Long Term Gait Outcomes of Idiopathic Toe Walkers

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Background/ Objectives

- Idiopathic Toe Walking (ITW): persistent toe walking with no known underlying cause
- Non-operative treatments: physical therapy, casting, bracing, and Botox
- Surgical treatment (triceps surae contracture):
  - Improved kinematic outcomes 1 yr post (McMulkin et al, JPO 2006; Hemo et al, JPO 2006)
- Purpose of this study: assess long term 3D gait outcomes of ITW treated surgically

Study Participants

- IRB approval – Prospective Cohort study
- 24 subjects identified from Motion Analysis Lab (MAL) database
  - diagnosis of ITW
  - surgical lengthening of gastrocnemius/soleus
  - MAL study pre-op and 1 yr post-op
  - >5 yrs since surgery
- 15 subjects contacted
- 8 subjects completed MAL study > 5 yrs after surgery
  - 6 males; 2 females
  - mean age 17.6 yrs at final follow-up

Methods

- Subjects completed:
  - Lower extremity physical exam
  - 3-D computerized kinematics /kinetics
  - Statistical analysis:
    - n=16 (both sides)
    - Dependent variables analyzed
      - repeated measures ANOVA timing: pre-op, 1 yr post-op, greater than 5 yrs post-op
    - Significance p = 0.05
      - post hoc tests student Newman Keuls

Results

- Mean age – at surgery = 9.0 yrs
- Mean time to follow-up
  - post-op = 1.3 yrs initial
  - >5 yrs = 8.7 yrs (5.1-15.5 yrs)
- 4 subjects tendo-Achilles lengthening; 4 subjects gastrocnemius lengthening
- Significant kinematic improvements at 1 yr maintained at 5 yrs post-op, Table 1

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-op</th>
<th>1yr Post-op</th>
<th>5yr Post-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Pelvic Tilt</td>
<td>17.7</td>
<td>14.7*</td>
<td>13.1*</td>
</tr>
<tr>
<td>Knee Ext Initial Contact</td>
<td>5.1</td>
<td>3.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Peak Knee Ext Stance</td>
<td>2.6</td>
<td>2.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Peak DF Stance</td>
<td>-2.9</td>
<td>9.1*</td>
<td>8.9*</td>
</tr>
<tr>
<td>Peak DF Swing</td>
<td>-15.4</td>
<td>-1.6*</td>
<td>-0.1*</td>
</tr>
<tr>
<td>Foot Progression Angle</td>
<td>-9.6</td>
<td>-11.1</td>
<td>-14.7*†</td>
</tr>
<tr>
<td>Gait Deviation Index</td>
<td>75.4</td>
<td>93.7*</td>
<td>88.2*</td>
</tr>
<tr>
<td>DF Knee Flexed - Phys Exam</td>
<td>2.3</td>
<td>12.3*</td>
<td>11.1*</td>
</tr>
<tr>
<td>DF Knee Extended - Phys Exam</td>
<td>-8.7</td>
<td>6.3*</td>
<td>0.6*†</td>
</tr>
</tbody>
</table>

* Significantly different from Pre-op
† Significantly different 1yr to 5yr post-op (p<0.05)

Discussion

- ITW treated surgically for triceps surae contractures maintained significant improvements in key gait variables at greater than 5 yrs post-op
- Improvement in physical exam measure of dorsiflexion with the knee extended was not maintained over time but was still greater than initial. This finding did not manifest in gait and may be related to poor correlation between physical exam and gait data (McMulkin JPO 2000)

Conclusion

Surgical lengthening of the gastrocnemius/soleus when indicated for idiopathic toe walkers resulted in gait improvements that were the same or better from 1yr to 5 yr follow-up