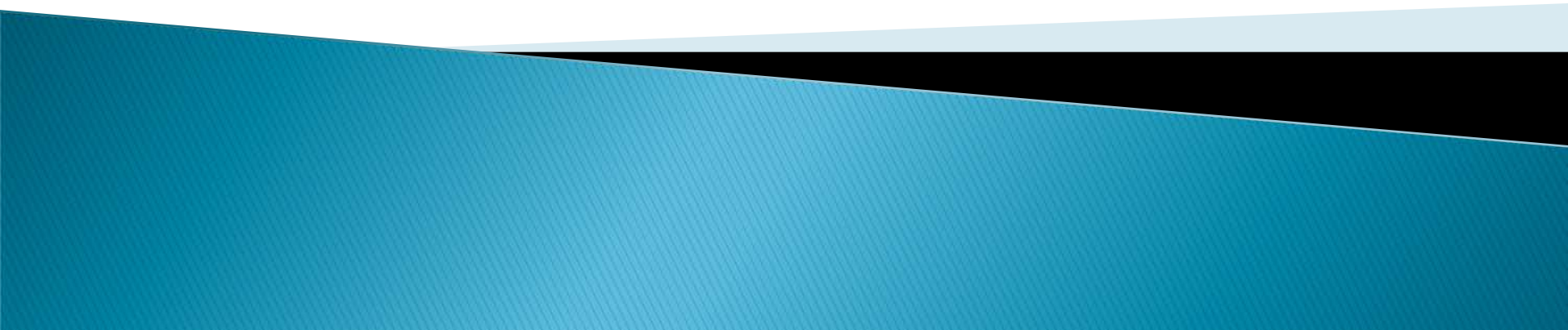


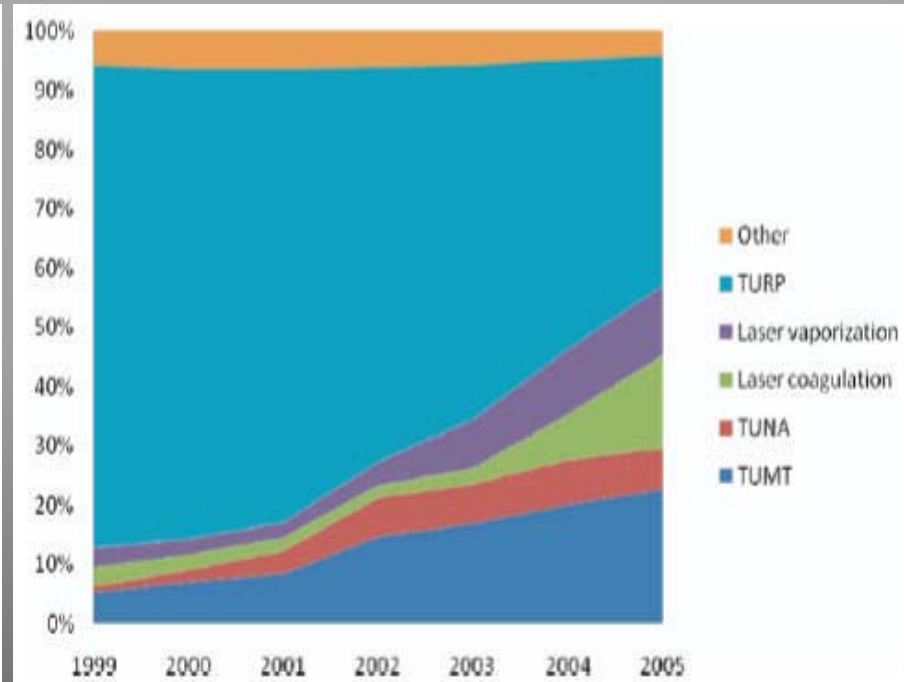
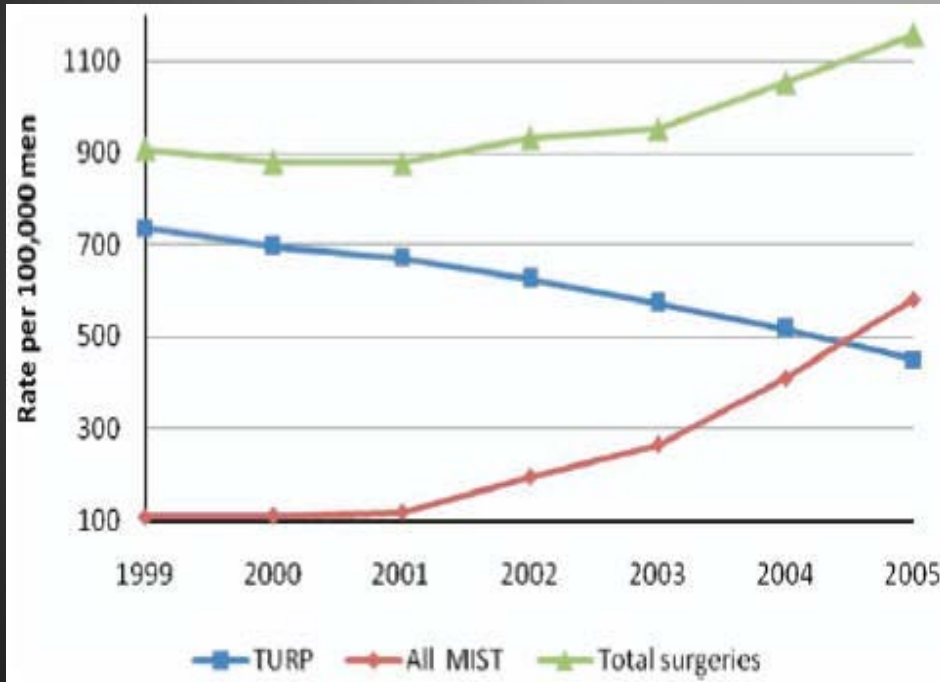
Laser Treatment In BPH

Yao-Chi Chuang
Director and Associate Professor
Chang Gung Memorial Hospital
Kaohsiung, Taiwan

