An update on the surgical management of Benign Prostatic Hyperplasia

March 29, 2017
Jennifer Locke

Background

- The success of medical therapy for BPH has lead to decreased rates of surgical treatments.

- Patients are now older at the time of surgery, have larger prostates, more abnormal voiding parameters and increased medical comorbidities.

- Current AUA and CUA guidelines are from 2010. EUA guidelines are more up-to-date (2015) but do not include recent meta-analysis on bipolar TURP and laser technologies.
Indications for surgery

• Absolute:
  • Bilateral hydronephrosis with renal functional impairment.
  • AUR.

• Relative:
  • Moderate-to-severe voiding symptoms attributed to BPH that are refractory to medical therapy.
  • Recurrent or robust gross hematuria (once other causes have been excluded).
  • Bladder calculi, diverticula and other signs of end-stage bladder decompensation.
  • Elevated or increasing PVR.

Antibiotic coverage

• Pre-procedural antibiotics significantly reduce the rates of bacteriuria, bacteremia and fever
  • Options include cephalosporins, aminoglycosides and trimethoprim-sulfamethoxazole.
  • Avoid fluoroquinolones as first-line prophylaxis
    – High rates of resistance.
    – Black box warning issued in 2016.

• If indwelling catheter then extend coverage post-operatively.

References:
Post-op care

- **Immediate:**
  - After surgery for BPH DVT/PE risk <1%, bleeding risk 2.5%.
    - The risk of bleeding outweighs benefit of thromboprophylaxis.
  - No data to suggest when to stop 5α-reductase inhibitor +/- α-antagonist post-operatively.
- **Long-term:**
  - Should see patient 4-6 weeks post-op for objective and subjective symptom assessment.

Types of surgery

- **Non-laser**
  - Transurethral resection of the prostate (TURP)
  - Transurethral incision of the prostate (TUIP)
- **Vaporization**
  - Transurethral vaporization of the prostate (Rezum)
- **Laser**
  - Transurethral GreenLight laser vaporization of the prostate (GreenLight)
  - Transurethral holmium laser enucleation of the prostate (HoLEP)
- **Prostatectomy**
  - Open, laparoscopic and robotic
- **Other modalities** (prostatic embolization, stents, UroLift, Aquablation)
Types of surgery

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Transurethral resection of the prostate

[Image: Diagram of TURP - Trans Urethral Resection of the Prostate]
Monopolar vs. Bipolar TURP

- Standard of care: monopolar
- Bipolar: both the active and return electrodes are contained within the instrument.
  - Bipolar plasma “button” and bipolar loop available.

Types of Bipolar TURP

- Olympus
- Gyrus
- Storz
- Wolf

Transurethral incision of the prostate

- Goal is to disrupt the prostatic capsule to alleviate voiding symptoms
  - unilateral or bilateral incision of the prostate or bladder neck.

Transurethral vaporization of the prostate

- Transurethral microwave therapy (TUMT)
- Transurethral needle ablation of the prostate (TUNA)
Transurethral prostate convective water vapor energy (Rezum)

- Goal to use convection water vapor thermal energy to ablate prostatic tissue.

Laser prostate treatments

- Rely on the prostate interacting with the light energy and converting it to local thermal energy, which in turn leads to coagulative necrosis and vaporization of the tissue.
Laser prostate treatments

- Amount of tissue ablated based on laser and tissue properties:
  - Laser characteristics include irradiation time, **power intensity**, beam angle and spread.
  - Tissue characteristics include carbonization and light scatter.
- Coagulation/ablation $\leftrightarrow$ Vaporization
- Laser prostate vaporization/enucleation techniques include Holmium, Thulium, GreenLight and Diode.

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Laser prostate treatments

- **Holmium enucleation of the prostate**
  - Ho:YAG 2140nm pulsed emission,
  - High affinity for water,
  - Depth of penetration 0.4mm.
- **GreenLight laser vaporization of the prostate**
  - Potassium titanyl phosphate 532nm near continuous emission,
  - High affinity for hemoglobin,
  - Depth of penetration 0.8mm.

