Lasers in urology

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Lasers in urology

- 1917 A. Einstein's concept
- 1960 T.H. Maimen visible laser light
- 1966 Parsons pulsing ruby laser on canin bladder
- 1968 Mulvany fragmented urinary stone using ruby laser

Urological applications

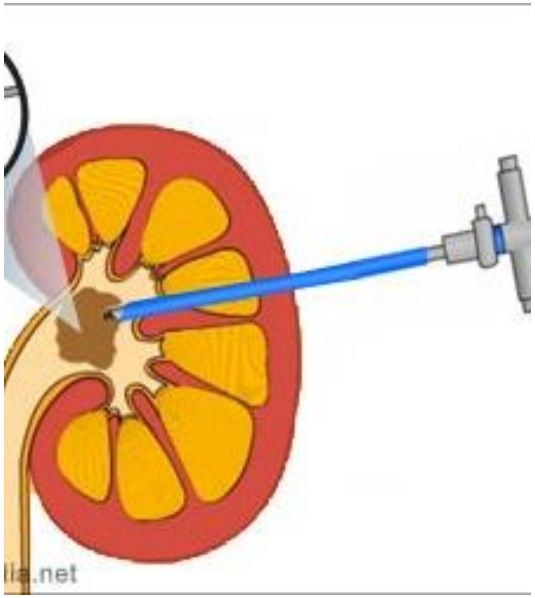
- Open and laparoscopic operations:
  - Kidney, bladder, ureter, penis, testis

- Endoscopic operations
  - Kidney, bladder, ureter stones
  - BPH interstitial laser therapy
  - BPH vaporization, vaporesection, enucleation
  - Vapoincision of urethral strictures
  - Bladder tumor, ureter tumor, pyelon tumor vaporizations
  - Bladder tumor, pyelon tumor fotodynamic therapy (PDT)

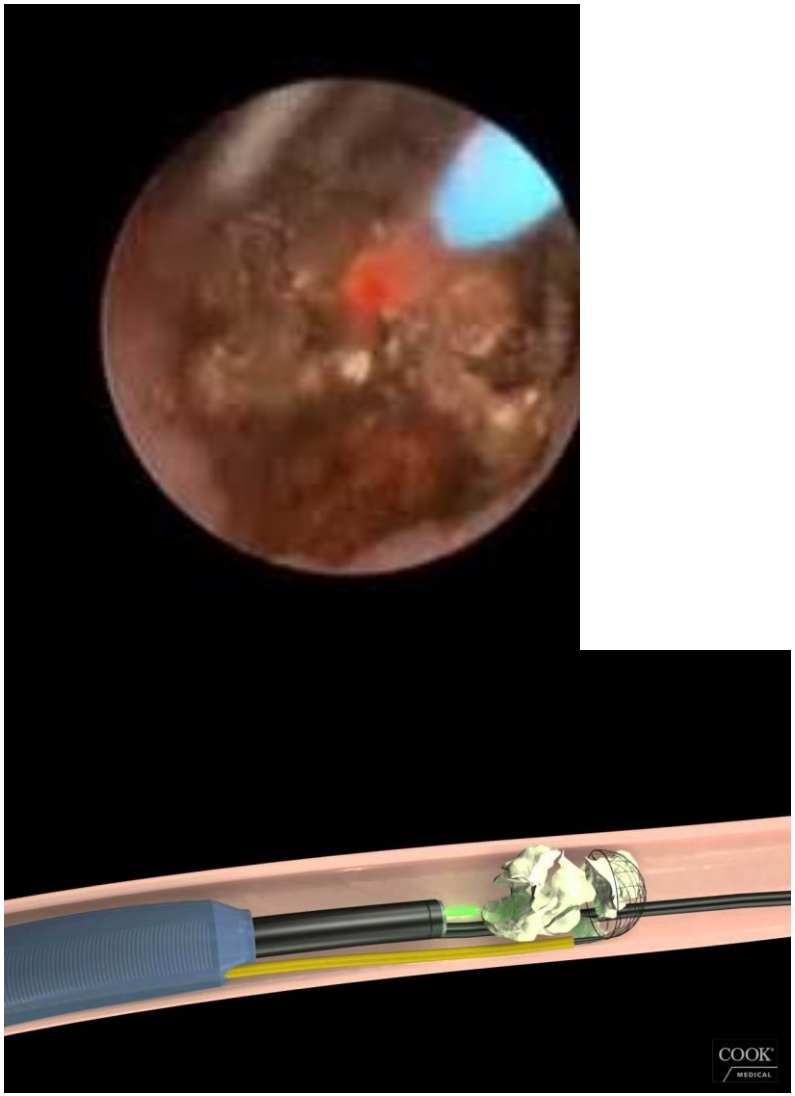
Lasers on stones

Kidney stones

- Percutan nephroscopy or/and retrograd pyeloscopy
- Flexible and rigid instruments
- Mini PCNL



