Three Dimensional True Spine Length (3D-TSL):

A Novel Technique for Assessing the Outcomes of Scoliosis Surgery

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Disclosures

- R. El-Hawary:
  - Consultant: DePuy Synthes, Medtronic, and Halifax Biomedical Inc.
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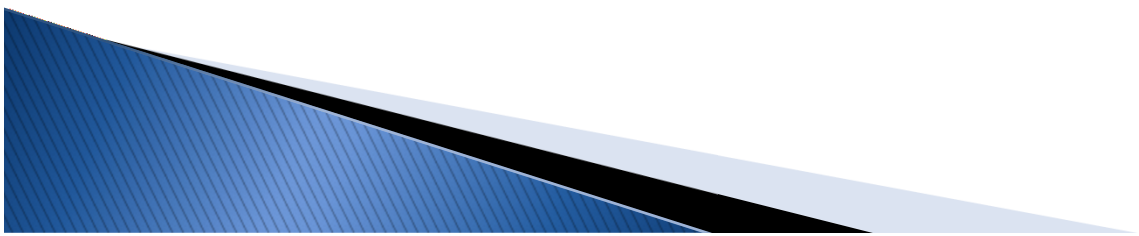
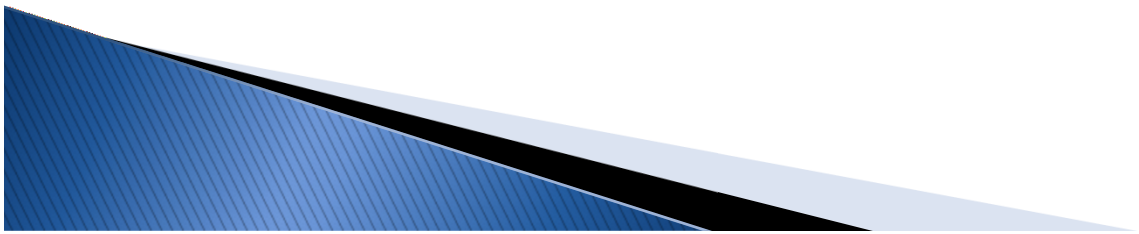
- All other authors have no disclosures



