#41 Comparing Risk of Unplanned Return to the Operating Room (UPROR): Magnetically Controlled Growing Rod (MCGR) System vs Prosthetic Rib Constructs (PRC)

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-Disclosures-

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Since FDA approval in 2014 (USA), use of MCGR has grown dramatically for patients with early onset scoliosis (EOS)

Utilized as alternative to Traditional Growing Rods (TGR) or “Prosthetic Rib Constructs (PRC)” in effort to reduce surgeries
Does MCGR Actually Reduce Surgeries? (Planned and/or unplanned)

- **Purpose**: To compare unplanned return to OR (UPROR) between MCGR and PRC - ...2 years follow up

- We hypothesized that MCGR patients will have fewer unplanned surgeries compared to PRC at 2 years
Retrospective cohort study

- Single academic medical center (CHONY)
- Consecutive PRC and MCGR patients receiving a primary implant

**Outcomes:**
- Unplanned return to OR (UPROR)

**Cause of UPROR**
- Instrumentation Failure
- Rod Fracture
- I&D/Infection
- I&D/Wound Dehiscence
- Revision or Removal
Primary Outcome: “UPROR”

• Outcomes were reported as:
  • 2 year risk, represented as risk per patient of UPROR
  • Hazard model showing failure over time
    • Probability of UPROR over time
    • Accounts for unequal follow up times due to construct availability
      • (PRCs available longer)
## Patient Demographics

<table>
<thead>
<tr>
<th>Variables</th>
<th>MCGR (N=22)</th>
<th>PRC (N=50)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at Surgery, mean year±SD</td>
<td>6.0±1.2</td>
<td>6.1±2.6</td>
<td>0.410</td>
</tr>
<tr>
<td>Male</td>
<td>16 (72.7%)</td>
<td>27 (54.0%)</td>
<td>0.136</td>
</tr>
<tr>
<td>Female</td>
<td>6 (27.3%)</td>
<td>23 (46.0%)</td>
<td></td>
</tr>
<tr>
<td>BMI mean %tile±SD</td>
<td>46.2±37.2</td>
<td>52.6±35.9</td>
<td>0.252</td>
</tr>
<tr>
<td>CEOS, Etiology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congenital/Structural</td>
<td>2 (9.1%)</td>
<td>7 (14.0%)</td>
<td>0.895</td>
</tr>
<tr>
<td>Neuromuscular</td>
<td>4 (18.2%)</td>
<td>6 (12.0%)</td>
<td></td>
</tr>
<tr>
<td>Syndromic</td>
<td>10 (45.5%)</td>
<td>23 (46.0%)</td>
<td></td>
</tr>
<tr>
<td>Idiopathic</td>
<td>6 (27.3%)</td>
<td>14 (28.0%)</td>
<td></td>
</tr>
<tr>
<td>Tone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>10 (45.5%)</td>
<td>21 (40.0%)</td>
<td>0.950</td>
</tr>
<tr>
<td>Normal</td>
<td>9 (40.9%)</td>
<td>21 (42.0%)</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>3 (13.6%)</td>
<td>8 (16.0%)</td>
<td></td>
</tr>
</tbody>
</table>

No Difference in Age, BMI, CEOS, Tone
## Patient Demographics

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<th>PRC (N=50)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Coronal Curve, mean degree ± SD</td>
<td>46.2 ± 37.2</td>
<td>52.6 ± 35.9</td>
<td>0.252</td>
</tr>
<tr>
<td>Kyphosis Curve, mean degree ± SD</td>
<td>71.1 ± 20.9</td>
<td>58.6 ± 18.7</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>51.5 ± 28.2</td>
<td>31.8 ± 18.5</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Cobb and Kyphosis Larger with MCGR
Patients with PRC (50): 206 total surgeries \( \rightarrow \) 3.2 per patient/yr

Patients with MCGR (22): 37 total surgeries \( \rightarrow \) 0.9 per patient/yr

PRC results in \( >3 \times \) more surgeries at only 2 years follow up
37.3% had UPROR within 2 years of index instrumentation

- Patients with PRC (50):
  - 0.8 UPROR per patient/year
  - 36.4% patients with at least 1 UPROR

- Patients with MCGR (22):
  - 0.9 UPROR per patient/year
  - 40.0% patients with at least 1 UPROR

UPROR Same at 2 years between groups
Patients with MCGR reach a 20% risk of UPROR at twice the speed of PRC patients; higher overall lifetime risk.

Patients with MCGR had a 4.6 times higher lifetime hazard of UPROR than patients with PRC (p=0.002), adjusted for coronal and kyphotic curvature.

NewYork-Presbyterian
Morgan Stanley Children's Hospital

Columbia University
Department of Orthopedic Surgery
Within high tone patients, MCGR has 2.59x increased risk of UPROR than VEPTR adjusting for coronal and kyphosis curvatures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Risk Ratio</th>
<th>95% C.I.</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCGR</td>
<td>2.59</td>
<td>1.03-6.51</td>
<td>0.043</td>
</tr>
<tr>
<td>Major Coronal Curve</td>
<td>1.02</td>
<td>1.01-1.03</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Maximum Kyphosis</td>
<td>0.96</td>
<td>0.92-1.00</td>
<td>0.033</td>
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</tbody>
</table>
Discussion

• Study limited by relatively small numbers, especially in subgroups using historical control of PRC

• Though MCGR constructs require fewer overall surgeries than PRC, risk of UPROR is not reduced; pattern changing…

• Risk of UPROR seems to be higher for MCGR over time
  • Longer follow up will better define the long term survivorship
Conclusions

• Reduction in surgical procedures and anesthesia exposure in a young, vulnerable population remains a significant benefit of MGCR.

• Larger studies with longer follow up necessary to identify risk factors associated with UPROR for MCGR over time (e.g., high tone) as some of these patients may do better with TGR.
Thank You

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