Ureter stones



- Rigid, semirigid, flexible ureteroscope
- Thin laser fiber
- Pulsating holmium or thulium lasers

Bladder stones

- Laser cystoscope
- Larger stones
- Thicker laser fibers

Lasers on soft tissues

Laser-tissue interactions

Photothermal effect:

- The tissue temperature is less than 100 C
- Coagulation at 50-99 C

Photoablation

- The tissue temperature is higher than 100 C
- Tissue removal by vaporization

Laser – tissue interactions

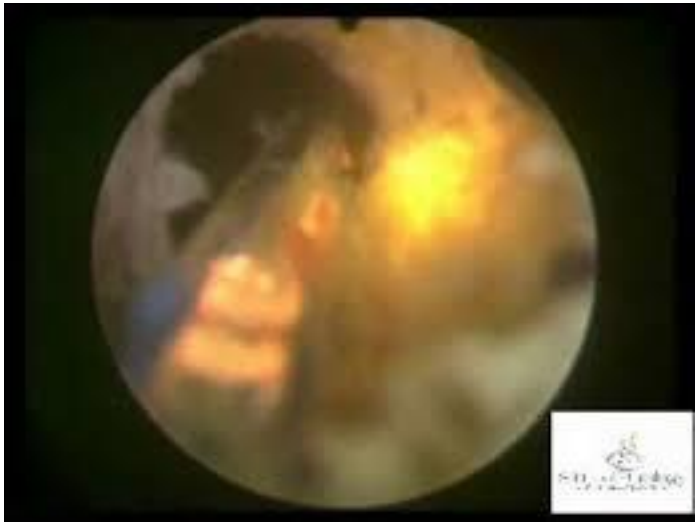
Depend on:

- The structure of the tissue
- Wave length of the laser
- Energy of the laser
- Using mode of the laser (pulsing/continuous)
- Handling technique of the laser fiber

The tissue penetrations of the lasers

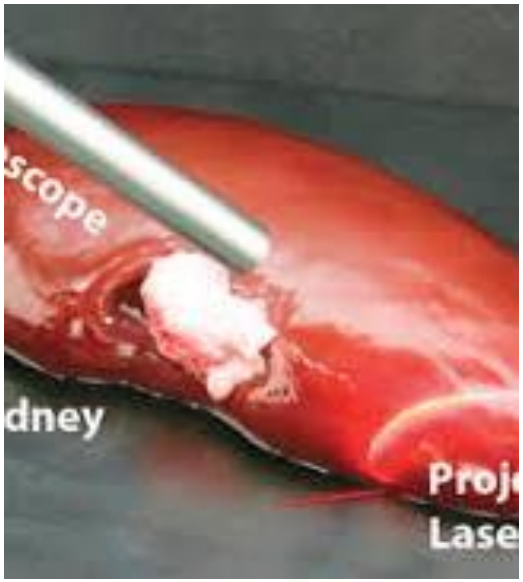
- Nd YAG: 10 mm
- Ho YAG: 0.4 mm
- KTP: 0.8 mm
- Diode: 5 mm
- CO2: 0.02 mm

