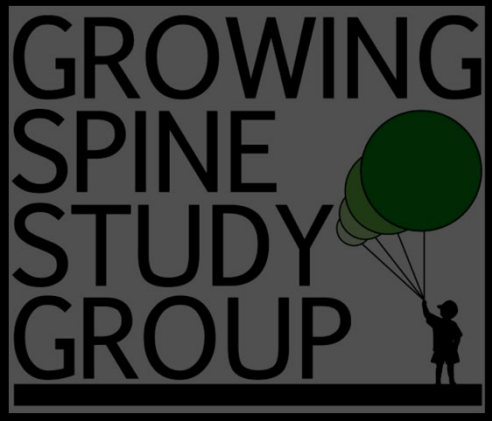
# Lengthening of Dual Growing Rods and the Law of Diminishing Returns

Wudbhav N. Sankar; David L. Skaggs; Muharrem Yazici, Charles E. Johnston, Pooya Javidan; Rishi V. Kadakia; Thomas F. Day; Behrooz A. Akbarnia, and the GSSG



# Objective

- Effect of
  - repeated lengthenings
  - time
- Spinal growth (T1-S1 length)
- Cobb angle

# Hypothesis

- The T1-S1 gain of lengthenings decreases with more lengthenings and time
- The Cobb angle is maintained.

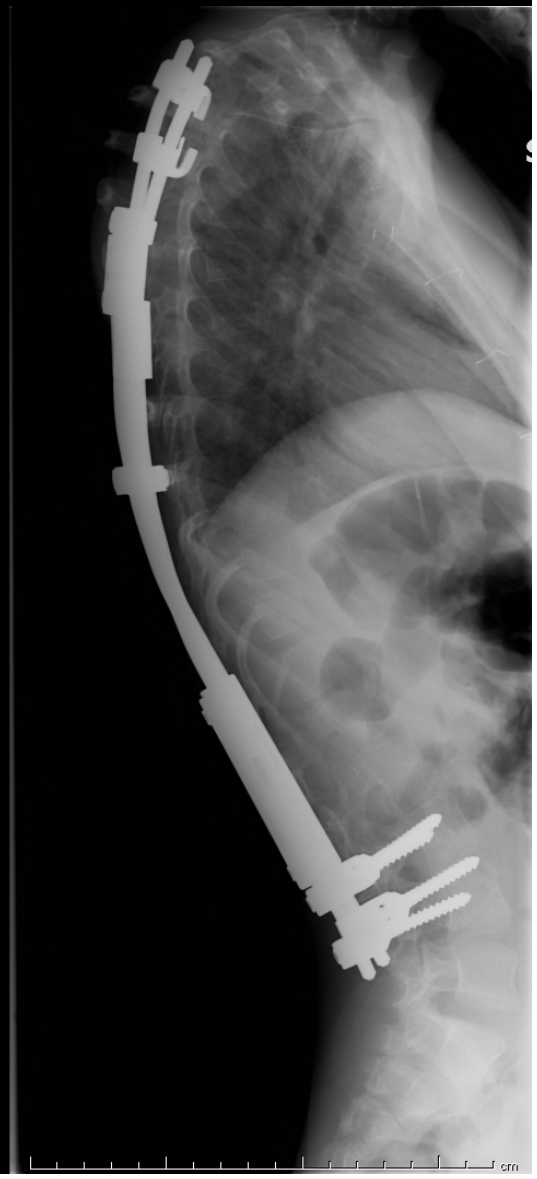
# Inclusion Criteria

- Early onset scoliosis
- Dual growing rods
- Min 2 yr f/u and 3 lengthenings
- Radiographs pre and post lengthening

# Methods

- Measure T1-S1 on each Pre- and Post-lengthening x-ray
  - Not just database mining

Could not measure implants
Implants change
Implants cut through bone
Pts with longest f/u
Could not measure end vertebrae
End vertebrae change over time