BPH and Laser Therapy

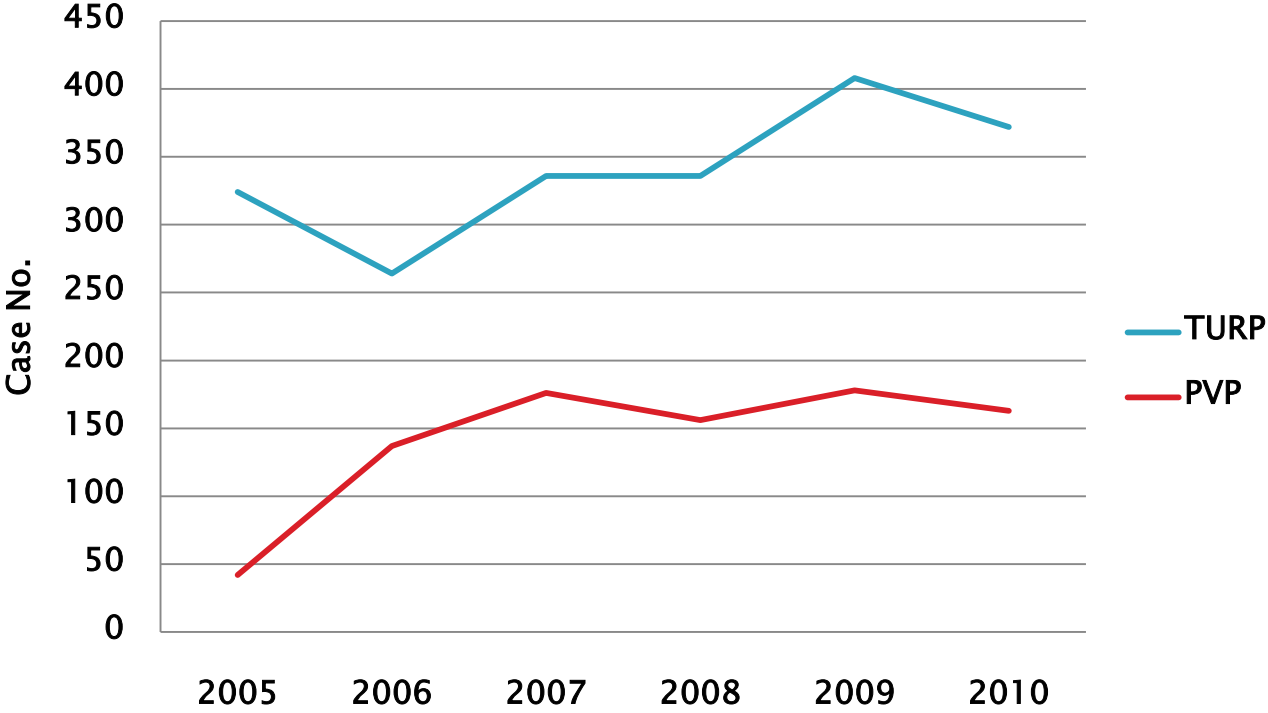
- ▶ Laser therapy is one of the most documented minimal invasive therapies for those who are poor response to medical treatment and unwilling or high risk to take TURP
 - ▶ Laser therapy challenges the standard TURP
- 