Stricture of the urethra



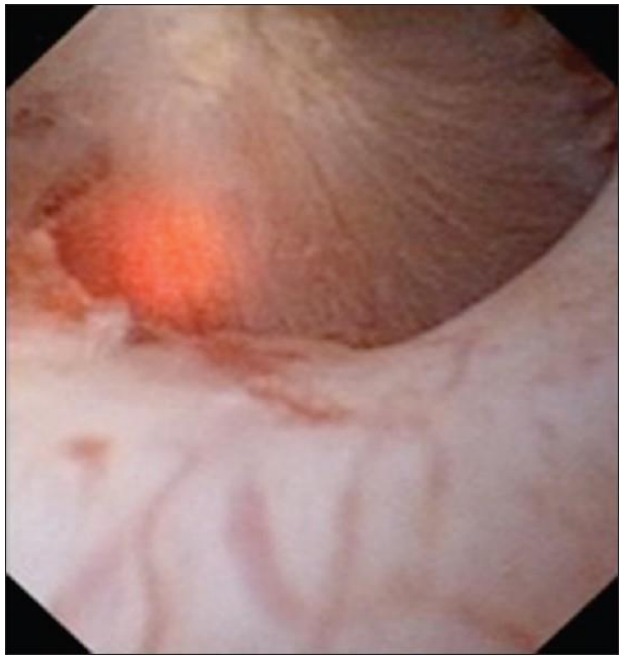
Penile tumors

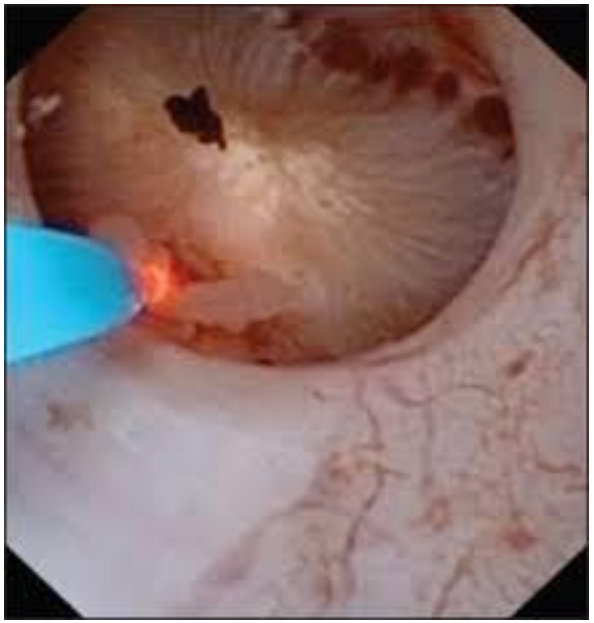
Tumor of the kidney



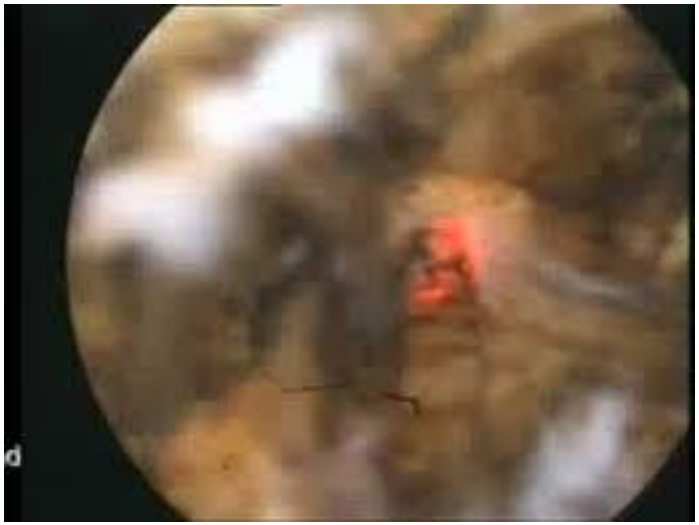
- Laparoscopic or open
- Gas cooling
- Gas suction

