Maximal Force Generated by Magnetically Controlled Growing Rods at Different Rod Length Decreases with Rod Lengthening

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Hillard T. Spencer
- None

Reginald Fayssoux
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Robert H. Cho
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Magnetically Controlled Growing Rods (MCGR) has been met with great enthusiasm by surgeons managing early onset scoliosis.

The new devices offer the potential to decrease the cost and morbidity associated with repeated lengthening surgeries.

One of the potential negative consequences of traditional growing rod treatment is the law of diminishing returns.

- Cause of this phenomenon is unknown and may be multifactorial.
- Strength of the lengthening mechanism in the MCGRs as it lengthens may have an impact on the length gained with each subsequent lengthening of the MCGR.
Objective

- To evaluate the maximal force generated by MCGR at 3 different lengthened positions.
Method

- 12 MCGRs (90mm actuator length) were obtained
- Maximal force generated at different distracted lengths tested with force testing machine
- Maximal lengthening force measured in pounds of force
- Expansion length of 0mm, 25mm and 40mm.
- Longitudinal analysis was performed using mixed effects linear regression to account for repeated measures and variability between individual implants.
## Results

<table>
<thead>
<tr>
<th>Actuator Length</th>
<th>Avg. Max Force Generated (lbs)</th>
<th>Std. Dev.</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>46.8</td>
<td>2.06 (range 43-50)</td>
</tr>
<tr>
<td>25</td>
<td>44.9</td>
<td>2.48 (range 39.4-49.5)</td>
</tr>
<tr>
<td>40</td>
<td>43.2</td>
<td>5.56 (27.3-49.1)</td>
</tr>
</tbody>
</table>
Mixed Effects Linear Model

Avg. decrease of 0.089 pounds per mm of lengthening (95% CI, 0.030-0.148; p=0.003)
Conclusion

- There is a small but statistically significant decrease in the maximal force generated by MCGR as the rods are lengthened.
- The decrease in force generated may result in diminished spine length gained with each subsequent MCGR lengthening.
- Despite the reduction in the number of invasive surgical procedures for lengthening, the decreasing force generated by MCGR may contribute to the diminishing returns.
Thank You