Operation for BPH in USA 1999–2005

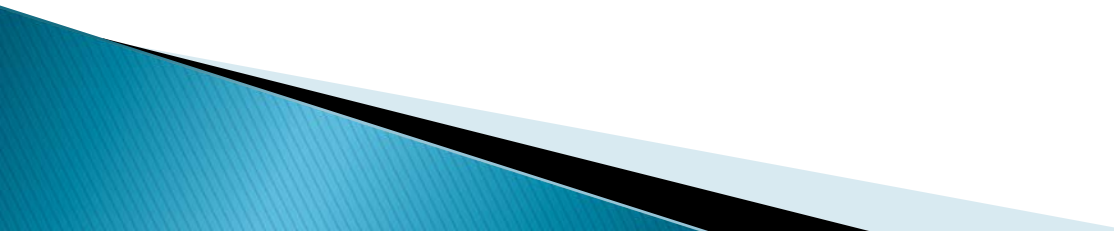


Yu X, et al. J Urol. 2008;180:241-5

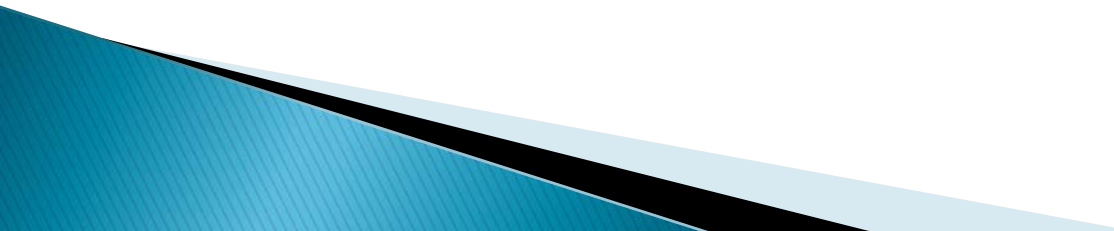
Operation for BPH in KCGMH

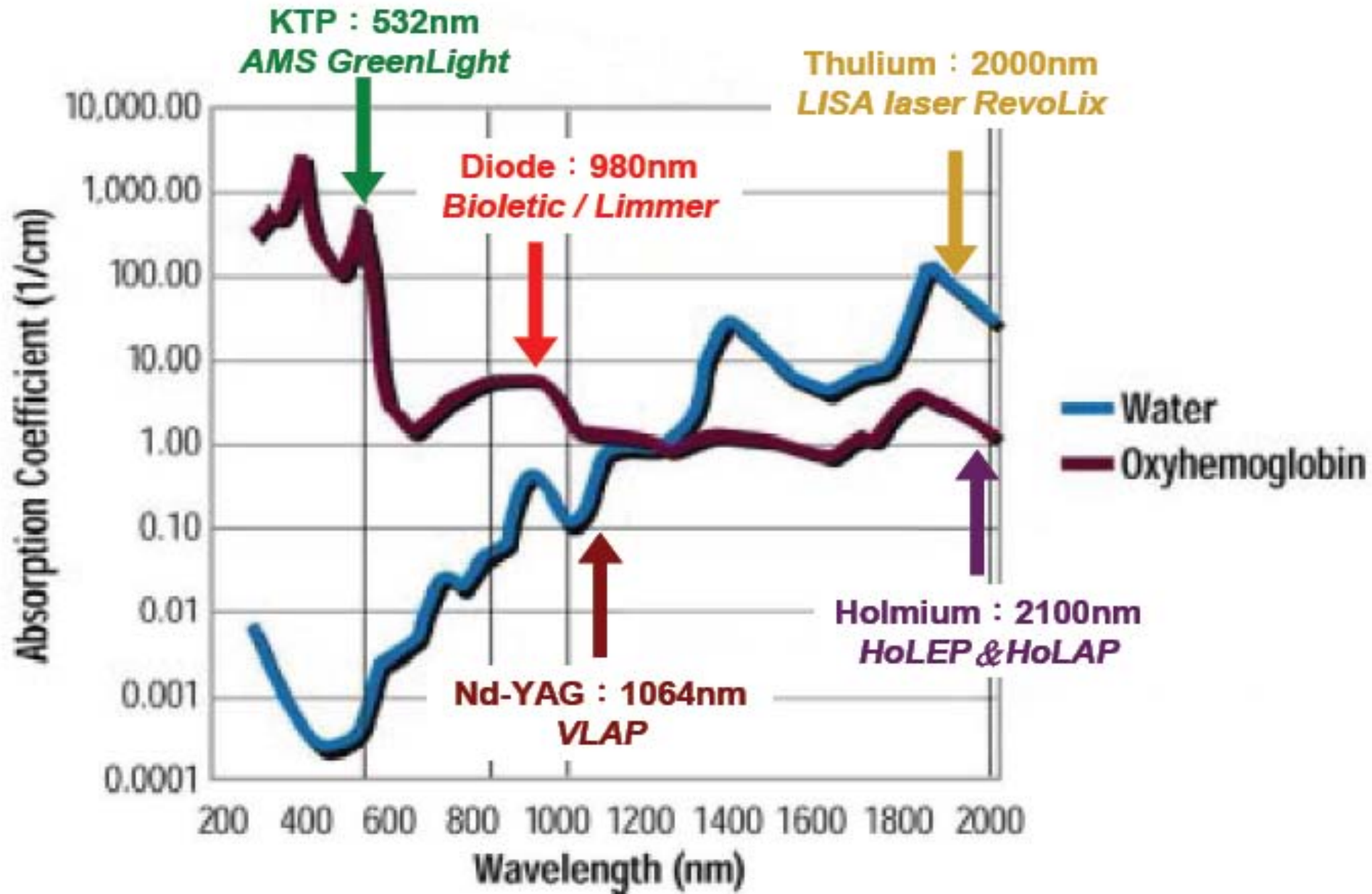


Evolution of Laser– from Theory to Practical Application

- ▶ Laser coagulative effect $> 50\text{ }^{\circ}\text{C}$, followed by delayed tissue sloughing
 - ▶ Laser vaporization effect $> 100\text{ }^{\circ}\text{C}$, photovaporolysis, immediate effect
 - ▶ Lack of bleeding and irrigant absorption
- 

Ideal Laser for BPH Treatment

- ▶ a high degree of incisional and vaporizing properties
 - ▶ clean removal of prostatic tissues
 - ▶ coagulate blood vessels
 - ▶ a relatively small penetrating ability
- 



Wavelengths and Optical Penetration Depths for Selected Lasers

Laser	Wavelength (nm)	Tissue penetration depth
Diode	980	5 mm
Ho:YAG	2100	0.5 mm
Nd: YAG	1064	10 mm
KTP	532	0.8 mm

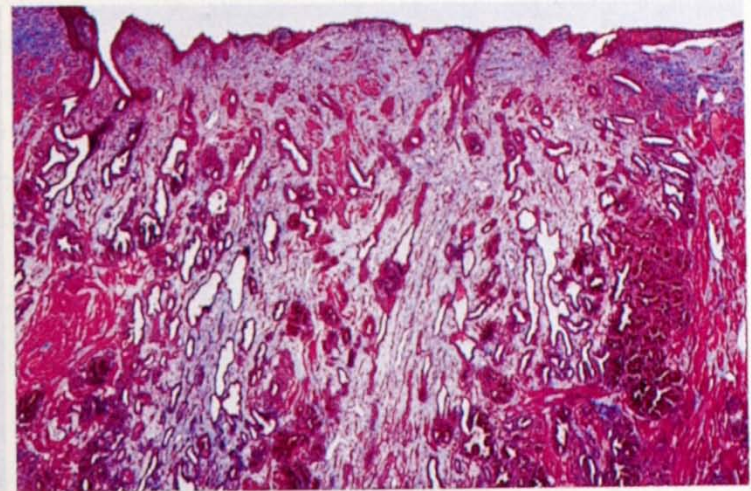
GreenLight **P**hotoselective **V**aporization of **P**rostate

- ▶ KTP laser– 60 W to 80 W, selective absorption by hemoglobin
- ▶ Vaporization of prostate in a hemostatic fashion
- ▶ High Performance System (HPS), generates up to 120 W of GreenLight laser using a lithium triborate (LBO) crystal
- ▶ GreenLight XPS 180 W LBO with higher vaporization rate and speed, a deeper hemostatic coagulation zone in the dog prostate (Malek et al., J Urol, 2011)



KTP Vaporization

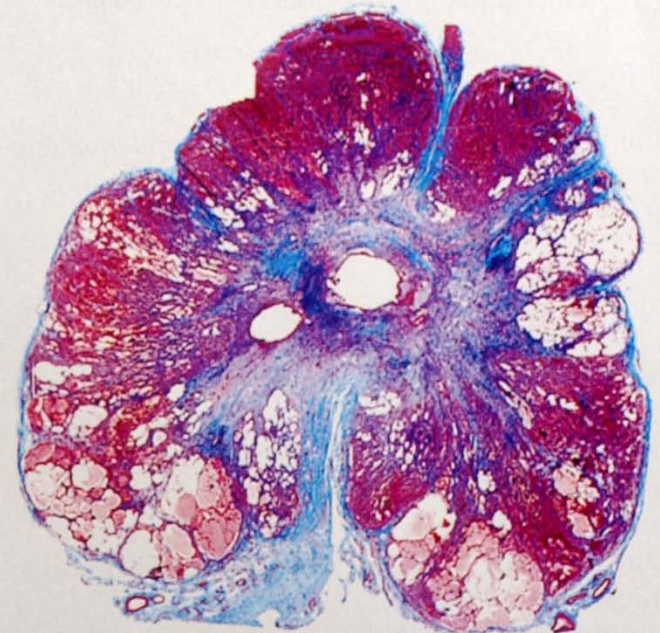
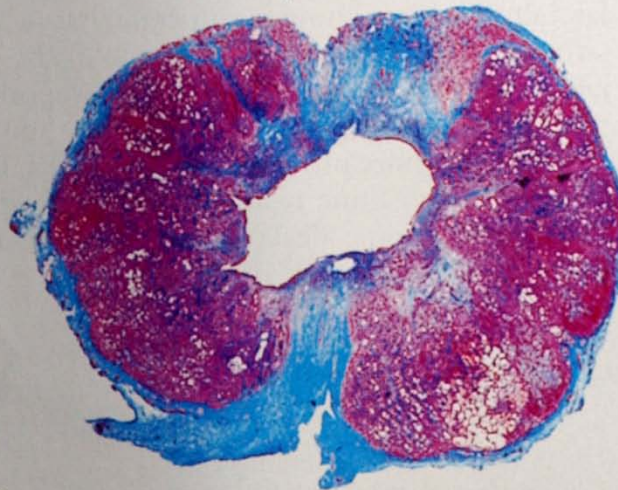
no submucosal
fibrosis



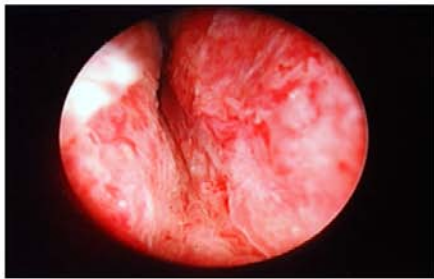
Nd:YAG Coagulation

submucosal
fibrosis

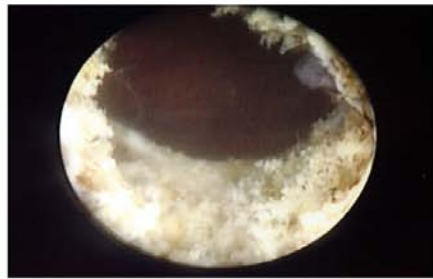
Nd:YAG Vaporization



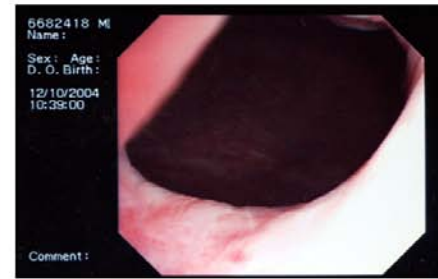
▶ Pre-OP Immediate post-OP 5 Month post-OP



