Clinical Efficacy and Anatomical Basis for A Cavernosal Nerve Interposition Graft

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Background

• Significant stage migration:
  cT3: 25% in 1987
  3% in 2001

• 40% of men with cT3 treated with XRT will recur locally

• 20-30% of cT3 treated with RRP will have organ confined disease

Carver et al. J Urol, 176, 564-568, 2006
Effectiveness of RRP in cT3 Disease

- XRT as monotherapy: 10-20% 5 year bDFS
- XRT +Hormones: 74% bDFS (Bolla et al.)
- RRP for cT3 Disease:
  - Mayo series: 90% 10yr CSS (52% received adjuvant hormones)
  - MSKCC series: 44% 10 yr bDFS 85% CSS at 10 years (no adjuvant tx)
- Local recurrence rates after XRT: 20-60%
Background

- RRP has a clear role in cT3 disease
- Resection of NVB may be indicated
- DRE, PSA, Endorectal MRI, site specific label of biopsy information
- Effect on Erectile function
Effect of Neurovascular Bundle Resection

Rabbani et al. J Urol, 1929-34, 2000
**Effect of Bilateral Resection**

### Table 2. Published reports on postoperative erectile function after non-nerve-sparing surgery

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Patients</th>
<th>Potency rate, %</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finkle and Taylor [12]</td>
<td>1982</td>
<td>14</td>
<td>43</td>
<td>PPE</td>
</tr>
<tr>
<td>Pontes et al. [13]</td>
<td>1986</td>
<td>35</td>
<td>54</td>
<td>RPE</td>
</tr>
<tr>
<td>Geary et al. [6]</td>
<td>1995</td>
<td>187</td>
<td>1</td>
<td>RPE</td>
</tr>
<tr>
<td>Stanford et al. [7]</td>
<td>2000</td>
<td>1,291</td>
<td>34</td>
<td>RPE</td>
</tr>
<tr>
<td>Katz et al. [14]</td>
<td>2002</td>
<td>50</td>
<td>30</td>
<td>LPE</td>
</tr>
</tbody>
</table>

PPE = Perineal prostatectomy; RPE = retropubic prostatectomy; LPE = laparoscopic prostatectomy.
What can be Done?

• Penile Injection therapy
• Vacuum Erection Devices
• Surgical Implant Devices
• *Nerve Grafting*?
Anatomical Basis for Nerve Grafting

• Walsh and Donker 1982

• One single nerve vs. network of nerve bundles

• Variation in anatomic location
History of Cavernosal Nerve Graft

• 1992 - Quinlan and Walsh demonstrate efficacy of cavernosal nerve graft in rat model

• Walsh 2000 expresses skepticism

• 2000 – Kim et al. report on first experience in 2 patients with bilateral grafts with recovery of complete erectile function
Role of a Nerve Graft

• Serves as conduit for nerve regeneration

• Source of Schwann cells and growth factors
# Published Results of Cavernosal Nerve Grafting