Pyelon tumors



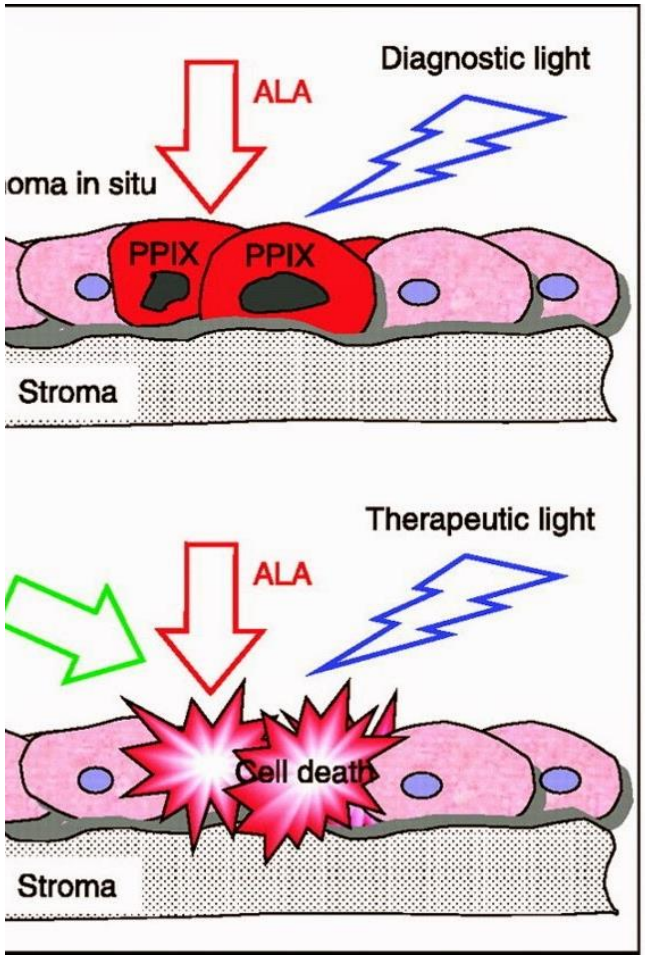


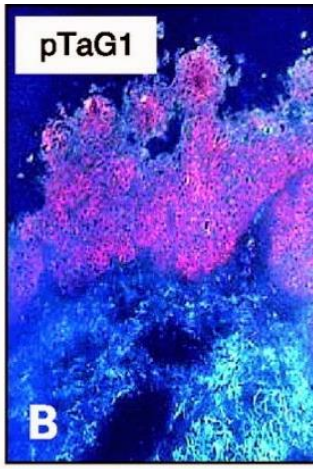
BPH enucleation

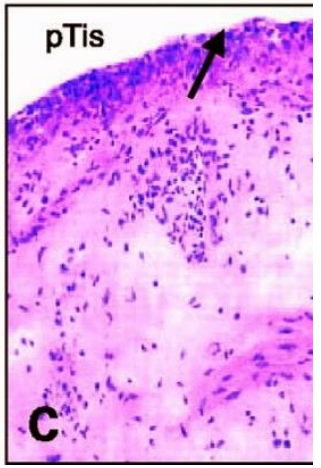


Fotodynamics

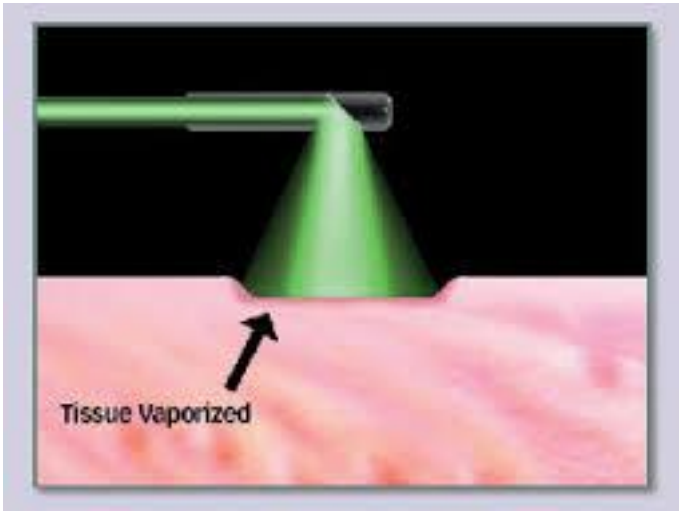
- 5 ALA
- In vivo and in vitro diagnostics PDD
- Fotodynamic therapy PDT







Prostate vaporization



Special instruments

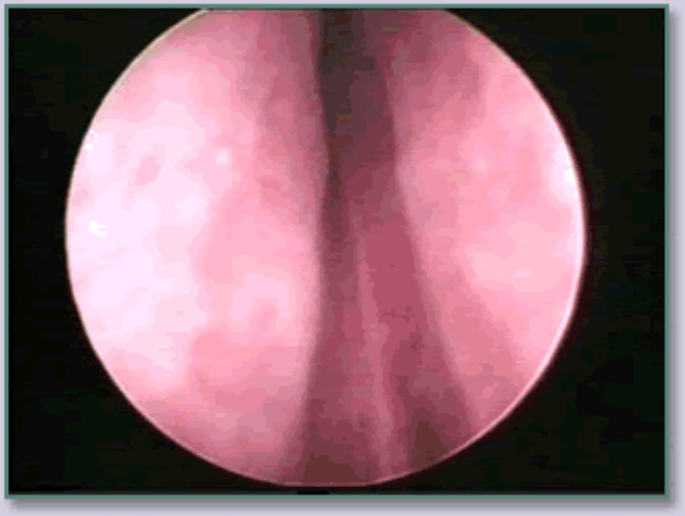
- Laser generator
- Laser fiber
- Laser cystoscop
- Laser filter of the camcorder
- Laser-protection glasses

