Mid-Term Results of Ponseti Method for Clubfoot in Patients with Spina Bifida

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Mid-Term Results of Ponseti Method for Clubfoot in Patients with Spina Bifida

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• Does not intend to discuss commercial products or services.
• Does not intend to discuss non-FDA approved uses of products/providers of services.
• Has no financial relationships to disclose
Background

• Clubfoot = most common foot deformity in spina bifida
  • 30-50% of patients

• Incidence varies with neurologic level
  • 90% thoracic/lumbar
  • 50% sacral

Westcott et al Radographics 1992
de Carvalho Neto et al J Pediatr Orthop 1996
Background

• Different from idiopathic clubfoot:
  • Severely rigid deformity
  • Recalcitrant to treatment
  • Propensity to recur
  • Often associated with severe internal tibial torsion
Background

• Ponseti serial casting method
  • Now widely applied to clubfoot in spina bifida

• While several studies have reported lower success rates of Ponseti method in non-idiopathic clubfoot,

• Most available studies include heterogeneous diagnoses or report short-term results
Purpose

• To report mid-term outcomes in patients with spina bifida treated for clubfoot using the Ponseti method

• To determine if there is a difference in recurrence rate in patients treated with percutaneous TAL compared to open excision
Methods

Design:
• IRB approved retrospective chart review
• All patients from a single-center with a diagnosis of spina bifida who underwent Ponseti casting for treatment of clubfoot deformity of one or both feet
Methods

Subjects:
• Patients age 0-2y with clubfoot and spina bifida
  • Seen at Lurie spina bifida clinic in Chicago, IL from 2004 - 2014

• Exclusion criteria:
  • Age >2y at presentation
  • Diagnosis other than spina bifida
  • History of prior treatment of clubfoot
  • Less than 1y follow-up available
Methods

Demographic variables:
• Age at presentation
• Age at initiation of casting
• Gender
• Laterality of clubfoot
• Number of casts prior to TAL
  • (or # needed for treatment if no TAL performed)
• Age at time of TAL
• Type of TAL performed
• Post-cast management
• Age at recurrence
Methods

Outcomes assessed:
• Recurrence – defined as need for further surgical intervention
• Further procedures performed
• Complications – skin breakdown, fracture, etc.
Methods

Treatment protocol:
• Ponseti method – serial manipulation, long-leg plaster casting
• TAL performed in operating room under GA

- Percutaneous TAL
- Open excision
Methods

Treatment protocol:

• After casting, all patients fitted with either boots and bar or AFOs
• All patients closely monitored for skin irritation and complications

- Boots and bar used at beginning of study period
  - Worn at night

- Shift toward AFOs
  - Worn 23h/d
Methods

Statistical analysis:

• Demographic data and outcome data were compared using:
  • Independent t-tests for continuous data
  • Chi-square tests for categorical data
Results: Subjects

• 26 feet
  • 16 consecutive patients (9♂ / 7♀)
• Average f/u = 5.4y (1.8 – 7.8y)
• Casting initiated at average age of 46 days (range 21-126 days)
• Average of 6.54 casts (range 2-9) prior to TAL
• 23 underwent TAL at average age of 105 days (64-189 days)
  • 12 percutaneous tenotomy
  • 11 open excision
Results: Recurrence

- Initial correction achieved in 26/26 feet
- After follow-up (avg 5y):
  - 42% (11 feet) successfully treated without recurrence
  - 58% (15 feet) recurrence
    - 10 posterior release
    - 4 PMLR
    - 1 tendon transfer
- Time to recurrence: 1.4y (0.9 – 2.8y)
  - All recurrence occurred <3y after initial treatment
Results: Recurrence

- 100% (12/12) percutaneous TAL had recurrence vs. 18% (2/11) open excision
  \( p<0.0006 \)

