Pelvic Fixation of Growing Rods

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Financial Disclosures

Presenter and Co-Authors: DePuy Spine research support

Introduction

- No prior studies of growing rods to pelvis
  - How do foundations behave over time?
- This project analyzed the outcomes and complications unique to this construct
  - Hypothesis: Iliac fixation provides the best correction of pelvic obliquity

Methods

- 36 patients from 8 centers
- Indications/Inclusion criteria
  - Severe pelvic obliquity
  - Distal deformity
  - Lack of satisfactory alternative anchor sites
  - ≥ 2 years treatment with growing rods fixed to the pelvis

Diagnoses

- SMA 6
- Cerebral palsy 5
- Myelomeningocele 5
- Congenital 4
- Arthrogryposis 1
- Miscellaneous/syndromic 15

Patient Characteristics

- Age at surgery **6.8 ± 3.1** years
- Preop curve **86 ± 22°**
- Preop pelvic obliquity **27° ± 11°**
- Coronal imbalance **8.6** cm
- Sagittal imbalance **5.2** cm
- Follow up **40** months

Anchor types

- Pelvic Fixation:
  - Iliac fixation – 33
    - 21 Iliac screws
    - 9 Iliac rods
    - 3 S-rods
  - Sacral fixation – 6
    - Hooks – 3
    - Screws – 2
    - Rod – 1
- Dual rods used in 30 patients; single in 6

Results

- Mean pelvic obliquity improved from 27º to 11 ± 7°.
  - Iliac screws 67%*
  - Iliac rods 57%
  - S-rod 59%
  - Sacral fixation 40%*

Iliac screws better than sacral fixation
P = 0.001

- Mean major scoliosis Cobb improved from 86º to 48 ± 20°.
  - Iliac screws 47% *
  - Iliac rods 35%
  - S-rod 30%
  - Sacral fixation 29% *

Iliac screws better than sacral fixation
P = 0.04

Results

- Compared to unilateral rods, bilateral rods provided better correction of both pelvic obliquity (67% vs 44%, p=0.008) and major curve (47% vs 25%, p=0.01)

- Overall, percentage of pelvic obliquity correction (59%) exceeds major curve correction(44%), $p < 0.001$

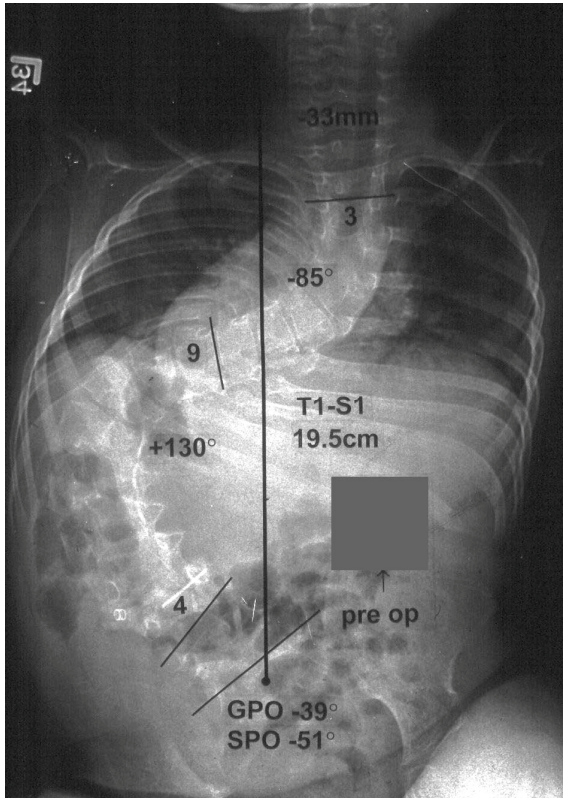
Results

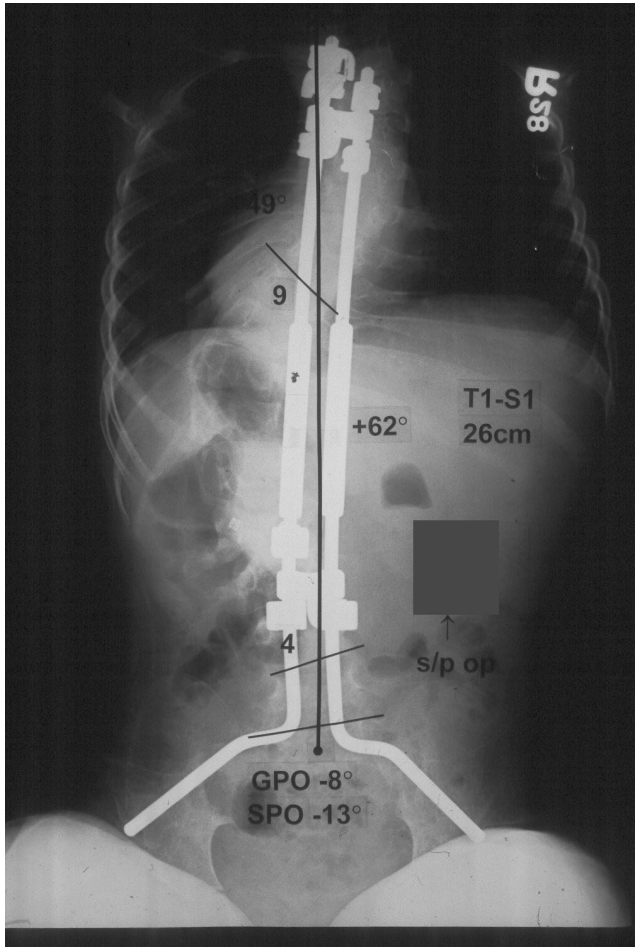
- Coronal imbalance improved from 8.6 → 4.6 cm
- Sagittal imbalance improved from 5.2 → 3.5 cm.