# Results

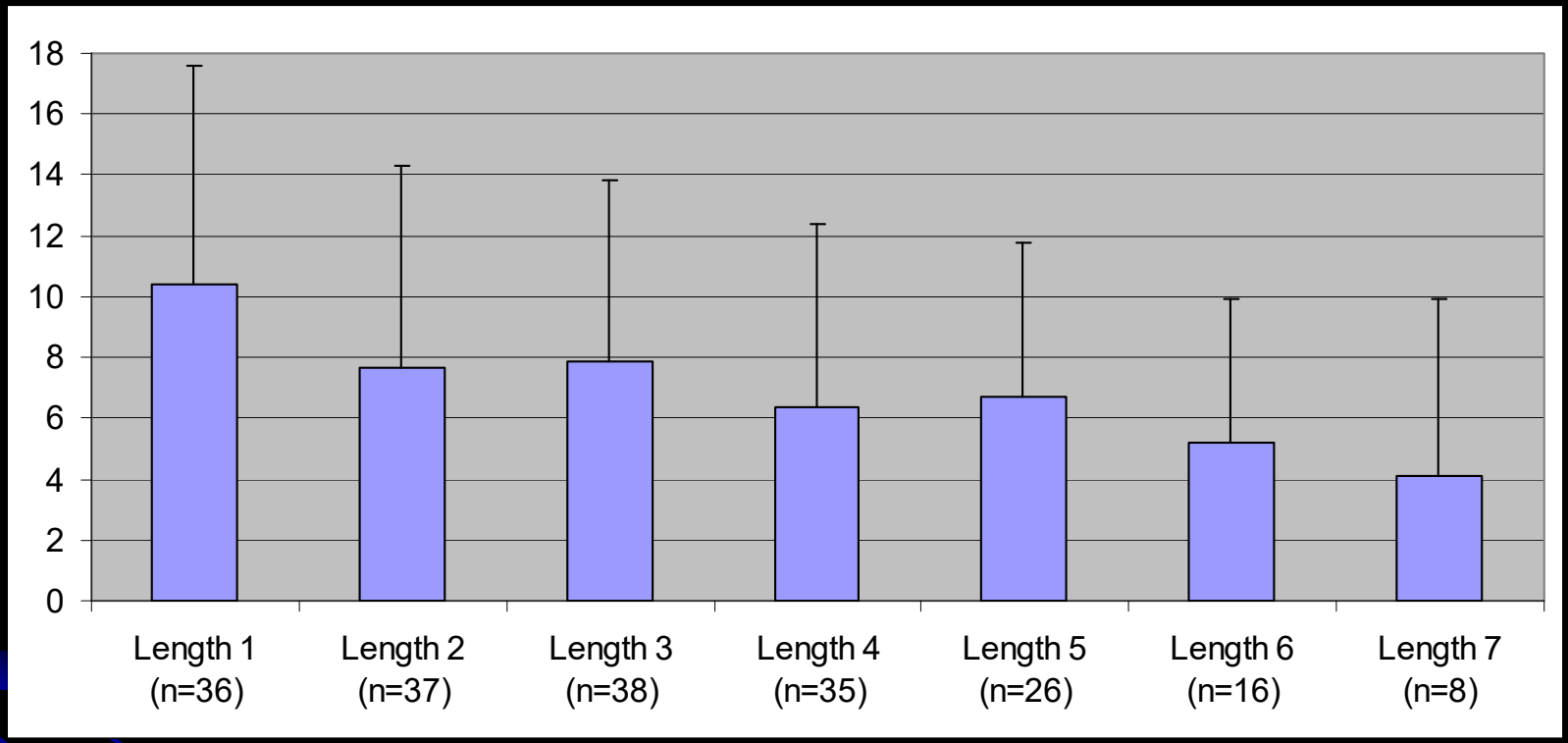
- 38 patients from 5 centers
- Mean age 5.6 years initial surgery
- Mean follow-up was 3.3 years (range 2-7).
- Mean interval between lengthenings 7 months.