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Campbell's 2016.

The Evolution of GreenLight

- Three generations:
  - 80W KTP (GreenLight PVP)
  - 120W HPS (GreenLight HPS)
  - 180W XPS (GreenLight XPS)
- Evolution of GreenLight technique:
  - Standard photovaporization (PVP) →
    Anatomical PVP → GreenLight enucleation of prostate (GreenLEP)

Prostatectomy

- Removal of the entire prostate.
  - Open, laparoscopic or robotic approach.

Figure from: http://www.ece.odu.edu/~rdmckenz/Medical/prostate/prostate_surgery_evaluation.htm.
• Embolization of specific arteries to the prostate bilaterally leads to:
  – shrinkage of the gland (ischemic apoptosis)
  – relaxation of smooth muscles (reduction in the number and density of $\alpha_1$ adrenergic receptors in the prostate stroma).
Prostatic stent

- Provides a rigid framework that once in place in the prostatic fossa pushes outward to open the prostatic lumen.

UroLift

- Alters prostatic anatomy without ablating tissue.
- Goal is to deploy adjustable small permanent implants that serve to retract the obstructing lateral lobes and create an open, continuous voiding channel through the prostatic fossa.
Aquablation

• Goal to use water ablation technique with image guidance to remove prostatic tissue.

Standard of Care: TURP

• Efficacy
  – Objective measures:
    • Mean Qmax improved 108-162%.
    • PVR decreased by 77% after TURP.
  – Subjective measures:
    • Mean obstructive and irritative symptom scores decreased 88 and 65%, respectively.
    • 84% of patients indicate improved voiding symptoms as measured by IPSS after TURP. Reduction in score was 70%.
    • 15-point reduction in AUA SS; >3-point improvement in bother.

Re-operation rate: The cumulative probability of undergoing a second procedure at 8 years was 12-15.5%.

<table>
<thead>
<tr>
<th>Time after Operation (Yr)</th>
<th>Denmark TURP</th>
<th>Denmark Open</th>
<th>Manitoba TURP</th>
<th>Manitoba Open</th>
<th>Oxford TURP (21st)</th>
<th>Oxford Open (21st)</th>
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<tr>
<td>1</td>
<td>4.3</td>
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<td>15.5</td>
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<td>12.0</td>
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*The calculations are based on records on patients 55 to 84 years old, covering 1977 through 1985 in Denmark, 1972 through 1985 in Manitoba, and 1967 through 1978 in the Oxford region.
TURP denotes transurethral resection of prostate, and “open” open prostatectomy. Values in parentheses are total numbers of patients.
TURP

- Complication rate: 3% overall
  - Intra-op
    - 2.5% blood loss requiring transfusion
    - 0.8% TUR syndrome (acute dilutional hyponatremia)
    - 4.0% capsular perforation/extravasation
    - Rare injury to ureteric orifices, external sphincter
  - Early post-op
    - 15% irritative symptoms
    - 5% infections
    - 6.5% urinary retention
  - Late
    - 0.6% urinary incontinence
    - 4.1% stricture
    - 2% bladder neck contracture
    - 3.4-32% erectile dysfunction

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Monopolar vs. Bipolar TURP

- Theory
  - Bipolar allows the use of ionic isotonic irrigating fluid, such as normal saline, which eliminates the risk of electrolytic disturbance from systemic uptake, such as TUR syndrome.
Monopolar vs. Bipolar TURP

• Efficacy:
  – At 5 years no significant difference in IPSS, QOL scores, PVR and prostate volume.
  – B-TURP associated with better Qmax.
• Re-operation rates:
  – Similar (9.6% M-TURP and 6.2% B-TURP after 4 years).
• Complication rates:
  – Favors M-TURP: urethral stricture rate.

• Bottom line: Bipolar TURP is a good alternative to Monopolar TURP.
Transurethral incision of the prostate (TUIP)

- **Efficacy:**
  - Worse Qmax with TUIP as compared to TURP.
  - No difference in symptom scores between TUIP and TURP.
- **Re-operation rate:**
  - 18.4% TUIP vs. 7.2% for TURP.