Irrigation

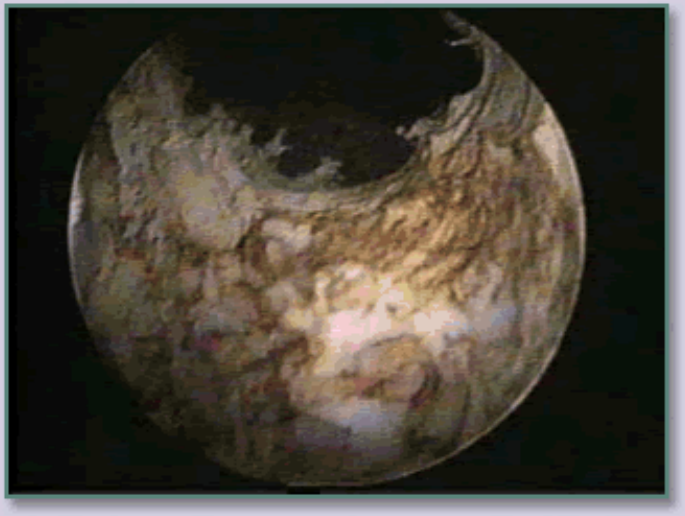
- Saline or distilled water at room temperature
- It cools the tip of the laser fiber (300 C)
- It wash out the bubbles and the tissue particles

Appropriate lasers for prostate vaporization

- Nd YAG laser (1064 nm)
- Ho YAG laser (2140 nm)
- Green light (KTP) laser (532nm)
- Diode laser (980 nm)
- Those are the most appropriate, which are highly absorbeable in the hemoglobine, and poorly absorbeable in water.

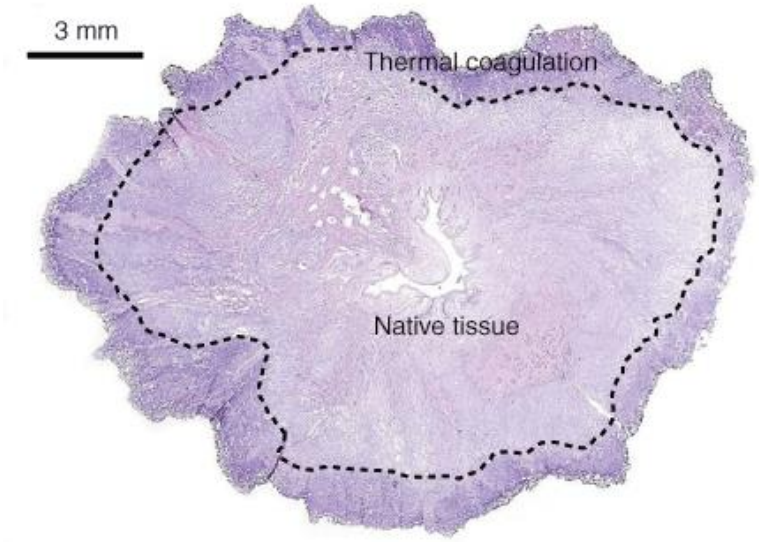


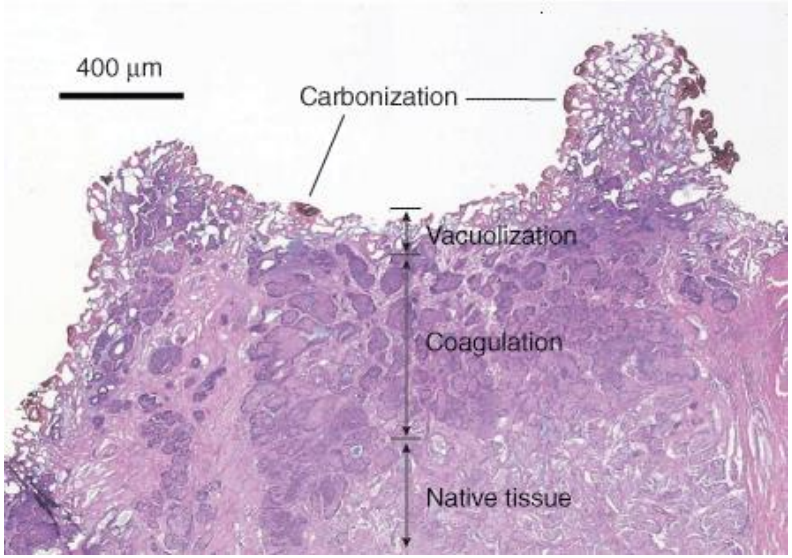
View of the prostate looking with cystoscope towards the bladder before treatment.