A



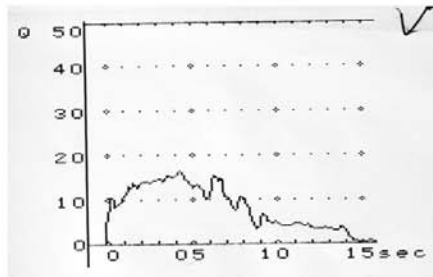
B



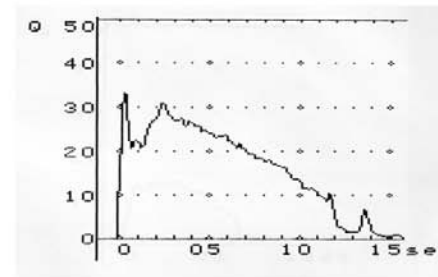
C



D



E



F

Photoselective Vaporization (PVP) versus Transurethral Resection of the Prostate (TURP): A Prospective Bi-Centre Study of Perioperative Morbidity and Early Functional Outcome (Bachmann, Eur Urol, 2005)

- ▶ PVP in 64 patients, TURP in 37 patients
- ▶ Severe bleeding: 0 in PVP, 4/37 (10.8%) in TURP
- ▶ Decrease of serum haemoglobin ($p = 0.027$) and serum sodium ($p = 0.013$) was larger after TURP
- ▶ Catheter drainage was removed significantly earlier after PVP than after TURP ($p < 0.001$)
- ▶ Outcome of Qmax, and IPSS were similar in both groups within 6 months

Photoselective Vaporization (PVP) versus Transurethral Resection of the Prostate (TURP): A Prospective Bi-Centre Study of Perioperative Morbidity and Early Functional Outcome (Bachmann, Eur Urol, 2005)

Complication	PVP (n = 64)	TURP (n = 37)	p [‡]
Intra-operative			
Severe bleeding [†]	0	4 (10.8)	0.016
Capsule perforation with bleeding	0	1 (2.7)	ns
Post-operative			
Urinary retention; discharge with indwelling catheter	5 (7.8)	1 (2.7)	ns
Bleeding with clot retention	0	1 (2.7)	ns
Acute renal failure	1 (2.7)	0	ns
Number of pts. (%) with serum hemoglobine <10 mg/dl at discharge	4 (6.3)	8 (21.6)	0.028
Post-discharge			
Urinary tract infection	7 (10.9)	4 (10.8)	ns
Mild to moderate dysuria	7 (10.9)	3 (8.1)	ns
Urethra stricture/Meatus synechia	5 (7.8)	1 (2.7)	ns
Erectile dysfunction	0	1 (2.7)	ns
Total*	25/64 (39.1)	16/37 (43.2)	ns

* Number of pts. (%) with serum haemoglobine <10 mg/dl at discharge are excluded.

[†] Subjective judgement, but requiring active intraoperative bleeding management or abortion of the TURP procedure.

[‡] χ^2 - Test.

HIGH POWER (80 W) POTASSIUM-TITANYL-PHOSPHATE LASER VAPORIZATION OF THE PROSTATE IN 66 HIGH RISK PATIENTS

OLIVER REICH,* ALEXANDER BACHMANN,* MICHAEL SIEBELS, ALFONS HOFSTETTER,
CHRISTIAN G. STIEF AND TULLIO SULSER

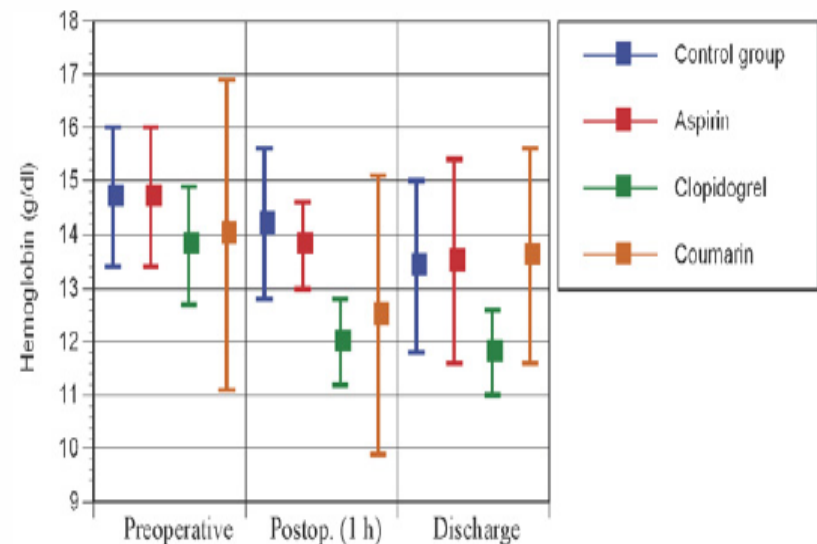
- All pts were at high cardiopulmonary Risk (ASA score ≥ 3) ; 29 pts with oral anticoagulant therapy

- **Result :**
 - Mean pre-op prostate vol.: 49 ± 32 g
 - Mean lasing time: 49 ± 19 min
 - No major complication 、 No blood transfusion
 - 48 of 62 (77%) catheterized pts didn't require
 - Bloodless ,safe and effective option