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**TABLE 2. Meta-analysis of secondary outcomes**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>No. Pts. (incisions/ resections)</th>
<th>Point Estimate (p Value)</th>
<th>95% CI</th>
<th>Heterogeneity</th>
<th>Statistic vs. Baseline Diffusion</th>
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<tr>
<td>Operative time</td>
<td>122/116</td>
<td>-18.7 (&lt;0.001)</td>
<td>-21.8 - -15.7</td>
<td>2.17</td>
<td>Yes, favors TUIP</td>
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<td>Blood transfusions</td>
<td>159/30</td>
<td>0.11 (0.32)</td>
<td>0.01 - 0.21</td>
<td>3.43</td>
<td>Yes, favors incision</td>
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<tr>
<td>Collateralization duration</td>
<td>60/72</td>
<td>0.48 (0.38)</td>
<td>0.21 - 0.75</td>
<td>5.20</td>
<td>Yes, favors TUIP</td>
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<tr>
<td>Hospital stay</td>
<td>63/76</td>
<td>-1.4 (0.85)</td>
<td>-2.7 - 0.2</td>
<td>2.68</td>
<td>Yes, favors TURP</td>
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<td>Adverse events</td>
<td>115/150</td>
<td>0.41 (-0.004)</td>
<td>0.24 - 0.70</td>
<td>4.60</td>
<td>Yes, favors TURP</td>
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<td>Recurrence</td>
<td>112/92</td>
<td>1.55 (0.10)</td>
<td>0.94 - 2.15</td>
<td>7.15</td>
<td>Yes, favors TURP</td>
</tr>
</tbody>
</table>

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Transurethral incision of the prostate (TUIP)

• Bottom line:
  – Most men undergoing TUIP are young, re-operation very common in the long-term.

Transurethral microwave therapy (TUMT)

• Efficacy:
  – Worse Qmax with TUMT as compared to TURP.
  – TUMT associated with improved QOL overall. However, perception of urinary difficulties and activities of daily living are worse with TUMT as compared to TURP.

• Re-operation rate:
  – Significantly more common after TUMT as compared to TURP.

• Complication rates:
  – Higher rates of dysuria, retention and new ED with TUMT
  – Higher rates of retrograde ejaculation and transfusions with TURP.

Transurethral needle ablation of the prostate (TUNA)

• Efficacy:
  – **Worse** than TURP in both objective and subjective measures after 3 months.

• Re-operation rate:
  – **Higher for TUNA** as compared to TURP.

• Complication rates:
  – Higher rate of UTI (14%) and common perineal pain with TUNA; lower rate of retrograde ejaculation.
  – **Lack of long-term data.**

Transurethral prostate convective water vapor energy (Rezum)

• Efficacy (vs. sham at 2 years):
  – Reduction in Qmax by 50%, QOL by 50% and IPSS by 51%.

• Re-operation rate:
  – At 2 years 3.7%.

• Complication rates (total 138 patients):
  – No negative effect on erectile function.
  – 3 serious adverse events (1 urosepsis, 1 bladder neck contracture and 1 bladder calculi).

• Bottom Line:
  – More data needed.
Transurethral vaporization of the prostate

• Bottom line:
  – TUMT and TUNA not covered by MSP in Canada.
  – Both associated with higher re-operation rates.
  – Lack of new information on TUMT and TUNA perhaps reflects a lack of interest and questions their durability.

Holmium laser prostate enucleation (HOLEP)

• Efficacy:
  – At 1 year HOLEP better than TURP in terms of Qmax, PVR, IPSS scores but not QOL scores.

• Re-operation rates:
  – At 3 years comparable to TURP (7.2 vs. 6.6%).
Holmium laser prostate enucleation (HOLEP)

- Complications rates:
  - HOLEP:
    - Longer operative time
    - Reduced blood transfusions
    - Reduced catheterization duration
    - Shorter length of hospital stay

- Bottom line:
  - Lower risk of bleeding in patients on anticoagulant; better for large glands (>100cc).