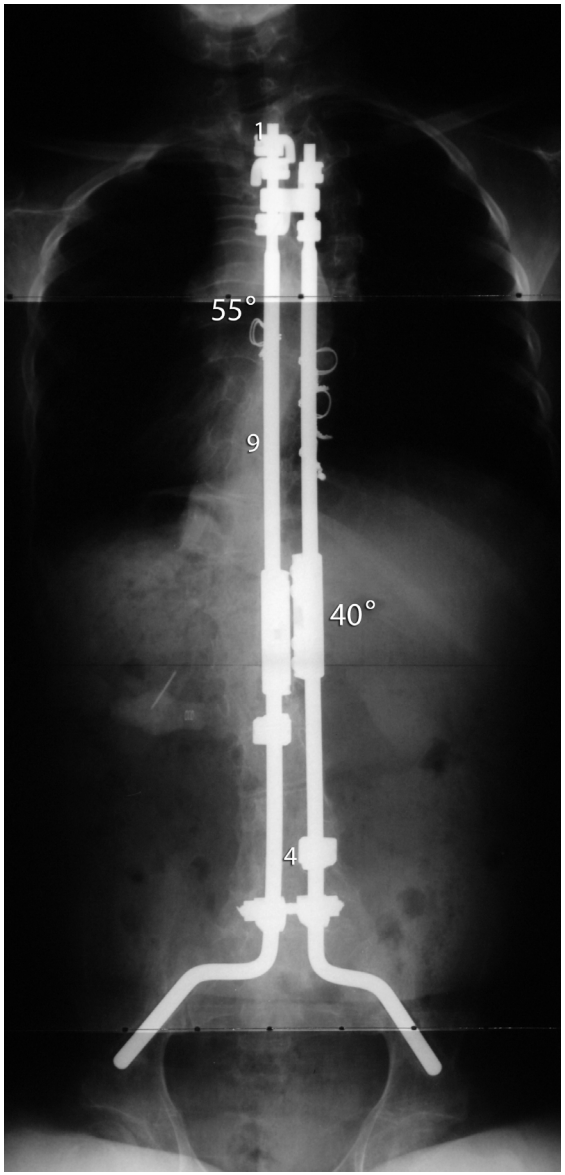
Results

- Mean increase in T1-S1 length **8.6 ± 4.3 cm**
  - Mean gain from post-initial growing rod insertion to latest follow-up or final fusion was 4.0±4.7cm
- Mean of **2.7 ± 1.8** lengthenings
- Six patients have undergone final fusion
  - mean age **11.7 ± 1.5** years
  - mean **3.3 ± 1.8** years after initial surgery

Syndromic Curve







Ambulation

- Seven patients were ambulatory pre-operatively
- Twelve patients were ambulatory at latest follow-up
- Ambulation was achieved by all patients who were expected to do so based upon their neurologic status

Complications

- 5 deep wound infections
- 10 distal fixation complications; all salvaged
- 6 rod breakages
  - this rate did not differ statistically from the rate for dual growing rods as a whole
  - (6/30 vs 26/216; ns)

Complications by distal anchor type

	Iliac Screw N=21	Iliac Rod N=9	S-Rod N=3	Sacral Fixation N=6
Rod Breakage	3	1	1	1
Rod Prominenece	2	0	0	0
Distal Anchor Breakage	5	0	0	0
Distal Anchor Loosening	0	1	1	0
Distal Anchor Prominence	1	1	0	1

- Iliac screws have a higher breakage rate than other distal anchors (P=0.02)

Conclusions

- Dual growing rods with iliac fixation provide the best correction of pelvic obliquity and trunk stabilization in patients with severe scoliosis
- Iliac screws have a higher breakage rate
- Edge prominence and anchor loosening was statistically similar in all groups
- Further improvements in instrumentation is necessary to minimize implant breakage

Thank You!