Lasers in Urology

Mark Fraundorfer
Tauranga
Laser

Coherence (photons in phase)
Collimation (resonator in parallel)
Monochromacity (same wavelength)

1960 Ruby laser  Maiman
1966 Dog bladder  Parson
1992 Human prostate  Costello
Comparison of physical tissue parameters and different Lasers
Laser uses in urology

1. Benign prostatic hypertrophy
2. Strictures
3. Bladder cancer
4. Urinary tract stones
BPH

• Common condition of aging
• Hypertrophy of transitional zone
• Main cause of “LUTS”
  – Poor flow
  – Frequency
  – Nocturia
  – Dribbling
  – Retention
Lasers in BPH

- Diode (830 nm) and Nd.YAG (1064nm) (free beam, interstitial) Coagulation, Ablation
- KTP (532 nm) “Greenlight” pulsed Ablation
- Holmium (2140 nm) pulsed Incision, Ablation, Enucleation
BPH Treatments

- Medical
- Minimally invasive
- Surgical
Surgical

- TURP
  - Bleeding
  - Catheter times
  - TUR syndrome
- Laser prostatectomy
  - Costello NdYAG 1992
  - Bloodless, saline irrigant
  - Long catheter times, irritative
KTP “Green light”

- Absorbed by Hb pigment
- Vaporises only
- Single use side firing fibres
- Minimal bleeding
- Saline irrigation
- Short catheter time
- 1 night stay
Holmium

- Absorbed in water
- Minimal depth of penetration
- Saline irrigation
- Contact vaporisation
- No bleeding
- Short catheter time
- 1 night stay
- Ablate or enucleate
Fig. 3. A, preoperative view of obstructive prostate. B, immediate postoperative view of resultant debulking of obstructing adenoma.
Enucleation
PSA change by procedure

TUNA – no change in PSA
TUMT – no change in PSA
TURP – mean decrease in PSA 70-75 %
   (Correlates with grams of tissue removed)
Laser ablation (NdYAG) – 45% reduction
Laser ablation (KTP) – 37-51% reduction
HoLEP – 81-86% reduction
Open Prostatectomy – 80-95% reduction
The Concerns with KTP

- High single use fibre cost
- Slow and tedious (large glands)
- Relatively low tissue removal ?durable
- Low retrograde ejaculation rate
- No specimen
- Lack of RCTs, long term follow up, urodynamic data
BPH Lasers in New Zealand

- No KTPs anyway
- High power Holmium
  - Auckland
  - Tauranga
  - Rotorua
  - Hamilton
  - Palmerston North
  - Wellington
Other soft tissue applications

- Vaporise/incise urethral strictures
- Bladder neck incision
- Resect/vaporise bladder tumours
- Urethral warts
Stone Treatments

- Patience and drugs
- Extracorporeal shockwave lithotripsy
- Endoscopic (holmium, pneumatic, basket)
- Percutaneous nephrolithotomy (holmium, USS, pneumatic)
- Open (knife)
Holmium laser lithotripsy

- The holmium laser is unparalleled in its ability to destroy all urinary calculi at all sites
  - Delivered via fibres 550 to 200m
  - Flexible
  - Absorbed in water
Holmium Laser vapourises and mechanically shocks stone
Methods

• Bladder stones via cystoscope
• Lower ureteric via semi rigid ureterorenoscope
• Upper ureteric and renal via flexible ureterorenoscope
• Percutaneous via nephroscope
Horses for courses
Stone parameters

- Location
- Size
- Availability of equipment
- Expertise
Holmium Summary

Prostate
Urinary tract stones
Bladder tumours
Urethral strictures
Kidney stones

Swiss army knife of urology