GreenLight PVP

- Efficacy:
  - At 2 years no significant difference in Qmax, PVR, QOL and IPSS as compared to TURP.

![Table 3](image-url)
GreenLight PVP

- Re-operation rates:
  - Significantly higher with GreenLight PVP as compared to TURP at 2 years.

![Table 4: Re-operations](image)


GreenLight XPS

- Re-operation rates:
  - At 2 years no significant difference between TURP (7.6%) and GreenLight XPS (9.0%).

![Graph: Kaplan-Meier survival curves](image)

GreenLight

• Complication rates:
  – GreenLight associated with **better length of hospital stay** and catheterization time; less incidence of capsular perforation, **blood transfusion, macroscopic hematuria and clot retention** but longer OR time as compared to TURP.

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GreenLight – 3 types

<table>
<thead>
<tr>
<th></th>
<th>Standard PVP</th>
<th>Anatomical PVP</th>
<th>Green.LP</th>
<th>p value</th>
</tr>
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<tbody>
<tr>
<td>Follow-up duration (months)</td>
<td>15.8</td>
<td>11.8</td>
<td>15.5</td>
<td>0.001</td>
</tr>
<tr>
<td>ΔIPSS</td>
<td>−17 (−18 to −15)</td>
<td>−17 (−20 to −13)</td>
<td>−15 (−18 to −13)</td>
<td>0.27</td>
</tr>
<tr>
<td>ΔQmax</td>
<td>10 (7−12)</td>
<td>11 (9−14)</td>
<td>13 (11−15)</td>
<td>0.020</td>
</tr>
<tr>
<td>Post-operative acute urine retention</td>
<td>6.4</td>
<td>7.9</td>
<td>8.6</td>
<td>0.85</td>
</tr>
<tr>
<td>Patients perception of improvement satisfaction (very improved + improved) (%)</td>
<td>94.0</td>
<td>94.8</td>
<td>100.0</td>
<td>0.36</td>
</tr>
<tr>
<td>Early storage symptoms (%)</td>
<td>24.5</td>
<td>35.8</td>
<td>42.9</td>
<td>0.034</td>
</tr>
<tr>
<td>Late complications (%)</td>
<td>14.4</td>
<td>6.3</td>
<td>0</td>
<td>0.011</td>
</tr>
</tbody>
</table>

*PSA prostate-specific antigen, IPSS International Prostate Symptoms Score
* Sum of very improved + improved

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GreenLight

• Bottom line:
  – **GreenLight associated with shorter hospital stay and reduced bleeding risk.**

GreenLight vs. HOLEP

• Efficacy:
  – At 4 months **better prostate size reduction** with HOLEP (74% vs. 43%, p=0.001).
  – At 12 months **higher Qmax** for HOLEP (26.4 ±11.5 vs 18.4 ±7.5 mL/sec, p=0.03).

• Re-operation rates:
  – No difference.

GreenLight vs. HOLEP

- Complication rates:
  - Overall no significant differences between early and late complications.
  - Favors GreenLight: Hospital stay (0.3 vs. 0.8 days), Catheter duration (0.4 vs. 1.3 days).
  - Favors HOLEP: Mean OR time (30 vs. 45 min), conversion rates to TURP (0 vs. 22%).

GreenLep vs. HOLEP

- Efficacy:
  - GreenLep associated with better Qmax.
  - HOLEP associated with better IPSS scores.
- Re-operation rates:
  - No long term data.
- Complication rates:
  - Favors GreenLep: total energy delivered (58 vs. 110 kJ, p < 0.0001) and OR time (60 vs. 90 min, p < 0.0001). Learning curve (14-30 cases vs. 22-40 cases).
  - Favors HOLEP: Length of catheterization and hospital stay (2 vs. 1 day, p < 0.0001; 2 vs. 1 day, p < 0.0001).
Open prostatectomy

- Efficacy: hard to compare to TURP as often done for larger prostates.
- Re-operation rates:
  - Significantly lower than that of TURP.