# Results – Lengthening

- Primary implant mean 3.2 cm
- First lengthening mean 1.0 cm
- $7^{th}$ lengthening mean 0.4 cm

# T1-S1Gain Vs. Lengthening

P<0.007



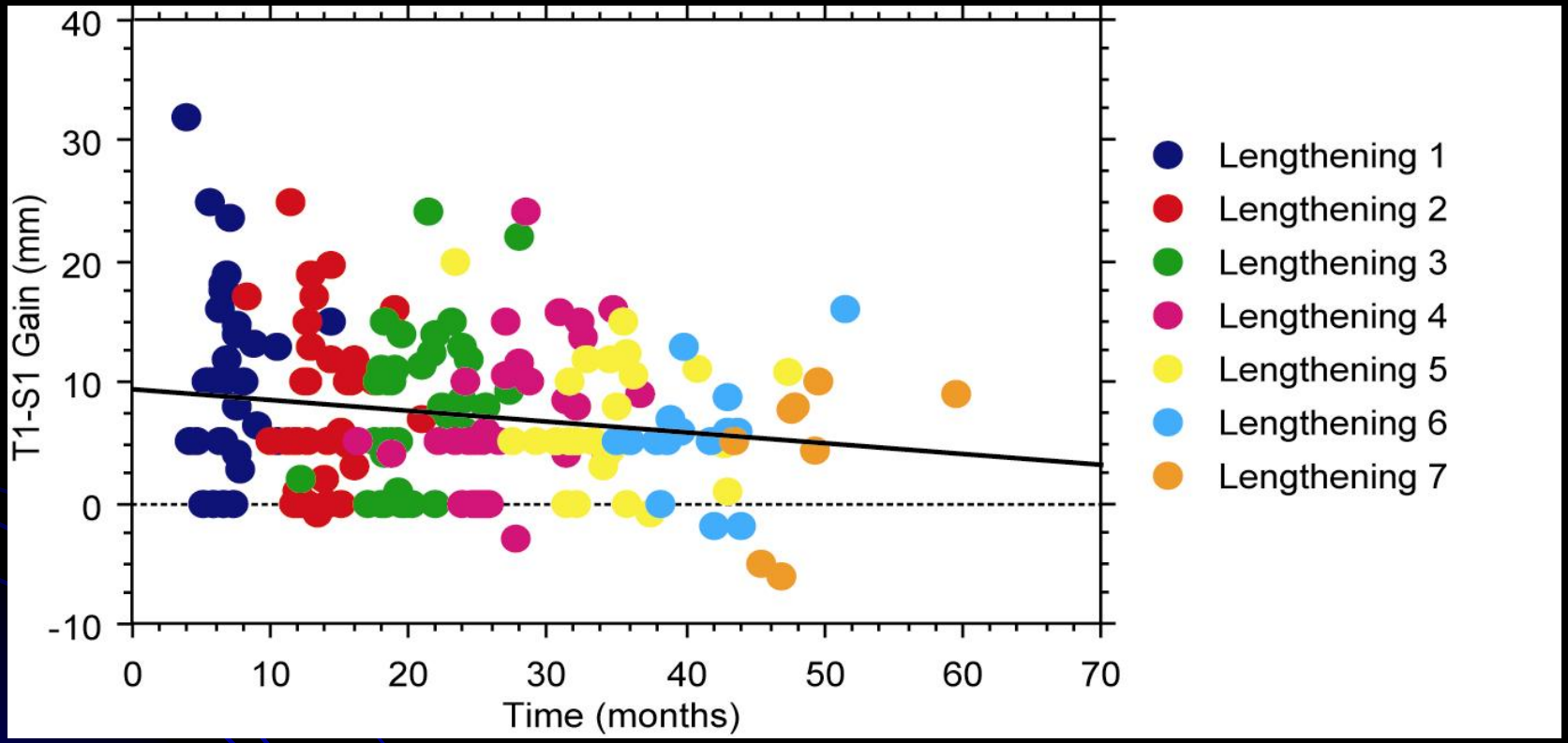

Does not include initial implant surgery

# Results – Cobb Angle

- Pre-Op mean 74$^{o}$
- Post primary implant mean 36$^{o}$
- Final f/u mean (2-7 yrs) 35$^{o}$