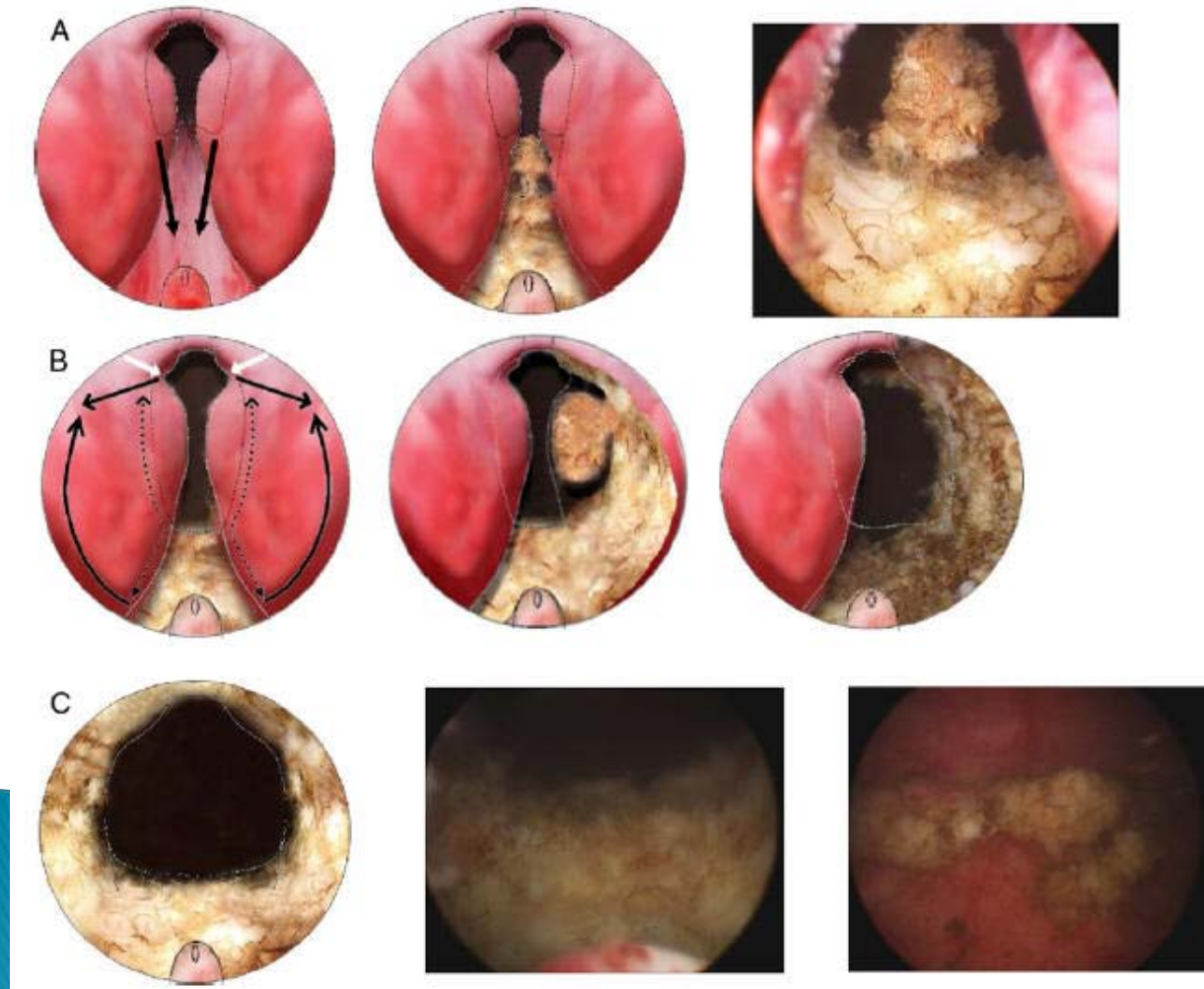
Safety and Effectiveness of Photoselective Vaporization of the Prostate (PVP) in Patients on Ongoing Oral Anticoagulation

Robin Ruszat^{a,*}, Stephen Wyler^a, Thomas Forster^a, Oliver Reich^b, Christian G. Stief^b, Thomas C. Gasser^a, Tullio Sulser^a, Alexander Bachmann^{a,b}

- ▶ No need for blood transfusion
- ▶ Average postoperative decrease of haemoglobin was 8.6% for patients on OA versus 8.8% for control



Modified vaporization-resection technique with GreenLight 120-W HPS laser



Holmium laser prostatectomy

- ▶ wavelength : 2,100–2,150 nm
- ▶ rapidly absorbed by water and cell fluid
- ▶ Penetration depth : 0.4 mm
- ▶ Holmium laser enucleation of the prostate (HoLEP)
 - enucleation technique + mechanical tissue morcellator
- ▶ prostate–size independent

Kuntz RM. Eur Urol 2006;49:961–9.

Tan AH, et al. J Urol 2003;170:1270–4

Major concerns

- ▶ Experience ↑ → complications ↓
- ▶ Capsular perforations
 - common in smaller prostates
- ▶ Steep learning curve:
 - 30 to 50 procedures
 - Prostate > 70g → > 200 procedures

Elzayat EA, et al. Eur Urol 2007; **52**:1465–1472.

Seki N, et al. J Urol 2003;**170**:1847–1850.

Naspro R, et al. Eur Urol. 2006;50:563-8.

Intraoperative complications

- ▶ Blood transfusion: 1~4%
- ▶ Capsular perforation: 0.3~10%
- ▶ Bladder injury : 0.5~18.2%
- ▶ Ureteric orifice injury: 1~2.1%
- ▶ Incomplete morcellation: 1.9~3.7%
- ▶ Cardiac events: ~1.2%

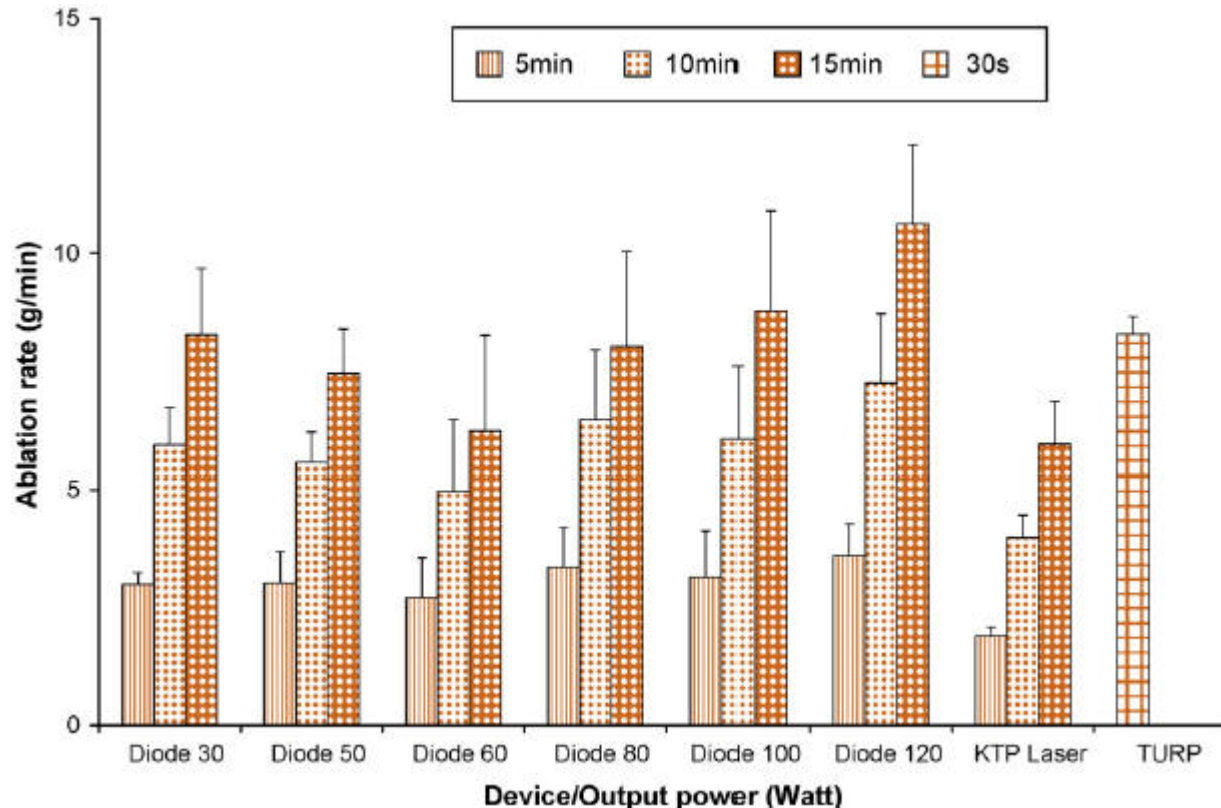
Kuntz R , et al. Eur Urol 49(6):961–969
Shah HN, et al. BJU Int 100(1):94–101