### Table 1. Cumulative Probability of Undergoing a Second Prostatectomy, According to the Type of Initial Prostatectomy, in Denmark, Manitoba, and the Oxford Region in Patients without Evidence of Bladder or Prostate Cancer at the Time of Operation.*

<table>
<thead>
<tr>
<th>TIME AFTER OPERATION (YR)</th>
<th>DISKOW</th>
<th>MANITOBA</th>
<th>OXFORD REGION</th>
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</thead>
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<tr>
<td></td>
<td>TURP (CT)</td>
<td>TURP (OPEN)</td>
<td>TURP (CT)</td>
</tr>
<tr>
<td></td>
<td>4.3</td>
<td>3.6</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>9.7</td>
<td>2.9</td>
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<td>4.5</td>
<td>15.5</td>
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</tbody>
</table>

*The calculations are based on records of patients 55 to 84 years old, conventionally treated 1977 through 1985 in Denmark, 1972 through 1985 in Manitoba, and 1965 through 1978 in the Oxford region.

TURP denotes transurethral prostatectomy, and "open" open prostatectomy. Values in parentheses are total numbers of patients.

Open prostatectomy

- Complication rates:
  - Prolonged hospital stay, high rates of transfusion (7-14%) and perioperative complications.
  - Higher rates of incontinence (10%), bladder neck contracture.
Open prostatectomy

• Bottom line:
  – Open prostatectomy good for large glands, re-operation rates low but open prostatectomy is associated with longer hospital stay, increased risk of bleeding and need for longer catheterization.

EUA LUTS and BPH guidelines 2015.

Open prostatectomy vs. HOLEP

• Efficacy:
  – At 5 years no significant difference in Qmax. PVR, IPSS and Mean AUA-SS.
• Re-operation rates:
  – Similar at 5 years.
• Complication rates:
  – HOLEP associated with longer OR times.
  – Open prostatectomy associated with higher risk of blood transfusion, longer catheterization duration and hospital stay.

Prostatectomy

• Trends:

• Open versus laparoscopic versus robotic approach:
  – Limited data.

• Efficacy:
  – At 3 months worse IPSS scores with prostatic embolization as compared to TURP.
• Re-operation rates: unknown.
• Complication rates:
  – Rare but significant- bladder partial necrosis.
  – Advantages: preservation of erectile function.

• Bottom Line:
  – We do not know long-term durability of the procedure.
  – There is perhaps a role for prostatic embolization in refractory AUR and hematuria, patients with long-term indwelling catheter as well as shrinkage of the prostate prior to prostatectomy.
Prostate Stents

• Bottom line:
  – high failure and removal rates, with difficult removal.

UroLift

• Efficacy (vs. sham, minimum 3 months follow-up):
  – Improved Qmax (3.8-4.0ml/s).
  – Improved symptom scores (standardized mean gain range of 1.3-1.6, IPSS difference of -7.2 to -8.7 points), QOL (2.2-2.4 points) in 65% of patients.
  – In 2 studies PVR worsened at 1 year.
Efficacy (vs. TURP, minimum 2 year follow-up):

- Changes in Qmax and BPH II score were worse with UroLift.
- Quality of recovery and ejaculatory function preservation were better with UroLift.

Re-operation rates:

- At 2 years 13.6% for UroLift vs. 5.7% for TURP in a small subset of patients.

Complication rates:

- Sexual function including ejaculation was unchanged.
- No comparison studies to TURP at this time.
UroLift- Real life experience

- Dr. Goldenberg has observed improvements in PVR and IPSS and no change to SHIM scores after 36 months follow-up.
- However, his overall perceived outcomes are below:

![UroLift- Real life experience](image)

Data courtesy of Dr. Goldenberg.

UroLift

- Bottom line:
  - UroLift efficacy outcomes at 3 months only modest with higher re-operation rate.
  - Favors UroLift: Can be done under local anesthetic and useful to preserve sexual function.

