surgeons can operate within a delimited surgical area by circularly incising the bladder neck mucosa with a laser, and this can protect ureteral orifices from injury. These two steps are not performed in traditional operations. Therefore, especially for beginners, some studies[14-16] have reported that the incidences of urethral sphincter and ureteral orifice injuries are relatively high, and the occurrence of these complications is a heavy burden for doctors and patients. Third, the operator can define the scope of surgery by incising the bladder neck mucosa and the prostatic urethra mucosa at the proximal end of the verumontanum, and this helps the surgeon find the prostate surgical capsule, reduces the occurrence of prostate capsule perforation, and facilitates the enucleation of the median and lateral lobes[17]. According to our experience, this operation involving a Cupid's Arrow greatly shortened the learning curve and facilitates the promotion of this new technology.

Compared to existing procedures used in BPH treatment, DiLEP demonstrates satisfactory short-term clinical outcomes. In addition, this promising technique has obvious advantages in that it preserves urinary continence. However, more research is needed to demonstrate the long-term efficacy of this technique. Only in this way can this technique be developed into a blueprint for a prostate enucleation protocol in the future.

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DISCLOSURES:
The authors have nothing to disclose.

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Yours sincerely

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CORRESPONDING AUTHOR

Name:	Ming LIU
Department:	Department of Urology, Beijing Hospital
Institution:	Beijing Hospital
Title:	Dr.
Signature:	[signature]
Date:	2019.6.17

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