Diode Laser Prostatectomy

- ▶ 980 nm, ~ 200 W
- ▶ Excellent hemostasis
- ▶ Surprisingly intraoperative clear visions
- ▶ The deeper coagulated tissues could escape vaporization → lead to **remaining necrotic tissues**
- ▶ If the larger **devitalized tissue sloughs off**, increase the risk of post-OP obstructive and irritative symptoms



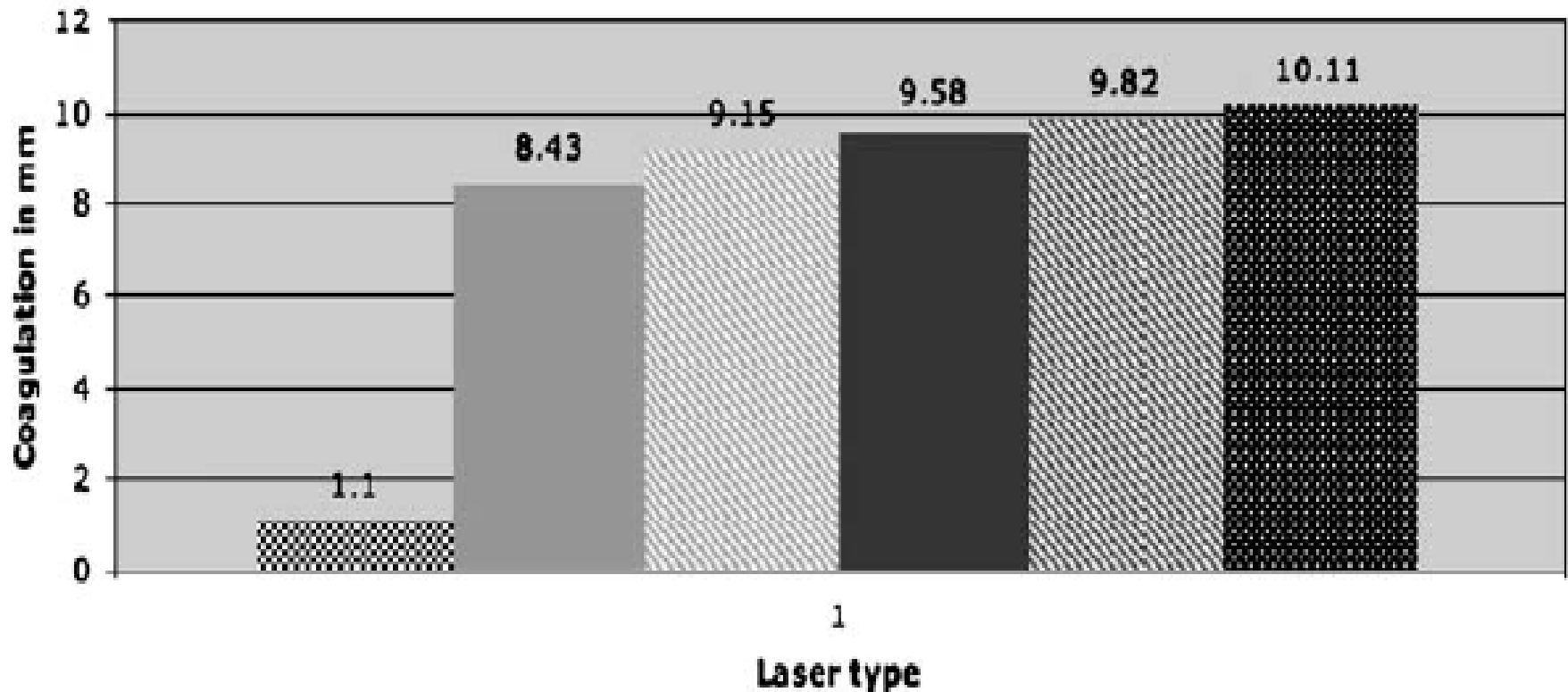
Ablation properties in TURP, KTP and Diode laser



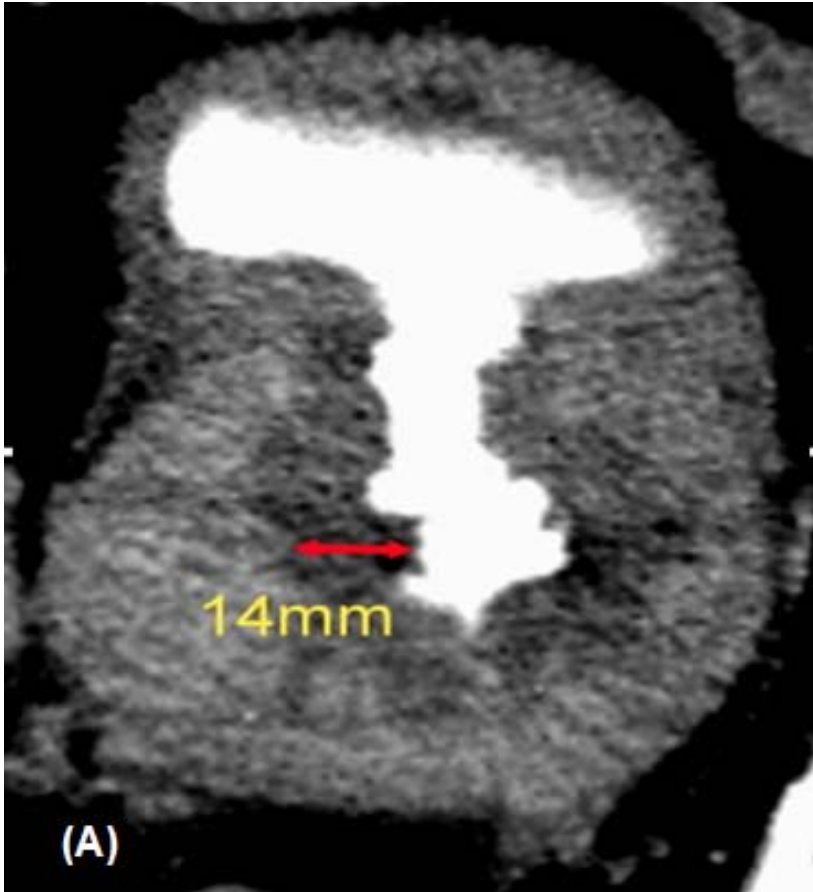
Wendt-Nordahl G, et al. Eur Urol. 2007;52:1723-8.

