Experience with laproscopic placement of peritoneal catheter in ventriculoperitoneal shunts at Children's Medical Center, Medical College of Georgia
2007-2011

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MCG story

• All shunts placed using minilaparotomy or split trochar open techniques prior to 2007
• Laproscopy reserved for the “hostile” abdomen
• Previous chairman left December 2008
• Pediatric surgery approached about laproscopically assisting with all distal catheter placement.

Alabama shunt study 2004-2009

• 810 consecutive VP procedures comparing laproscopic procedure to open placement of shunts
• Found no change in failure, but shorter LOS, reduced operative time, and blood loss
• Over course of study it was noted that surgeons began to prefer laproscopic assistance
• This study looked at adult shunt population

Study description

• Obtained IRB from our institution to conduct a retrospective chart review of all ventriculoperitoneal shunts placed with laproscopic assistance at our Children's Medical Center from Jan 2007- Dec 2011
• Study to review outcomes for our method of shunt placement
• Inclusion Criteria – Any operation that included placement with laproscopic assistance of complete proximal, valve and distal catheter system with a proximal terminus in ventricle and distal terminus in peritoneal cavity

Procedure

• Cranial
  – Curvilinear occipital incision on right
  – Burr hole made
  – Distal tunneling performed
    • With possible supraclavicular exit if one pass to abdomen not possible
    • Terminus of distal tunneling determined by laproscopic team over RUQ

• Distal
  – Incision and trochar for endoscope placed at umbilicus after insufflation of abdomen
  – Abdominal contents inspected, adhesions taken down with camera, if necessary
  – RUQ palpation visualized to determine entry point
  – Peel-away trochar placed through abdominal incision using Seldinger technique
Procedure

• Joint
  – Distal tubing is passed to abdominal incision site and covered in antibiotic soaked sponge
  – Ventricular catheter is placed with Neuro-pen endoscope for optimal placement
  – Catheter attached to distal system, flow confirmed before placement in abdomen
  – Catheter passed into abdomen under laproscopic visualization and guided above liver where again, flow is confirmed

Patient Characteristics

• 120 Shunt procedures met inclusion criteria in 81 patients

Sex
Female 31 (38.2%)
Male 50 (61.7%)

Race
White 31 (38.3%)
Black 48 (59.2%)
Mixed 2 (2.5%)

Birth Age
Term 27 (33.3%)
Preemies 47 (58 %)
Unknown 7 (8.6%)

• Gestational Age in Preemies
  Avg. 28.2 weeks
  Range 24-36 weeks

Patient Characteristics

• Previous Abdominal surgery
  40 (49.4 %)

• Indication for Shunt
  Congenital Hydrocephalus 71.6 (61.6%)
  IVH 12 (14.8%)
  Tumor 6 (7.4%)
  Trauma 3 (3.7%)
  Congenital Infection 1 (1.2%)
  Pseudotumor Cerebri 1 (1.2%)

• ASA Score
  1-2 8 (6.6%)
  3 86 (71.6%)
  4 22 (18.3%)
  NA 4 (3.3%)

• Blood loss
  11.6 cc

• OR time
  79.8 min

Our data vs. Other lap VPS series (adult)

<table>
<thead>
<tr>
<th></th>
<th>Infection (%)</th>
<th>Prox. Mal. (%)</th>
<th>Dist. Mal. (%)</th>
<th>Total Mal. (%)</th>
<th>Mean Age yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCG (n = 120)</td>
<td>13 (10.8%)</td>
<td>26 (21.7%)</td>
<td>3 (2.5%)</td>
<td>52 (43%)</td>
<td>5.0</td>
</tr>
<tr>
<td>Naftel et al. Lap (n= 475)</td>
<td>39 (8.2%)</td>
<td>35 (7.3%)</td>
<td>11 (2.3%)</td>
<td>85 (17.9%)</td>
<td>52.0</td>
</tr>
<tr>
<td>Naftel et al. Open (n= 335)</td>
<td>22 (6.6%)</td>
<td>40 (12.0%)</td>
<td>6 (1.8%)</td>
<td>68 (20.2%)</td>
<td>51.1</td>
</tr>
</tbody>
</table>