<table>
<thead>
<tr>
<th>Author</th>
<th>Center</th>
<th># patients</th>
<th>Mean Age</th>
<th>Unilateral vs. Bilateral</th>
<th>Potency Rate (Unassisted)</th>
<th>Potency rate with Medication</th>
<th>Mean Follow up (mos)</th>
<th>Graft Used</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim et al.</td>
<td>Baylor/MSKCC</td>
<td>23</td>
<td>59</td>
<td>Bilateral</td>
<td>6/23 (26%)</td>
<td>10/23 (43%)</td>
<td>23</td>
<td>Sural</td>
<td></td>
</tr>
<tr>
<td>Perotte et al.</td>
<td>MD Anderson/Univ. of Montreal</td>
<td>8</td>
<td></td>
<td>Bilateral</td>
<td>3/8 (37.5%)</td>
<td></td>
<td>12</td>
<td>Sural</td>
<td></td>
</tr>
<tr>
<td>Masterson et al.</td>
<td>MSKCC</td>
<td>11</td>
<td></td>
<td>Unilateral</td>
<td>0%</td>
<td></td>
<td></td>
<td>Sural</td>
<td>Salvage RRP</td>
</tr>
<tr>
<td>Anastasiadis et al.</td>
<td>Columbia</td>
<td>12</td>
<td>57.5</td>
<td>Unilateral</td>
<td>4/12 (33%)</td>
<td></td>
<td>16.1</td>
<td>Sural</td>
<td></td>
</tr>
<tr>
<td>Nelson et al.</td>
<td>Vanderbilt</td>
<td>27</td>
<td>57</td>
<td>19% bi 81% uni</td>
<td>4/27 (15%)</td>
<td>10/27 (37%)</td>
<td>14</td>
<td>Genitofemoral</td>
<td></td>
</tr>
<tr>
<td>Porpiglia et al</td>
<td>Univ. of Turin, Italy</td>
<td>12</td>
<td>66</td>
<td>Unilateral</td>
<td>5/12 (42%)</td>
<td></td>
<td>18.4</td>
<td>Sural</td>
<td>Laparoscopic</td>
</tr>
</tbody>
</table>
Role of Nerve Graft in Continence?

- Singh et al – 53pts with unilateral nerve graft
- Compared unilat. Nerve resection with and without graft
- UCLA Prostate Cancer Index Questionnaire
- Multivariate analysis showed that UNR+SNG associated with 9.95 times greater chance of reaching complete urinary control
- Contribution of cavernosal nerve to external sphincter function

Singh et al. Urology, 63(6): 1122-27, 2004
### Robotic Genitofemoral-Cavernosal Nerve Graft Experience
#### Weill Medical College of Cornell University

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Preop PSA</th>
<th>Clinical Stage</th>
<th>Initial Gleason</th>
<th>Final Gleason</th>
<th>P Stage</th>
<th>Margin Status</th>
<th>Hormones</th>
<th>Unilateral vs. Bilateral</th>
<th>Unassisted Potency</th>
<th>Potent with Medication</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>61</td>
<td>6.2</td>
<td>T2A</td>
<td>7</td>
<td>7</td>
<td>T2BN0M0</td>
<td>Negative</td>
<td>None</td>
<td>Unilateral</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>36</td>
<td>T3B</td>
<td>8</td>
<td>9</td>
<td>T3AN1M0</td>
<td>Negative</td>
<td>Yes</td>
<td>Bilateral</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>72</td>
<td>9.4</td>
<td>T1C</td>
<td>9</td>
<td>9</td>
<td>T3AN0M0</td>
<td>Positive</td>
<td>Yes</td>
<td>Bilateral</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>49</td>
<td>21</td>
<td>T2B</td>
<td>6</td>
<td>7</td>
<td>T3AN0M0</td>
<td>Negative</td>
<td>None</td>
<td>Unilateral</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>53</td>
<td>8.8</td>
<td>T1C</td>
<td>6</td>
<td>6</td>
<td>T2BN0M0</td>
<td>Negative</td>
<td>None</td>
<td>Unilateral</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>66</td>
<td>8.7</td>
<td>T2B</td>
<td>7</td>
<td>7</td>
<td>T3AN0M0</td>
<td>Negative</td>
<td>None</td>
<td>Unilateral</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Mean Follow up 14.1 months**
Technique of Robotic Nerve Graft

- Robotic RRP performed in standard fashion
- Proximal and distal end of nerve identified and marked with suture (Cavermap assisted)
- NVB resected en bloc with prostate
- Graft site measured for length – 20% longer than required
- Genitofemoral nerve harvested and retrieved
- Reverse graft placed with 7.0 sutures
- Urethrovesical anastamosis performed
Conclusion

• Early data on nerve grafting is intriguing

• Robotic nerve grafting is feasible

• May have some benefit in urinary function

• Multicenter, randomized trials are necessary to validate results