Ex vivo porcine kidney model: KTP-laser vs. diode-laser

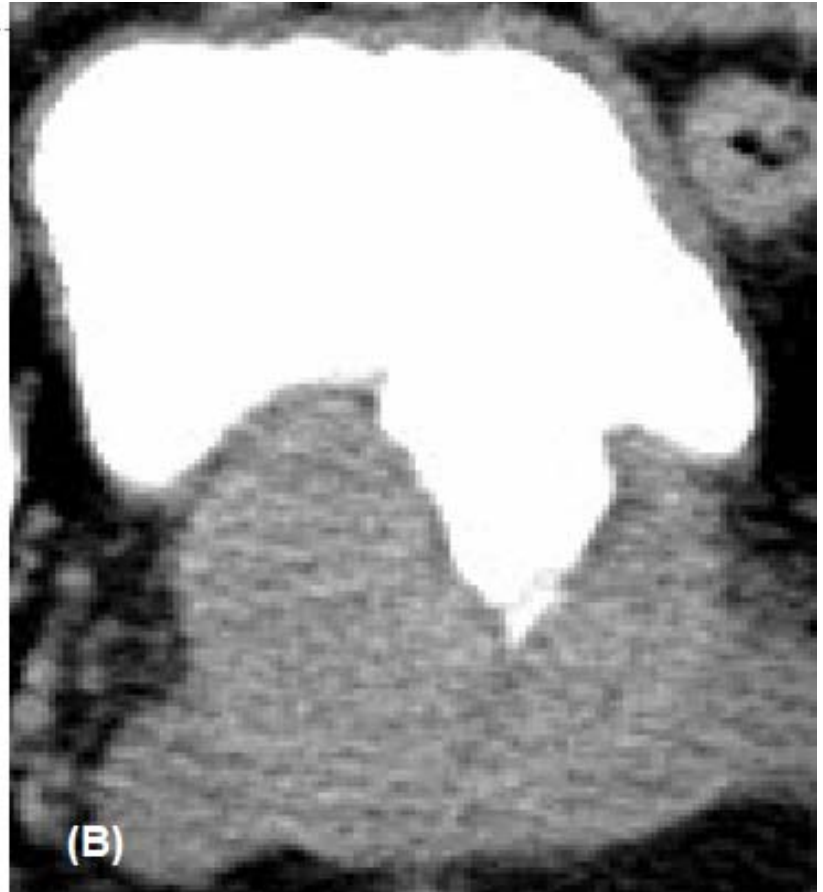
⊗ KTP 80 ■ Diode 60 ▨ Diode 90 ■ Diode 120 ▨ Diode 100 pulsed ▨ Diode 120 pulsed



Coagulation zone



200-W diode laser



120-W HPS laser

Preliminary Results of Prostate Vaporization in the Treatment of Benign Prostatic Hyperplasia by Using a 200-W High-intensity Diode Laser

(Chen, Chiang and Chuang et al., Urology, 2010)

- ▶ No blood transfusion or TUR syndrome
- ▶ Significant improvements in the values of IPSS, Qmax, RU, and quality of life score at 1- and 6 months of follow-up as compared with the baseline values
- ▶ Transient urge incontinence was noted in 8 patients (8/55, 14.5%)
- ▶ Sloughing of necrotic tissues in 8 patients within several weeks or months after the operation
- ▶ The recatheterization rate was 10.9%, and retreatment rate (secondary transurethral resection of the prostate) was 7.3%.

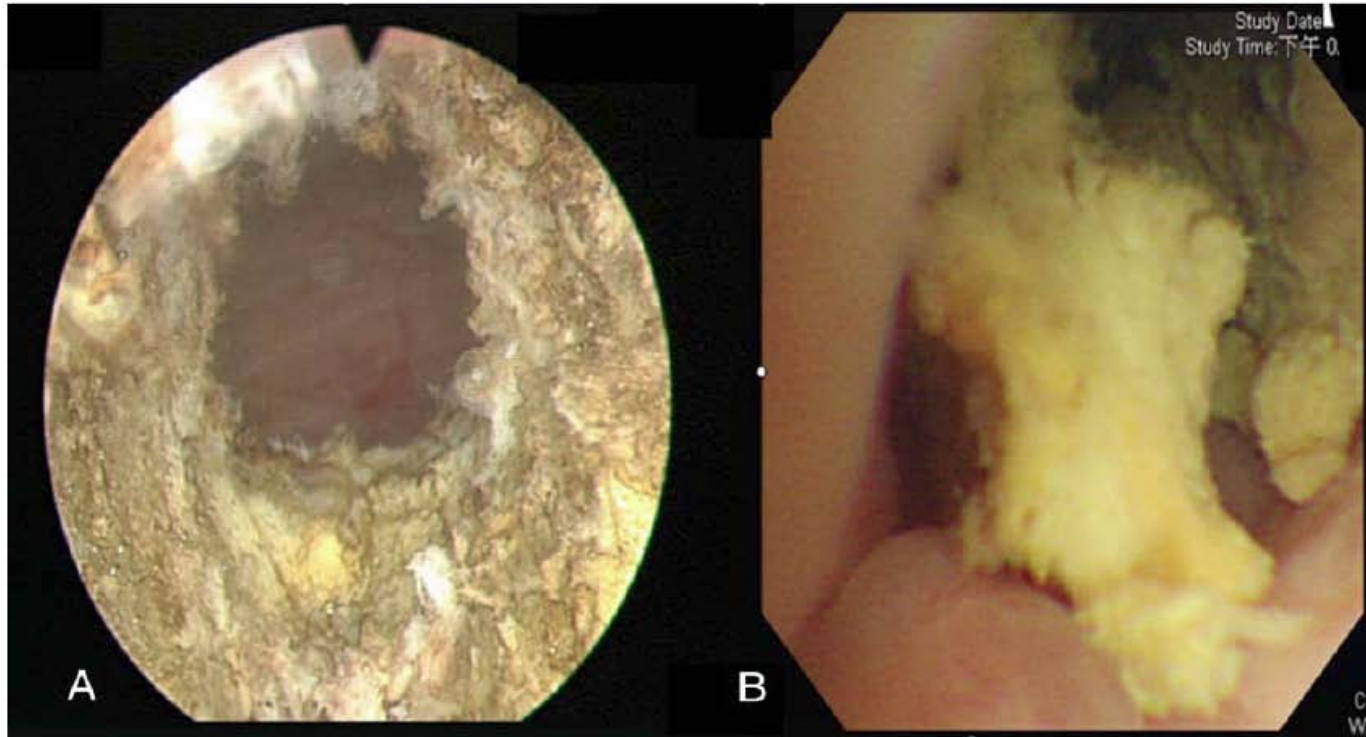


Figure 1. Cystoscopic findings. **(A)** The diode laser allowed immediate ablation of the prostate tissues intraoperatively. **(B)** Large sloughed-off tissues obstructing the urethra could be observed 3 months after the operation.

Suggestion for diode laser

- ▶ In consideration of safety, we suggest using **lower power setting** (eg, 120W or 150W) instead of 200W to reduce the coagulative zone.
- ▶ Diode laser prostatectomy could be **followed by TURP** to remove the residual coagulated tissues with clear view

GreenLight HPS Laser 120-W Versus Diode Laser 200-W Vaporization of the Prostate: Comparative Clinical Experience