Same view after treatment with green light laser, showing more open urinary channel.

Changes in the tissue





Inclusion criteria (AUA)

- BPH with complains and needed surgical intervention
- AUA-7 score >12
- Q-max <15 ml/s (min. 125 ml voided urine)
- Obstructive symptoms since at least 3 months
- Prostate size: 15 - 200 g

Egon Schiele

Catheter removal

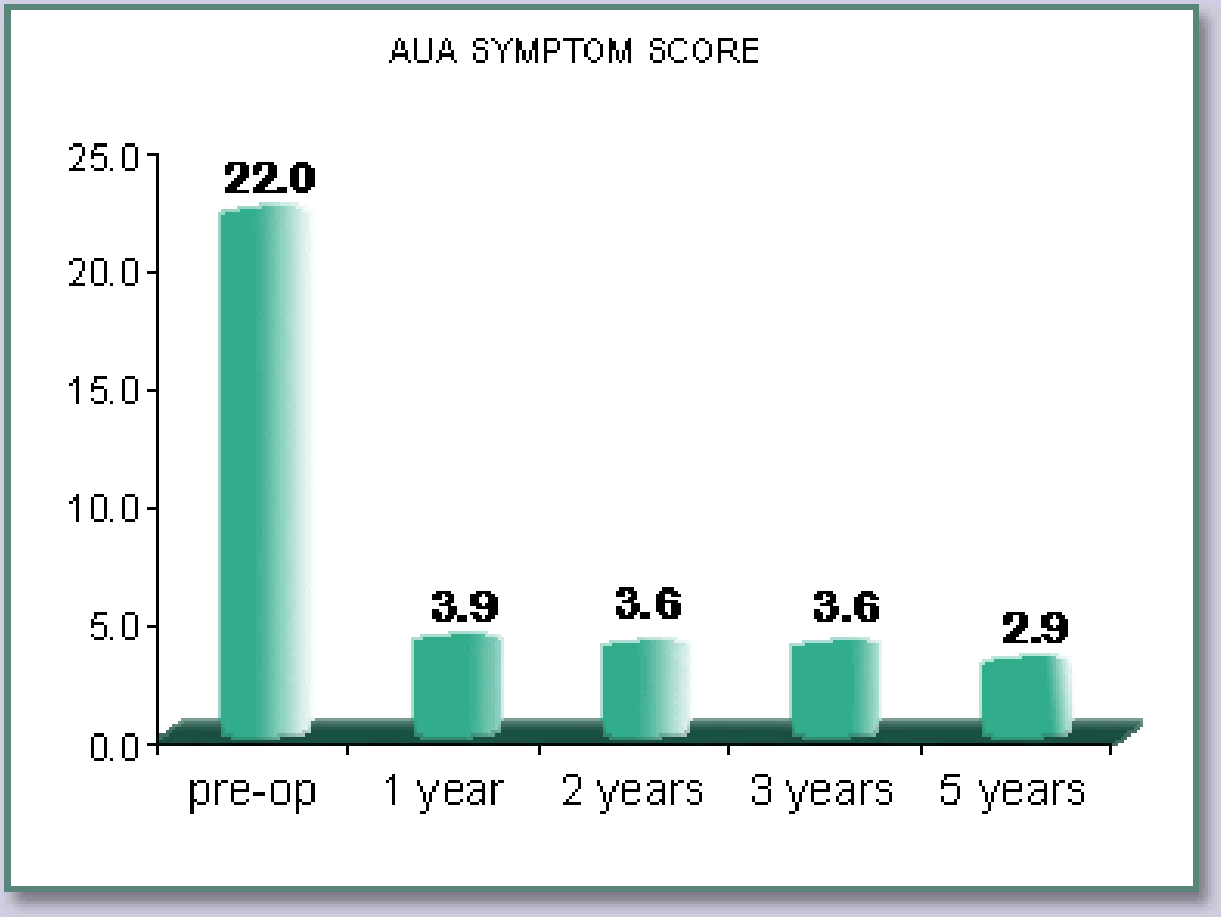
- On the day of the operation in 50%
- Within 24 hours in 90%

