Satisfaction of patients who have undergone lengthening with both internal and external fixation: a comparison study

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Disclosures

- Dr. Standard is a paid consultant and receives royalties from Ellipse Technologies Inc.

- Dr. Herzenberg is an unpaid consultant for Ellipse Technologies Inc.

- Drs. Standard and Herzenberg are part of the Physician Development Team for the PRECICE nail.

- Sinai Hospital receives research funds from Ellipse Technologies Inc.
Current options

- **External lengthening devices**
  - Ring fixators
  - Monolateral fixators

- **Internal lengthening devices**
  - Mechanical nails
    - PRECICE (Introduced 2011)
    - ISKD (Removed from market)
    - Albizzia nail (No FDA approval)
  - Motorized nail
    - Fitbone (No FDA approval)
Lengthening

- Disadvantages with external fixators
  - Joint stiffness
  - Pin infection
  - Muscle contracture
  - Malalignment
  - Refracture
Lengthening

- Advantages of internal lengthening devices
  - Less joint stiffness
  - No pin tract infections
  - Higher activity level during lengthening
  - Faster rehabilitation
  - Less pain
Which lengthening puppy is happier: Ex Fix or Internal Nail?
Hypochondroplasia

1\textsuperscript{st} Lengthening

2\textsuperscript{nd} Lengthening
Our hypotheses

- Patients prefer internal lengthening to external lengthening.
- Patients perceive less pain with internal compared to external lengthening devices.
Isn’t it obvious?

Exclusive To All Newspapers

DIANA WAS STILL ALIVE HOURS BEFORE SHE DIED

A SERIES of previously unseen CCTV images have revealed that Diana was alive and well before she was tragically killed in Paris, ten years ago.

INSIDE • Do you think Diana is dead? Or have you seen her in Morocco? Call now: 0900 000 0000. If not, call: 0900 0000. Calls cost (cont. p.94)
PRECICE lengthening nail

- Femur and tibial lengthening
- FDA approved since 2011
- Magnetic drive
- Over 400 implantations worldwide
- Baltimore: 75 implantations since January 2012
Materials and Methods

- Retrospective chart review
- Telephone questionnaire
Inclusion criteria:

- Completed lengthening with PRECICE nail
- Prior lengthening with ex-fix
- Able to answer questionnaire (patient or parent)
Material and Methods

- January 2012-present --- 75 PRECICE nails implanted
- 16 patients fulfilled the criteria (PRECICE plus prior ex-fix lengthening)
- 13/16 responded to questionnaire
Case example

- Newborn Right CFD (PFFD)
Case example (age 3)
Case example (age 10)
Questionnaire (12 questions)

- **Questions asked:**
  1. Pain over the course of lengthening (1-10)
  2. Comfort with PT
  3. Pain medicines requirement
  4. Duration for full weight bearing w/o crutches
  5. Cosmetic experience
  6. Return to full knee ROM
  7. Complications
  8. Tolerance
  9. Return to social activities
  10. Return to sports
  11. Satisfaction
  12. Choice for lengthening if required in future
### Result analysis

<table>
<thead>
<tr>
<th></th>
<th>N=13</th>
<th>External</th>
<th>Internal</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VAS pain score</strong></td>
<td></td>
<td>7 (2-10)</td>
<td>3 (0-6)</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Pain med requirement duration</strong></td>
<td></td>
<td>12.5 weeks (4-24)</td>
<td>5.2 weeks (2-12)</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Time to full WB</strong></td>
<td></td>
<td>20.3 weeks (4-52)</td>
<td>15.1 weeks (3-24) N=12</td>
<td>.022</td>
</tr>
<tr>
<td><strong>Comfort with PT</strong></td>
<td></td>
<td>0</td>
<td>13 (100%)</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Better cosmetic experience</strong></td>
<td></td>
<td>0</td>
<td>13 (100%)</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Fewer complications</strong></td>
<td></td>
<td>0</td>
<td>12 (92%)</td>
<td>.003</td>
</tr>
<tr>
<td><strong>Quicker return to full knee ROM</strong></td>
<td></td>
<td>3*</td>
<td>10 (76%)</td>
<td>.092 (not-significant)</td>
</tr>
</tbody>
</table>
## Result analysis

<table>
<thead>
<tr>
<th>N=13</th>
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<th>Internal</th>
<th>p</th>
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<tbody>
<tr>
<td>Easy to deal with</td>
<td>0</td>
<td>13 (100%)</td>
<td>.001</td>
</tr>
<tr>
<td>Quicker return to social activities</td>
<td>0</td>
<td>8 (61%)</td>
<td>.99 (not-significant)</td>
</tr>
<tr>
<td>Quicker return to sports)**</td>
<td>2</td>
<td>7 (53%)</td>
<td>.405 (not-significant)</td>
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<tr>
<td>Overall satisfaction</td>
<td>0</td>
<td>13 (100%)</td>
<td>.001</td>
</tr>
<tr>
<td>Preferred method if need future lengthening</td>
<td>0</td>
<td>13 (100%)</td>
<td>.001</td>
</tr>
</tbody>
</table>
Conclusions

- Internal lengthening nail as compared to external fixator:
  - Less painful
  - Easier during PT
  - Quicker return to full weight bearing
  - Better cosmetically
  - Associated with lesser complications
  - Associated with quicker return to social activities
  - Associated with better patient satisfaction
  - Preferred method of lengthening if required in future
Weakness of study

- Retrospective study
- Observer bias
- Recall bias
- Small sample size
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