Interstitial Laser Coagulation for the Treatment of Benign Prostatic Hyperplasia: A 3 Year-Follow-Up of 30 Cases

WACHIRA KOCHAKARN, M.D.*,
SUPUNNEE NILSAKULWAT, B.Sc.**,
UBOLRAT ROONGRUANGSILP, B.Sc., M.Sc.**,
VERASING MUANGMAN, M.D.*

Abstract

Objective : To report the results and 3 year-follow-up of treatment of benign prostatic hyperplasia (BPH) using interstitial laser coagulation.

Material and Method : Thirty men with BPH underwent treatment with interstitial laser coagulation between December 1996 and April 1997. Their average age was 68 years old. All of them were assessed prior to the treatment and post treatment for symptoms score, uroflowmetry and postvoid residual urine. Any complication and consequence were evaluated at each follow-up visit.

Results : Up to 36 months follow-up, all parameters showed marked improvement. The symptom score decreased from 20 to 5. Peak flow rate increased from 4 ml/sec to 17 ml/sec. Residual urine decreased from 115 ml to 8 ml. No major complication was detected. Urethral catheter or intermittent catheterization were used for the mean of 9.1 days. All of the patients who were potent prior to the treatment remained potent and 75 per cent still had prograde ejaculation. No re-treatment was needed in the 3 year-follow-up.

Conclusion : On the basis of these results, we propose that interstitial laser coagulation appears to be a minimally invasive treatment for BPH, with substantial improvement of both objective and subjective parameters.

Key word : Prostate Gland, Benign Prastatic Hyperplasia, Interstitial Laser Coagulation

KOCHAKARN W, ROONGRUANGSILP U, NILSAKULWAT S, MUANGMAN V
J Med Assoc Thai 2001; 84: 1126-1130

* Division of Urology, Department of Surgery,
** Department of Nursing, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand.

Transurethral resection of the prostate (TURP) is still the standard treatment of benign prostatic hyperplasia (BPH). Although TURP is effective and relatively safe, there are several disadvantages. It requires hospitalization and anesthesia. Although the mortality rate is low, the morbidity is considerable e.g. bleeding, infection, incontinence and TUR syndrome[1]. Late complications are urethral stricture, erectile dysfunction as well as retrograde ejaculation[2]. This has led to a search for a less morbid but equally effective treatment. Recently, several minimally invasive treatments for patients with BPH have been introduced. The application of heat has been believed to be beneficial since the earliest day of medicine[3]. Many ingenious methods of heating the prostate have been described since the mid-19th century[4]. Only limited success was obtained because of the superficial nature of prostatic heating obtained by conduction from the urethral or rectal surface. Interstitial laser coagulation (ILC) is one of the options, heating prostatic tissue with low energy laser was introduced for the treatment of BPH in 1992 and showed good results with low morbidity[5]. This technique was used in Thailand in 1996 at the Division of Urology, Department of Surgery, Ramathibodi Hospital. This study is the first experience of IL C in Thailand.

MATERIAL AND METHOD

From December 1996 to April 1997, thirty patients with benign prostatic hyperplasia (BPH) who were indicated for TURP were treated by the interstitial laser coagulation (ILC) technique. Their average age was 68 years old with a range of 50-80 years and their AUA symptom scores ranged from 15-25 (mean 20). The average peak flow rate (Q max) was 4 ml/second (range 2-9 ml/sec.). The average residual urine was 115 ml (range 80-200 ml). The average prostatic specific antigen (PSA) was 2.5 ng/ml (range 0.1-4.00 ng/ml) and prostatic volume from transrectal ultrasonography (TRUS) ranged from 9.8-56.5 ml (mean 31.2 ml). All of the patients who had abnormal PSA, abnormal TRUS findings and neurological abnormalities were excluded from this study.

