Urethral Strictures
Inevitable or preventable?

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Urethral Strictures

- Incidence
- Patho-Physiology
- Risk factors
- Prevention
Incidence and Pathology

> 90% in membranous urethra

Incidence 0-15%

Review of 7 studies 3%

Vicini. Presented at ABS Meeting, May, 2001
Risk Factors

• Dosimetry
  • Prostate V100 D90 not predictive

• HDR vs LDR

• XRT

• TURP

• Hypertension
No reliable dosimetric parameters predicting for acute urinary retention or symptoms

Allen 2005 IJROBP
Merrick 2000 IJROBP
Merrick 2003 IJROBP
Stone 2004 J Urol
Why V100 and V150 may not predict urinary toxicity
Why V100 and V150 may not predict urinary toxicity
Segment Urethral Dosimetry
Schematic of prostatic urethral dose partitioning
Schematic of prostatic urethral dose partitioning
Schematic of prostatic urethral dose partitioning
Cumulative hazard function for post-brachytherapy urethral stricture

1186 patients

3.6%

Merrick et al, J Urol 2006
Urethral strictures:
Bulbomembranous urethral dose

Between stricture groups: p < 0.001

Merrick et al, J Urol 2006
Urethral strictures

• Related to:
  – Brachytherapy dose to bulbomembranous urethra
    • No stricture 80% mPD
    • Stricture 95% mPD
  – XRT

Merrick et al, J Urol 2006
HDR Brachytherapy - strictures

475 pts tx HDR    Duchesne 2009

Median time 22 months

92% Bulbo-membranous

Incidence 12% at 6 yrs

Dose per fraction

Hypertension

Previous TURP? Vascular effect
Does technique influence incidence of strictures?
Study to evaluate dose to prostatic apex

- Identify a dose-response correlation to potential stricture formation

- Use these dose-responses to critically evaluate a change in treatment technique
Guildford Hybrid technique

- Pre-loaded peripheral needles
- Real-time central loose seeds
- Apex and base seeds placed longitudinal view
- Aim to reduce bulb dose
- Increase potency
Mean Dosimetric Coverage Penile Bulb

![Bar chart showing comparison between Classical and Guildford methods for D10, D25, D50, and D90 doses.](chart.png)

- **D10**: Classical > Guildford
- **D25**: Classical > Guildford
- **D50**: Classical = Guildford
- **D90**: Classical > Guildford

% Prescribed Dose vs. Dose Levels (D10, D25, D50, D90)
Prostate brachytherapy

Novel prostate brachytherapy technique: Improved dosimetric and clinical outcome

Jenny P. Nobes*, Sara J. Khaksar, Maria A. Hawkins, Melanie J. Cunningham
Stephen E.M. Langley, Robert W. Laing

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Table 4
Post-implant potency data at 12 and 24 months

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Time post-implant (months)</th>
<th>Group 1, n = 60 classical technique</th>
<th>Group 2, n = 60 novel technique</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIEF-5 score</td>
<td>12</td>
<td>65%</td>
<td>85%</td>
<td>0.011</td>
</tr>
<tr>
<td>≥ 11/25</td>
<td>24</td>
<td>61.7%</td>
<td>83.3%</td>
<td>0.008</td>
</tr>
</tbody>
</table>
Case control study

• 23 stricture patients matched to 23 non stricture patients.

• Matching criteria:
  • Post operative prostate: volume, V150 & D90 (within 5%)
  • Seed activity
  • Planning and treatment technique
  • Catheter at time of CT scan

• Modified Uniform - 12 strictures
• Guildford Hybrid - 11 strictures with 20 matches

• Stricture and matched patient dosimetry were grouped together and analyzed using an unpaired student t-test (p<0.05 is significant)
## Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Stricture group</th>
<th>Control group</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median V150 (cc)</td>
<td>0.9</td>
<td>0.6</td>
<td>0.028*</td>
</tr>
<tr>
<td>Median of mean dose (Gy)</td>
<td>199</td>
<td>165</td>
<td>0.012*</td>
</tr>
</tbody>
</table>
Technique

- New technique lowers dose to penile bulb also reduces strictures

<table>
<thead>
<tr>
<th>Technique</th>
<th>Dates</th>
<th>Stricture incident rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Uniform</td>
<td>Jan 03 - Jan 05</td>
<td>11%</td>
</tr>
<tr>
<td>Guildford Hybrid</td>
<td>Feb 05 - Feb 07</td>
<td>2%</td>
</tr>
</tbody>
</table>
Conclusions

- Dose to apex / bulb critical
- Technique matters
- Dose rate dependent
- Patient factors
- Small % incidence inevitable