![UroLift](image)

Gratzke C. BJU Int 2016; Epub ahead of print. Jones P. There Adv Urology 2016; B: 372-376. Figure courtesy of SIU slides Goldenberg.
Aquablation

• Efficacy (no control group):
  – At 6 to 12 months improved Qmax, PVR, IPSS and QOL were observed.

Aquablation

• Re-operation rate: unknown.
• Complication rates (total 15 patients):
  – 5/15 required re-catheterization.
  – 3/15 developed hematuria.
  – No incontinence, retrograde ejaculation, or ED observed.
• Bottom Line:
  – More data needed.
Special issues

- Trends in Canada and BC
- Re-operation rates
- Sexual function
- Large Prostate
- Anticoagulated patient
Laser procedures in Canada

Number of laser procedures performed in Canada for BPH over time

Laser procedure distribution according to province as a percentage of total procedures 2011-2012

Re-operation rates in BC

Patients who had procedure 08311 Prostatectomy
Percentage of (Male) Patients who had a re-operation in the 10 years following
Re-operation rates

- PSA as a predictor for resection success
  - May be used as a marker of response after initial surgery (PSA decreases 46-67% after TURP, 50-60% after GreenLight, 80-85% after HOLEP and 80% after open prostatectomy).
- Resection to capsule important to prevent re-operation
  - Shimizu et al. demonstrated in small resection weight specimens (9.8g from average gland 37.4 +/- 19.9cc) 54.5% of patients underwent a re-operation for an average of an additional 10.2g resected.


Retrograde Ejaculation

Sexual adverse events

- HOLEP vs. TURP: 78% loss of ejaculation in both groups.
- **Lower rate of retrograde ejaculation with GreenLight** (30% GreenLight vs. 60.5% TURP; 22% GreenLight vs. 88% HOLEP).
- B-TURP vs. M-TURP: no difference.

Large Prostate

- For prostates >70cc HOLEP and GreenLight had similar efficacy to open prostatectomy but significantly lower complication rates.
- For larger prostates >100cc **HOLEP** is superior than GreenLight in terms of efficacy, re-operation rates and complication rates overall; overall outcomes for HOLEP are independent of gland size.
Anticoagulated patient

• Urology practice patterns:
  – Only 60% temporarily paused oral anticoagulation (OA) therapy.
  – 16% performed >30 surgeries for BPH on OA per year.
  – GreenLight most frequently used in anticoagulated patient (39%) followed by TURP (35%) and HOLEP (12%).

Anticoagulated patient

• In patients on anticoagulation or antiplatelet therapy vs. none:
  – HOLEP associated with:
    • No difference in transfusion rates or post-op hemoglobin.
    • Slightly worse length of stay and duration of CBI.
  – GreenLight associated with:
    • No difference in outcomes in several small studies.
    • GreenLight has excellent hemostatic properties due to the uptake of the 532 nm wavelength for oxyhemoglobin.
Conclusions

• The TURP remains a good operation.

• Resection using bipolar devices (B-TURP) should be considered as an alternative to M-TURP.

• GreenLight should be offered for patients with prostate volume <100 ml and is seen as promising in patients at high risk of bleeding or high risk of complications.

• HOLEP should be offered for patients in whom complete enucleation of the adenoma is required, especially in big prostates >100 ml.
Acknowledgements

- Dr. Ryan Paterson
- Dr. Brian Mayson
- Dr. Larry Goldenberg

Extra slides
## Costs

### Table 2. National TURP and laser reimbursement codes for urologists for 2010

<table>
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<th>2010</th>
<th>AB</th>
<th>BC</th>
<th>MB</th>
<th>NB</th>
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## Benign Prostatic Hyperplasia (BPH)

- **Men > 40 years**
- **EP**
- **Histologic BPH**
- **BPO**
- **LUTS**

Consequences of BPH

- Bladder diverticulum
- Bladder incontinence
- Progressive bladder dysfunction and decompensation
- Recurrent UTIs
- Hematuria
- Acute Urinary Retention
- Upper tract deterioration
- Bladder Stones