Table 1: Recurrence vs Non-Recurrence

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Recurrence</th>
<th>Non-Recurrence</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Number of Feet</td>
<td>15 (57.7%)</td>
<td>11 (42.3%)</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>8</td>
<td>4</td>
<td>0.39</td>
</tr>
<tr>
<td>Left</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Follow-up (years)</td>
<td>5.8 ± 1.7</td>
<td>4.9 ± 1.4</td>
<td>0.14</td>
</tr>
<tr>
<td>Gender – Feet (patients)</td>
<td></td>
<td></td>
<td>0.95 (0.46)</td>
</tr>
<tr>
<td>Male</td>
<td>7 (4)</td>
<td>5 (5)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>8 (5)</td>
<td>6 (3)</td>
<td></td>
</tr>
<tr>
<td>Age at First Cast (days)</td>
<td>38.9 ± 26</td>
<td>56 ± 25.1</td>
<td>0.12</td>
</tr>
<tr>
<td>Age at First Cast (days)</td>
<td>(21, 126)</td>
<td>(26, 97)</td>
<td></td>
</tr>
<tr>
<td>Age at TAL (Days)</td>
<td>104.6 ± 38.7</td>
<td>105.4 ± 30.8</td>
<td>0.96</td>
</tr>
<tr>
<td>Age at TAL (Days)</td>
<td>(24, 188)</td>
<td>(76, 352)</td>
<td></td>
</tr>
<tr>
<td>TAL Method</td>
<td></td>
<td></td>
<td>( 0.00059 )</td>
</tr>
<tr>
<td>Percutaneous</td>
<td>12</td>
<td>0</td>
<td>0.39</td>
</tr>
<tr>
<td>Open</td>
<td>2</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Post Cast Treatment</td>
<td></td>
<td></td>
<td>0.91</td>
</tr>
<tr>
<td>Dennis Brown Boots and Bar</td>
<td>3 (20%)</td>
<td>2 (18.2%)</td>
<td></td>
</tr>
<tr>
<td>AFOs</td>
<td>12 (80%)</td>
<td>9 (81.8%)</td>
<td></td>
</tr>
</tbody>
</table>
Results: Recurrence

Outcome of Ponseti Treatment by Method of TAL

16
14
12
10
8
6
4
2
0

Recurrence
Maintenance of Correction

Percutaneous  Open  None
Results: Recurrence

- Percutaneous tenotomy vs open excision:
  - Gender distribution and laterality similar between groups
  - Average follow-up longer in percutaneous group (6.3y vs 4.2y, p=0.0009)
  - Recurrence occurred earlier with percutaneous tenotomy compared to open excision (1.19y vs 2.08y from treatment initiation, p=0.035)
  - Post cast management similar between groups
Results: Post-Cast Management

- After casting:
  - Dennis Brown boots and bars
  - 5 patients:
    - 3 recurrence
    - 2 non-recurrence

- After casting:
  - AFOs
  - 21 patients:
    - 12 recurrence
    - 9 non-recurrence
Results: Complications

- 10 patients: 6 recurrence/ 4 non-recurrence
  - Dennis Brown boots and bars (80%)
  - AFOs (29%)

**4/5 patients:**
Skin complications
2 transitioned to AFOs

**6/21 patients:**
Minor skin complications
No significant delay in treatment
Conclusions

• 42% patients with spina bifida and clubfoot treated with Ponseti method had successful outcome requiring no further treatment at mid-term follow-up of 5.4 years

• Recurrence with open Achilles excision significantly lower than with percutaneous TAL (18% vs 100%, $p<0.0005$)
  • Also substantially lower than previously published recurrence rates in spina bifida (33.3- 68%)

Conclusions

- Ponseti method leads to reliable initial correction of clubfoot associated with spina bifida
  - Useful to decrease the need for extensive soft-tissue releases
  - 15% (4/26) required PMLR

- To decrease risk of recurrence, an open excision of the Achilles should be performed

- Families should be counseled prior to initiation of treatment about realistic expectations regarding the high risk of recurrence and potential need for further treatment
Thank you
References