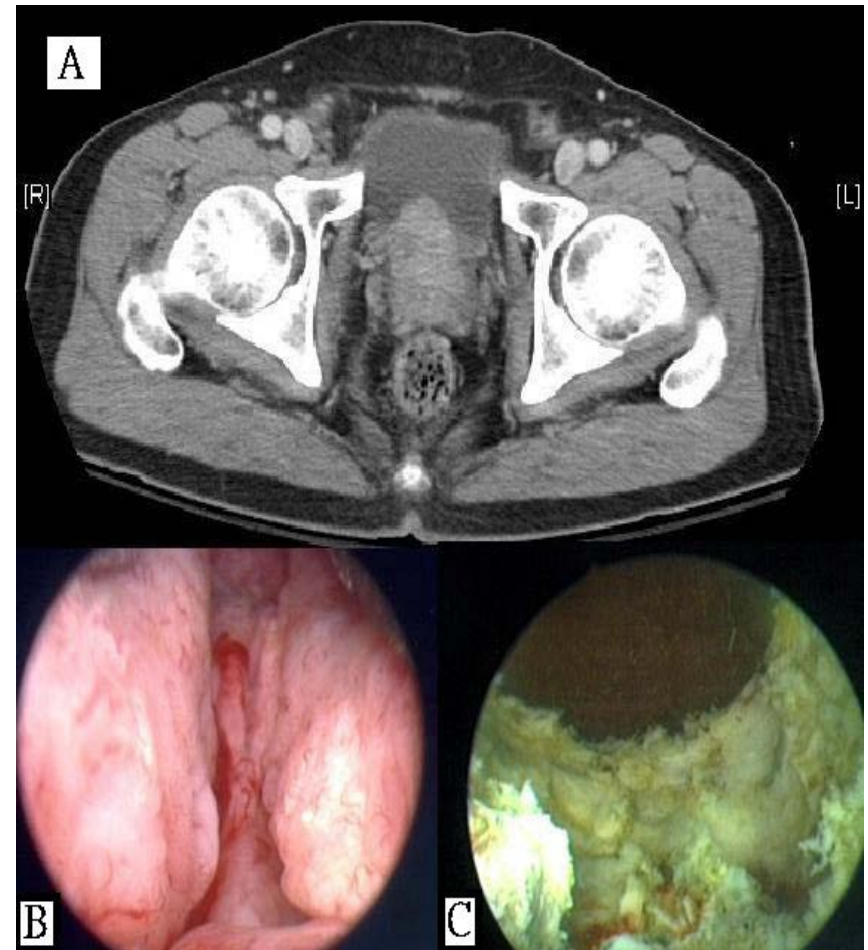
Chiang and Chuang et al., *Lasers in Surgery and Medicine* 42:624-629 (2010)

- ▶ Significant improvement in IPSS, Qmax, PVR, and QoLs in each laser group at the 1, 6, and 12-month follow-ups compared with baseline.
- ▶ No significant difference in any of these parameters between each group.
- ▶ The diode laser demonstrates superior hemostatic properties compared with the GreenLight HPS laser.
- ▶ Postoperative incontinence, irritative symptoms, and dysuria with sloughing tissues and epididymitis are more pronounced after diode laser prostatectomy.

Efficacy and Safety of Photoselective Vaporization of Prostate in Patients with Prostatic Obstruction Induced By Advanced Prostate Cancer

(Cheng & Chuang et al., Asia J Surgery, 2011, in press)

- ▶ 13 patients, mean 76.5 years, range 60-91, with advanced PC (stage III, IV: 4/9, mean PSA 1740 ng/mL)
- ▶ prostatic obstruction, mean volume 65.0 ml, AUR in 10
- ▶ PVP is a safe and effective procedure in advanced PC patients without intraoperative complication or blood transfusion
- ▶ Mean Lasering time 67 ± 26 min
- ▶ Failed initial catheter removal, 61.5% in PVP vs. 16.7 to 43.5% in TURP
- ▶ All patients could resume voiding function, mean catheterization time 3.0 days



Effects of Greenlight HPS(™) laser photoselective vaporization prostatectomy on sexual function

- ▶ 72 patients completed 52 weeks of follow-up, median age 69 yrs
- ▶ Median SHIM changed from 15 to 17 at the 52 W follow-up period
- ▶ Minimum change (0 ± 5) in SHIM occurred in 73.7% of patients
- ▶ 7.0% of patients had deterioration of erectile function (SHIM reduction >5)
- ▶ 19.3% of patients had improvement of erectile function (SHIM increase >5)
- ▶ Incidence of new-onset retrograde ejaculation was 30%.
- ▶ PVP appears to not have a detrimental effect on erectile function ([Spaliviero, et al., J Endourol, 2010](#))
- ▶ 149 patients, median age 74 yr
- ▶ IIEF-5 scores were comparable preoperatively and postoperatively if we consider all the population.
- ▶ However, considering patients with preoperative IIEF-5 >19 , the postoperative IIEF-5 scores were significantly decreased at 6, 12, and 24 mo.
- ▶ Sexual function appears to be maintained after PVP; however, in patients with normal preoperative EF, we showed a significant decrease in EF after PVP. (Bruyere, EurUrol, 2010)

Thulium laser prostatectomy

- ▶ Wavelength: 2000 nm
- ▶ Continuous wave
- ▶ Absorption peak in water
- ▶ Short penetration depth
- ▶ OP procedure:
 - enucleation
 - vaporessection

	Thulium laser vaporesection	HoLEP	KTP laser vaporisation
Acquisition costs	~100 000€	~120 000€	~120 000€
Costs per patient (fibre costs)	Reusable fibre, ~20€	Reusable fibre, ~20€	Nonreusable fibre, ~1000€
Learning curve [4,15,17,26,28]	Short, TURP-like technique	Rather longer than for TURP	Rather shorter than for TURP
Speed of tissue ablation (g/min) [4,8,17,20,26]	0.3–0.9	0.2–0.5	0.3–0.5
Tissue ablation [4,20,25,27]	56–70%	30–85%	27–53%
Ideal adenoma size [4,17]	Small to medium	Size independent	Small to medium
Histologic evaluation [4,17,18,20,23]	33–50% of tissue suitable for evaluation	90–95% of tissue retrieval for histology	Not possible
Versatility [4,16–19]	Very smooth precision cutting of various tissues, multimodal tool	Usable for laser lithotripsy, multimodal tool	Only usable for prostate vaporisation
Intraoperative complications [8,20,22,25]	No significant complications reported	Bladder injuries after morcellation reported	No significant complications reported
Postoperative decrease in haemoglobin [8,20,22,24,25]	1.4–6.6%	8.9–9.6%	3.4%
Postoperative decrease of PSA after 6–9 mo [4,17,26]	56%	80–85%	30%

Szlauer R, et al. Eur Urol. 2009;55:368-75.

Take Home Message

	Holmium Laser	Thulium laser	GreenLight HPS laser	High-intensity diode laser
Procedure	Enucleation	Enucleation Vaporesction	Vaporization	Vaporization
Efficacy	comparable to TURP and open prostatectomy	comparable to TURP	comparable to TURP	comparable to TURP
Learning curve	Long	Moderate	Short	Short
Coagulation zone	Superficial	Superficial	Superficial	Deep
Hemostasis	Good	Good	Good	Excellent
Re-operation	Low	Low	Low	High
Limitation	Learning curve	Limited reports	High reoperation in large prostate	Post-op irritative symptoms

Summary

- ▶ All of the current laser therapies for BPH can produce durable TURP-like cavity without the potential hazard of bleeding or water intoxication.
- ▶ Diode laser induced deeper coagulation effects may lead to irritative voiding symptoms
- ▶ Time consuming is a problem for large prostate
- ▶ Should we consider combination therapy (Laser Prostatectomy + TURP) for large prostate?

**Thank You for Your
Attention !!**