Management

- Conservative
- Medical
- Surgical
## Medical Management

- **Four important trials**
  - PLESS
  - VA Cooperative Study
  - MTOPS
  - COMBAT

### Table: Medical Management

<table>
<thead>
<tr>
<th>Trial</th>
<th>Arms (N)</th>
<th>Time</th>
<th>Criteria</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLESS</td>
<td>Placebo, Finasteride</td>
<td>4 yrs</td>
<td></td>
<td>Finasteride decreased risk of AUR (3 vs 7%) and need for TURP (5 vs 10%) in larger prostate volume (&gt;40g) higher risk of AUR</td>
<td>Better outcomes with big prostates &gt;55g</td>
</tr>
<tr>
<td>VA Cooperative Study</td>
<td>Placebo, Finasteride</td>
<td>1 yr</td>
<td></td>
<td>Finasteride no better than placebo</td>
<td>No difference between terazosin and combo.</td>
</tr>
<tr>
<td>MTOPS</td>
<td>Placebo, Doxazosin</td>
<td>4 yrs</td>
<td></td>
<td>All groups had decreased risk of progression and had improved symptom scores compared to placebo</td>
<td>Baseline prostate volume small 37g; In prostates &gt;50g finasteride had better symptoms and flow rates</td>
</tr>
<tr>
<td>COMBAT</td>
<td>Dutasteride, Tamsulosin</td>
<td>2 yrs</td>
<td>Inclusion: prostate size, PSA ≤10</td>
<td>Higher AUR or need for surgery with Flomax alone</td>
<td>Mean prostate volume 36.3cc, PSA 2.4</td>
</tr>
</tbody>
</table>

Campbell’s 2016.
Medical Management: Bottom Line

- First-line management of BPH: α-antagonist or (if the prostate is large) a 5α-reductase inhibitor.
- Combination therapy with both an α-antagonist and a 5α-reductase inhibitor best to prevent progression.
- Antimuscarinic agents and PDEIs are useful adjuncts for men with storage symptoms or erectile dysfunction, respectively.

Table 1. Cumulative Probability of Undergoing a Second Prostatectomy, According to the Type of Initial Prostatectomy, in Denmark, Manitoba, and the Oxford Region in Patients without Evidence of Bladder or Prostate Cancer at the Time of Operation.*

<table>
<thead>
<tr>
<th>Time after Operation (yr)</th>
<th>TURP</th>
<th>OPEN</th>
<th>CP REOPER</th>
<th>CP OPEN</th>
<th>CP TURP</th>
<th>OP REOPER</th>
<th>OP OPEN</th>
<th>OP TURP</th>
<th>OP OPEN</th>
<th>OP TURP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.3</td>
<td>1.2</td>
<td>3.6</td>
<td>2.3</td>
<td>0.6</td>
<td>3.8</td>
<td>3.2</td>
<td>0.8</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9.7</td>
<td>3.4</td>
<td>2.9</td>
<td>9.6</td>
<td>2.1</td>
<td>4.6</td>
<td>8.9</td>
<td>1.1</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>12.0</td>
<td>4.5</td>
<td>2.7</td>
<td>15.5</td>
<td>4.2</td>
<td>3.7</td>
<td>12.0</td>
<td>1.8</td>
<td>6.7</td>
<td></td>
</tr>
</tbody>
</table>

*The calculations are based on records on patients 55 to 84 years old, covering 1972 through 1985 in Denmark, 1972 through 1985 in Manitoba, and 1967 through 1978 in the Oxford region. TURP denotes transurethral resection and "open" open prostatectomy. Values in parentheses are total numbers of patients.

A word of caution.....

- Example: Importance of long-term follow-up (Reoperation rates at 8 years).
A word of caution.....

• Example: Reliability of each source of data?

Other lasers

• **Diode**
  • 980nm

• **Thulium**
  • Tm:YAG 2013nm continuous emission,
  • High affinity for water,
  • Proposed to have cleaner incision and absorption by tissue more efficient than Holmium; data lacking.