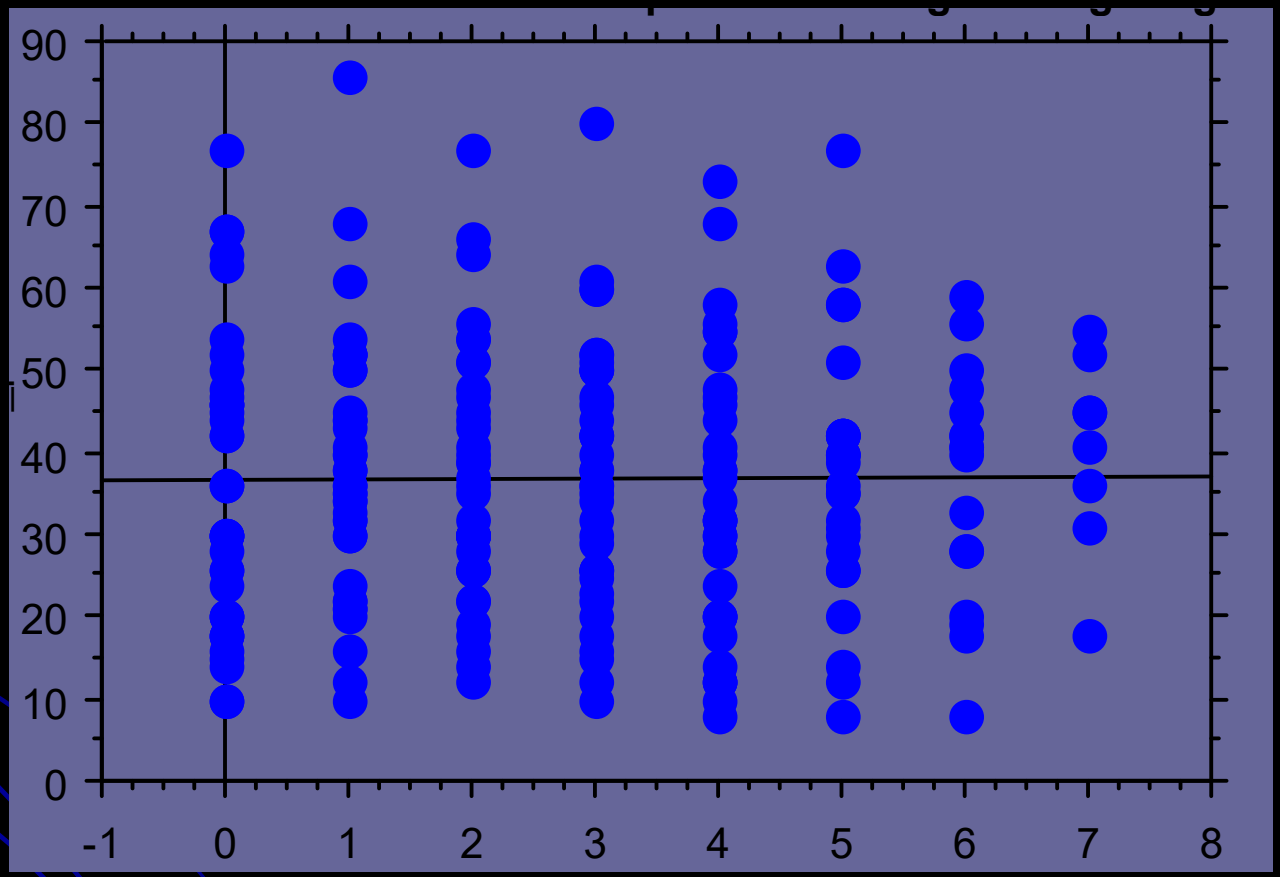
# T1-S1Gain Vs. Time

Less significant P=0.01

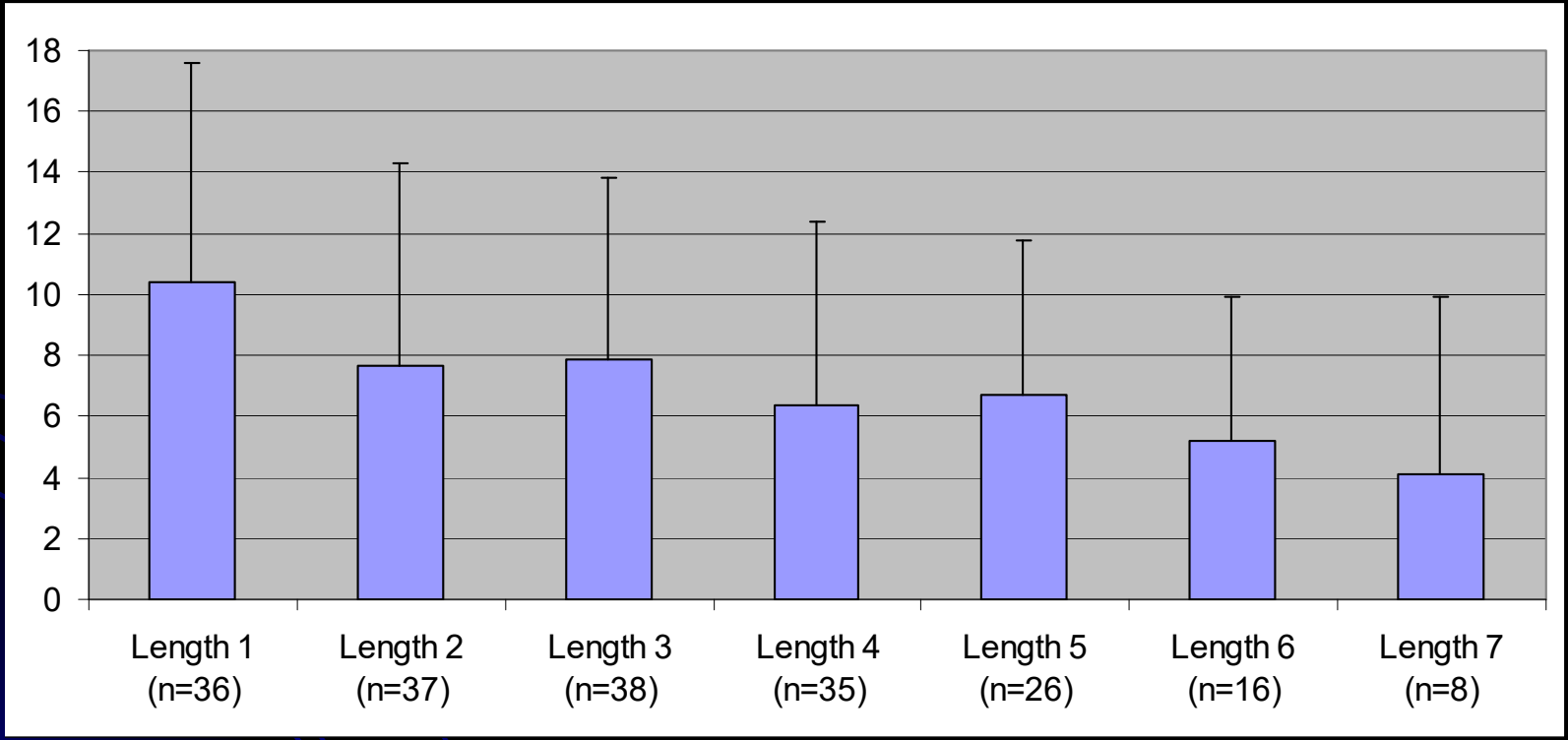


# Cobb Angle Vs. Lengthening

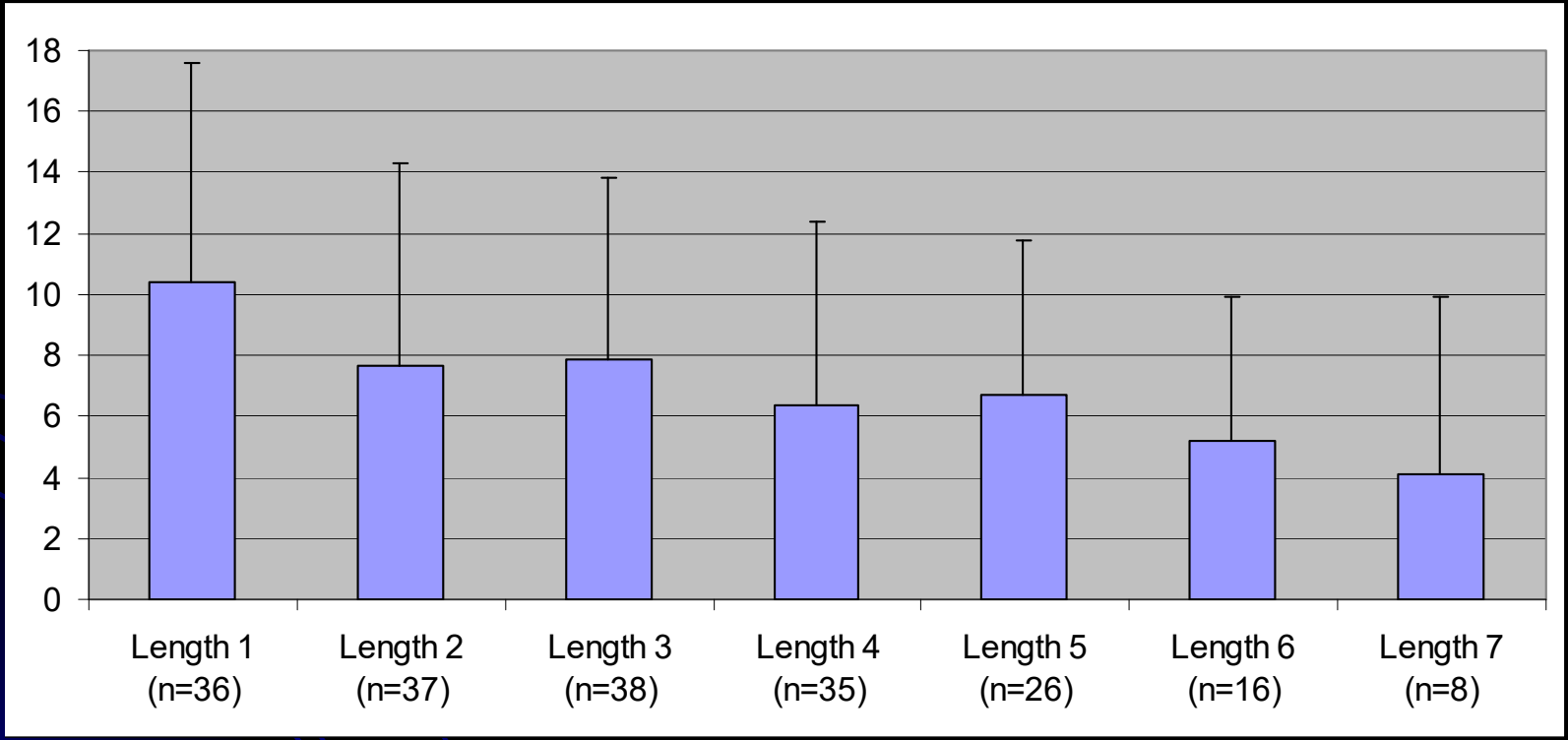
Not Significant P=.957



# Why?
# No motion of joints =
# Auto fusion at 5 years???



# Should we delay growing rods as long as possible?



# Normal T1-S1 Growth

| 0-5 yrs | 2.0 cm/yr |
|---|---|
| 5-10 yrs | 1.2 cm/yr |
| 10-18 yr | 1.3 cm/yr |

# Normal T1-S1 Growth

| 0-5 yrs | 2.0 cm/yr |
|---|---|
| 5-10 yrs | 1.2 cm/yr |
| 10-18 yr | 1.3 cm/yr |

Lengthenings Driving the Spine ?

## This Study

| | |
|---|---|
| 5-10 yrs | 1.8 cm/yr |
| | |

# Conclusions
# Law of Diminishing Returns

- T1-S1 gains continue to occur AT LEAST through 7 lengthenings
- These gains decrease
  - over repeated lengthenings
  - over time
- Cobb Angle
  - Does not change over repeated lengthenings or time

**This beats the natural history!**
At least for 2-7 years f/u

# Thank You!