Prolonged catheterization, if:

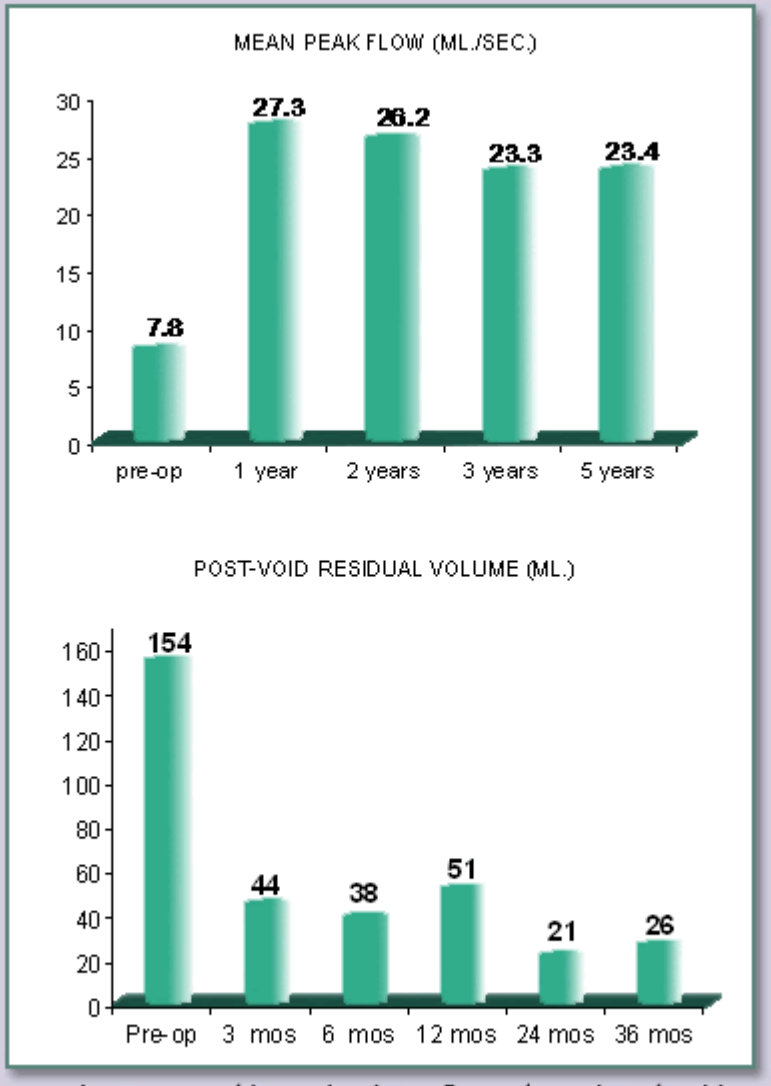
- Prostate size is very large
- The intervention was long in duration
- It needed by the anesthesiologist
- The bladder function is questionable
- The surgeon is still unexperienced

What to do postoperatively

- Antibiotics
- NSAID
- Physical and sexual temperance for 2 weeks
- Light physical activity from the 2-3. post operative day



Improvement in AUA symptom score seen after green light laser prostatectomy.



Improvement in peak urinary flow rate and post-void residual after green light laser prostatectomy.

Complications I.

- Mild-intermediate dysuria (lasts more than 10 days): 9,4 %
- Mild-intermediate hematuria (lasts more than 10 days): 8,6 %
- Urine retention and re-catheterization:

Complications II.

- Urge incontinence: 6,5 %
- UTI: 2,2 %
- Stricture of the bladder neck: 1,4 %
- Urethral stricture: 0,7 %
- Retrograd ejaculation: 36 %
- ED: 0-1 %

PVP vs. TURP

- Can be performed as one-day surgery
- Less bleeding and blood loss
- Less fluid intake into the circulation, lower risk for TUR syndrome
- Post-operative ED is less than 1%
- Similar efficacy with the TURP

Thank you for your attention!

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