All of the patients were treated with interstitial laser coagulation (ILC). Diode laser 830 nm (Fig. 1) was used *via* the standard cystoscope with 6F working channel. The diffuser tip was inserted into the prostatic tissue under direct visual guidance up to its dept marker. (Fig. 2) In general, the sites of fiber placement were chosen to coagulate the bulk of the prostatic tissue. Thus, the total number of fiber placements varied depending on the size and configuration of the prostate. Heating of the prostatic tissue was done at 85 Celsius and 3 minutes of each fiber placement. Due to earlier experience, all of the patients were done under spinal anesthesia. Urethral catheter was used as post-operative urinary drainage and removed on the 3rd post-operative day. In the case of inablility to void, clean intermittent catheterization or urethral catheterization for another 2 weeks were used. The follow-up parameters were AUA symptom score, Q max and residual urine at 1 month, 3 months, 6 months, 12

Fig. 1. Shows interstitial laser coagulation generator machine.

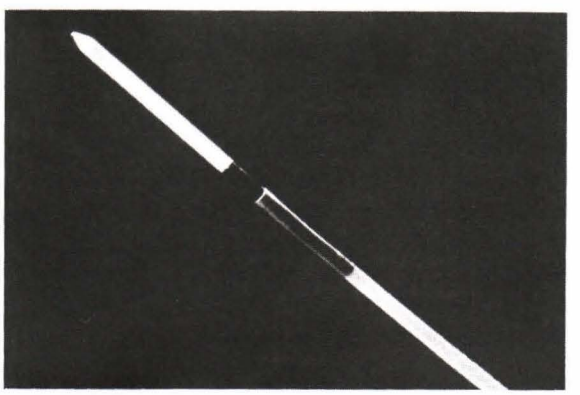

Fig. 2. Shows fiberoptic applicator used for the procedure.

Table 1. Results of the treatment.

	Pre -treatment	1 month	3 months	6 months	12 months	24 months	36 months
Symptom score	20	17	10	5	6	5	5
Q max	4 ml/sec	9 ml/sec	19 ml/sec	17 ml/sec	18 ml/sec	18 ml/sec	17 ml/sec
Residual urine	115 ml	42 ml	22 ml	10 ml	12 ml	10 ml	8 ml

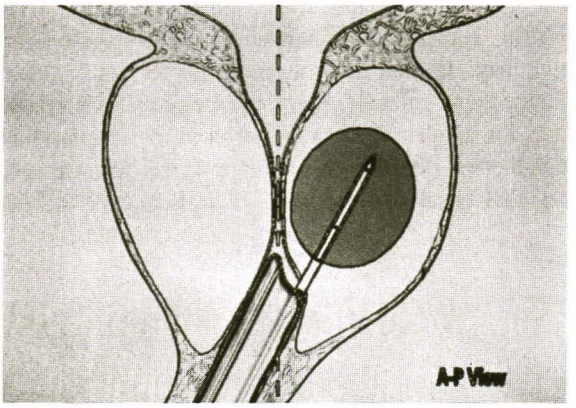

Fig. 3. Diagram shows coagulation effect during the procedure.

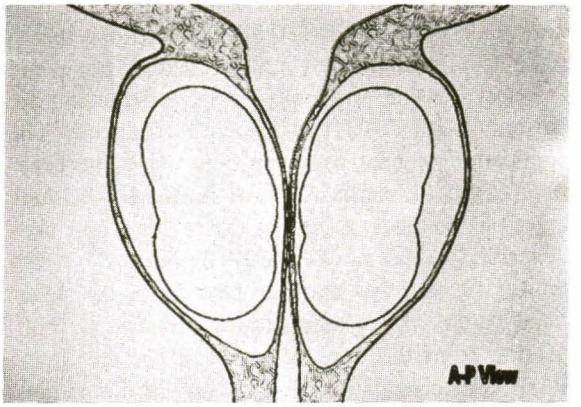

Fig. 4. Diagram shows immediate after treatment. Complete obstruction at prostatic urethra due to tissue edema is noted.

months, 24 months and 36 months. The statistical analysis was performed by means of an SPSS software program and a p value =0.005 was used as significance level.

RESULTS

The mean operative time was 25 minutes (range 15-45). Urethral catheter or intermittent catheterization was used for the mean of 9.1 days (range 3-21). No major complication was detected except minimal hematuria for less than 24 hours.

Post-operatively, all measures of micturition improved substantially from pretreatment. (all p value = 0.005) (Table 1) Most patients experienced transient irritative symptoms. One patient had post-operative urinary tract infection which was cured after one week of antibiotics. Up to 3 years, no retreatment was required in this study. No patient reported sexual function complications during recuperation from the procedure. Twenty patients who were potent prior to the procedure remained potent at 3 years or at last available follow-up and 15 of 20 (75%) still had antegrade ejaculation. Patients suffering retrograde or no ejaculation were, on average, older than patients who maintained antegrade ejaculation (70 *vs* 63).