Infections

• MSSA: 3/13 (23.08%)
• MRSE: 3/13 (23.08%)
• MRSA: 2/13 (15.38%)
• Enterococcus: 2/13 (15.38%)
• E. coli: 2/13 (15.38%)
• Pseudomonas: 1/13 (7.69%)
### < 1 year at surgery subpopulation

<table>
<thead>
<tr>
<th>Birth Age</th>
<th>Infection</th>
<th>Proximal</th>
<th>Distal</th>
<th>Total complications</th>
<th>Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30 weeks</td>
<td>4 (14.8%)</td>
<td>11 (40.7%)</td>
<td>2 (7.4%)</td>
<td>17 (63%)</td>
<td>27</td>
</tr>
<tr>
<td>30-36 weeks</td>
<td>1 (11.1%)</td>
<td>0</td>
<td>0</td>
<td>1 (11.1%)</td>
<td>9</td>
</tr>
<tr>
<td>Term</td>
<td>1 (5.9%)</td>
<td>4 (23.5%)</td>
<td>0</td>
<td>5 (29.4%)</td>
<td>17</td>
</tr>
</tbody>
</table>

* Remaining population infection rate 7/67 (10.4%)

### Failure Cause According to Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Infection</th>
<th>Proximal</th>
<th>Distal</th>
<th>Disconnect</th>
<th>Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0</td>
<td>1 (33.3%)</td>
<td>1 (33.3%)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2008</td>
<td>3 (18.7%)</td>
<td>4 (25.0%)</td>
<td>0</td>
<td>1 (6.2%)</td>
<td>16</td>
</tr>
<tr>
<td>2009</td>
<td>4 (15.4%)</td>
<td>8 (30.8%)</td>
<td>1 (4%)</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>2010</td>
<td>4 (9.5%)</td>
<td>9 (21.4%)</td>
<td>1 (2.3%)</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>2011</td>
<td>2 (6.0%)</td>
<td>5 (9.1%)</td>
<td>0</td>
<td>0</td>
<td>33</td>
</tr>
</tbody>
</table>

### Distal Malfunctions

- 17 yo AAF former preemie with multiple open VP shunt placements and revisions s/p laparoscopic VP shunt placement at age of 13
- Preemie with infected G-tube that caused distal shunt obstruction. Shunt found walled in by omentum on revision
- 24 wk preemie with NEC who had been managed with subgaleal shunt and EVD until 2 kg. VP shunt attempted and later converted to VA shunt.

### Our data vs. open VPS in children

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Infection (%)</th>
<th>Prox. Mal. (%)</th>
<th>Dist. Mal. (%)</th>
<th>Total Mal. (%)</th>
<th>Mean Age (yrs)</th>
</tr>
</thead>
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<td>MCG (n = 120)</td>
<td>13 (10.8%)</td>
<td>26 (21.7%)</td>
<td>3 (2.5%)</td>
<td>52 (43%)</td>
<td>5.0</td>
</tr>
<tr>
<td>Ahmed et al. (n = 50)</td>
<td>6 (12%)</td>
<td>7 (14%)</td>
<td>9 (18%)</td>
<td>22 (44%)</td>
<td>Range = 1 day–7 yrs</td>
</tr>
<tr>
<td>Casey et al. (n=380)</td>
<td>12%</td>
<td>*</td>
<td>*</td>
<td>53%</td>
<td>0-10 years</td>
</tr>
</tbody>
</table>

* = 41% total mechanical failure rate (Prox, dist, malposition, fracture, etc.), 30% Blockage (Prox or dist)

### Cons

- Reliance on another surgical team for every procedure
- Agreement on procedure methods
- No significant improvement in overall shunt failures

### Pros

- Reduced take-backs for misplaced catheters
- Above liver placement protects distal catheter
- Placement of only proximal catheter by neurosurgeon
- Reduced blood loss
- Reduced operative time
- No blind intraperitoneal procedures
- Training benefit for surgery residents at academic institutions
Future direction

• Attempt to compare laproscopic outcomes to open outcomes in the same study period.

Bibliography