DISCUSSION

During the recent past, several minimally invasive treatment modalities were introduced for BPH. The main reason for the development of these new techniques has been to reduce the morbidity of TURP[1,2]. Some of the minimally invasive treatments were designed to treat high-risk patients[6]. Laser- induced interstitial thermotherapy or interstitial laser coagulation (ILC) is a new concept of minimally invasive treatment of BPH. It is performed by inserting specially designed fiberoptic applicators into the prostatic tissue[7]. (Fig. 3) Coagulating a large volume of tissue is obtained after heating *via* fiberoptic applicators. (Fig. 4) Unlike other modalities that heat from the urethra, such as side-firing laser, ILC does not require destruction of the urethral epithelium[8]. Healing occurs usually without sloughing of heat tissue because the urothelium remains intact. The necrotic coagulation zones degenerate by fibrosis and predominantly atrophy, leaving only minor scar tissue and a soft

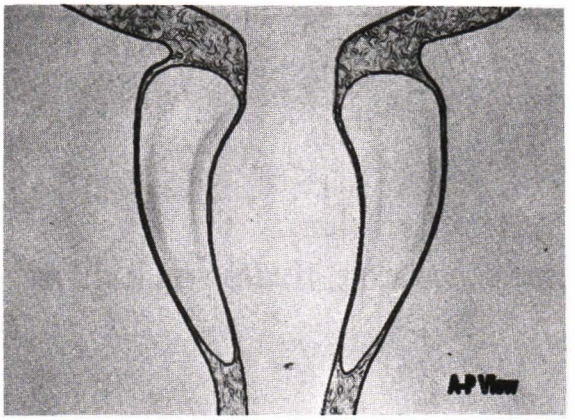

Fig. 5. Diagram shows after coagulative necrosis. No obstruction at prostatic urethra is noted.

shrunken prostate gland. This process is completed within 8-12 weeks. The clinical result is a marked decrease in obstruction[7]. (Fig. 5)

Several wavelengths were examined, demonstrating that 800-1,100 nm wavelengths offered relative penetration and can be delivered by optical fibers[9]. The best available laser to produce this wavelength is a diode laser. Diode lasers are relatively inexpensive, low in operating cost and require only the power from a standard wall socket [7]. In a more recent series, heating at 85 Celsius for 3 minutes at each site of puncture is enough for prostatic tissue coagulation without damaging the urethra and sphincter[6,7]. Regarding the result of treatment, Munschter reported significant improvement of 239 cases. His series showed reduction of AUA symptom score from 25.4 to 8.1 within 3 months, 6.9 in 6 months and 6.1 at one year. It also showed the reduction of residual urine from 151 ml to 32 ml within 3 months and 19 ml in one year. The results are comparable with TURP. The complication rates found in his study are gratifying in contrast to the complication rates often associated with TURP[6,7]. Minimal hematuria is the only complication in all reported series[5]. Four to six per cent of post-operative retrograde ejaculation and 2.7 per cent incidence of re-operation were reported[9]. The catheter time of ILC was longer than TURP but was in the same range as in the different laser procedures[7]. This study also showed the same good clinical results with minimal complications as previous studies.

SUMMARY

Our initial results provide substantial evidence that interstitial laser coagulation can improve both subjective and objective parameters of BPH. All measured outcomes improved significantly from pretreatment to 3 years follow-up.

(Received for publication on August 9, 2000)

REFERENCES

1. Borboroglu PG, Kane CJ, Ward JF, Roberts JL, Sands JP. Immediate and post-operative complications of transurethral prostatectomy in 1990s. J Urol 1999; 162: 1307-10.
2. Melchior J, Valk WL, Foret JD, Mebust WK. Transurethral prostatectomy: computerized analysis of 2,223 consecutive cases. J Urol 1974; 112: 634-42.
3. Muschter R, Hofstetter A. Technique and results of interstitial laser coagulation. World J Urol 1995; 13: 109-14.
4. De La Rosette JJMCH, Debruyne FMJ. Transurethral Thermotherapy In: Puppo P ed. Contemporary BPH Management. Bologna: Monduzzi Editore, 1993: 77-86.
5. Muschter R. Interstitial laser therapy. Curr Opin Urol 1996; 6: 33-8.
6. Muschter R, de la Rosette JJMCH, Whitfield H, et al. Initial human clinical experience with diode laser interstitial treatment of benign prostatic hyperplasia. Urology 1996; 48: 223-8.
7. Muschter R, Hofstetter A. Interstitial laser therapy outcomes in benign prostatic hyperplasia. J Endourol 1995; 9: 129-35.
8. McNicholas TA, Aslam MM, Lynch MJ, O' Donoghue N. Interstitial laser coagulation for the treatment of urinary outflow obstruction. J Urol 1993; 149: 465A.
9. Arai Y, Ishitoya S, Okubo K, Suquki Y. Interstitial laser coagulation for benign prostatic hyperplasia: treatment outcome and quality of life. J Urol 1995; 153: 415A.

การรักษาต่อมลูกหมากโตด้วย Interstitial laser coagulation: ประสบการณ์ในผู้ป่วย 30 ราย ติดตามการรักษา 3 ปี

วชิร คชการ, พ.บ., อุบลรัตน์ รุ่งเรืองศิลป์, วท.บ., วท.ม.**,*
*สุพรรณี นิลสกุลวัฒน์, วท.บ.**, วีระสิงห์ เมืองมั่น, พ.บ.**

วัตถุประสงค์ : เพื่อศึกษาและรายงานผลการรักษาผู้ป่วยที่มีต่อมลูกหมากโต (BPH) ด้วยวิธีการ Interstitial laser coagulation

วิธีการ : ระหว่างเดือนธันวาคม 2539-เมษายน 2540 ได้รักษาผู้ป่วยที่มีต่อมลูกหมากโตด้วยวิธี Interstitial laser coagulation จำนวน 30 ราย อายุเฉลี่ย 68 ปี ประเมินผลการรักษาด้วย AUA symptom score, ความแรงของการปัสสาวะ (Uroflow), ปัสสาวะตกค้าง (residual urine) โดยติดตามผู้ป่วยเป็นระยะเวลา 3 ปี

ผลการศึกษา : ผู้ป่วยทุกรายมีอาการดีขึ้นตามลำดับ ปัสสาวะมีความแรงมากขึ้น ปัสสาวะตกค้างน้อยลงอย่างชัดเจนหลังการรักษา โดยเมื่อครบ 36 เดือนพบว่า symptom score ลดลงจาก 20 เหลือ 5 ความแรงของปัสสาวะเพิ่มจาก 4 มล. ต่อวินาทีเป็น 17 มล.ต่อวินาที ปัสสาวะตกค้างลดลงจาก 115 มล.เหลือ 8 มล. ไม่พบอาการแทรกซ้อนรุนแรง ผู้ป่วยต้องสวนปัสสาวะหลังการรักษาเฉลี่ย 9.1 วัน ผู้ป่วยที่สมรรถภาพทางเพศปกติก่อนการรักษายังคงมีสมรรถภาพเหมือนเดิมและร้อยละ 75 มีการหลั่งอสุจิตามปกติ

สรุป : การรักษาต่อมลูกหมากโต โดยวิธี interstitial laser coagulation เป็นวิธีการที่ปลอดภัย ได้ผลดีและอาการแทรกซ้อนน้อย เป็นทางเลือกทางหนึ่งสำหรับรักษาต่อมลูกหมากโต

คำสำคัญ : ต่อมลูกหมากโต, การรักษา, การผ่าตัดต่อมลูกหมากด้วยเลเซอร์

วชิร คชการ, อุบลรัตน์ รุ่งเรืองศิลป์,
สุพรรณี นิลสกุลวัฒน์, วีระสิงห์ เมืองมั่น
จดหมายเหตุทางแพทย์ ฯ 2544; 84: 1126-1130

* หน่วยศัลยศาสตร์ระบบปัสสาวะ, ภาควิชาศัลยศาสตร์
** ภาควิชาพยาบาลศาสตร์, คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี, มหาวิทยาลัยมหิดล, กรุงเทพ ฯ 10400