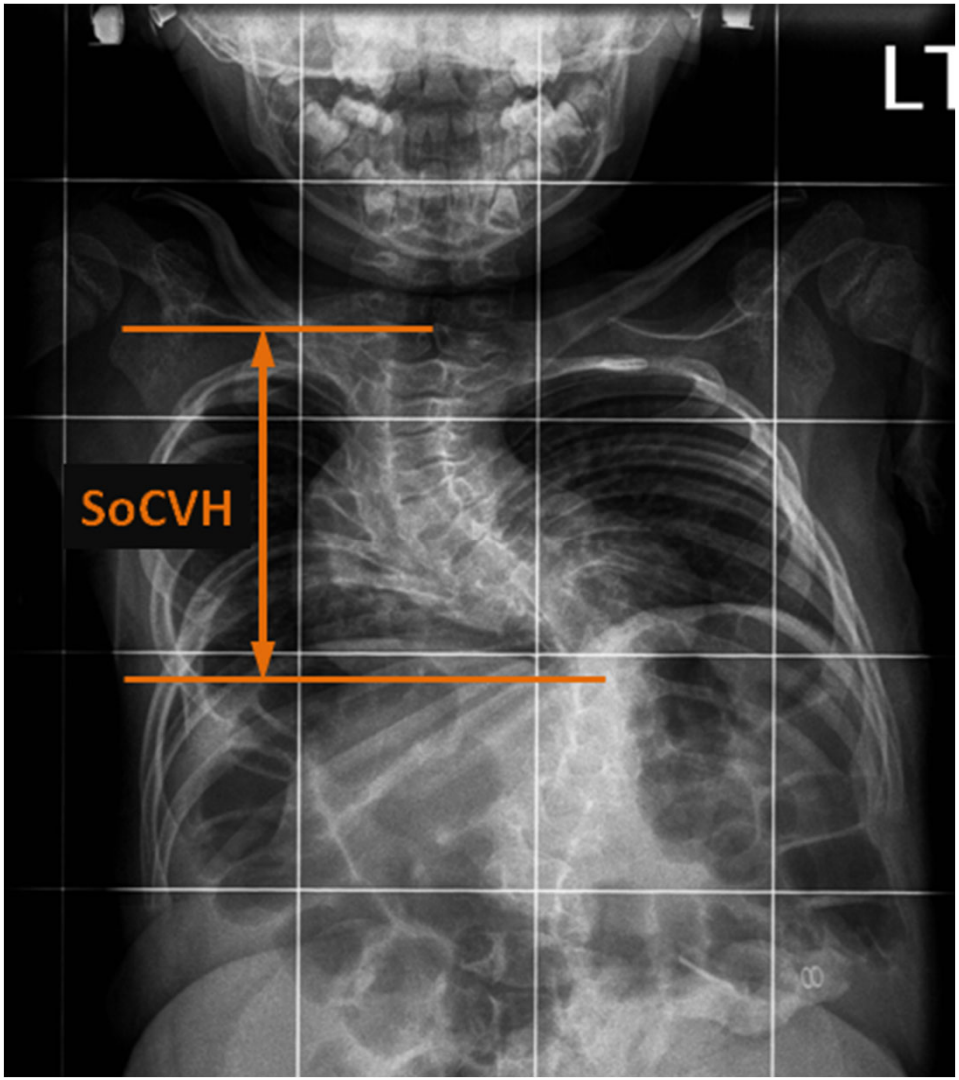
Introduction

- Growth Friendly surgeries control scoliosis, however these surgeries are kyphotic by nature
- "Law of Diminishing Returns"
  - Auto-fusion from surgical intervention?
  - Error in traditional measurement methods?
  - Out of plane growth not captured?



Traditional Measurement

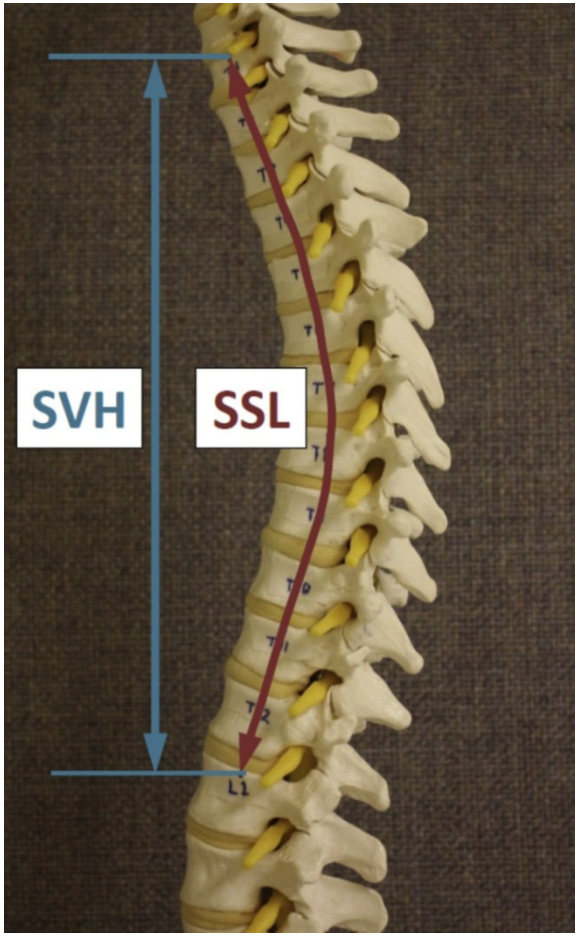
- Standard-of-Care Vertical Height (SoCVH)
- Only a Single Dimensional Measurement
- Serial Height Measurements used to assess growth



Sagittal Spine Length Measurement: A Novel Technique to Assess Growth of the Spine

Alan J. Spurway, PEng, MSc*, Chukwudi K. Chukwunyerenwa, MD, MCh, FRCS (C)[1], Waleed E. Kishta, MD, PhD, FRCS (C)[2], Jennifer K. Hurry, MSc, Ron El-Hawary, MD, MSc, FRCS (C)

- What about the effects of Kyphosis?
- Sagittal Spine Length (SSL)



Spine Deformity 2016

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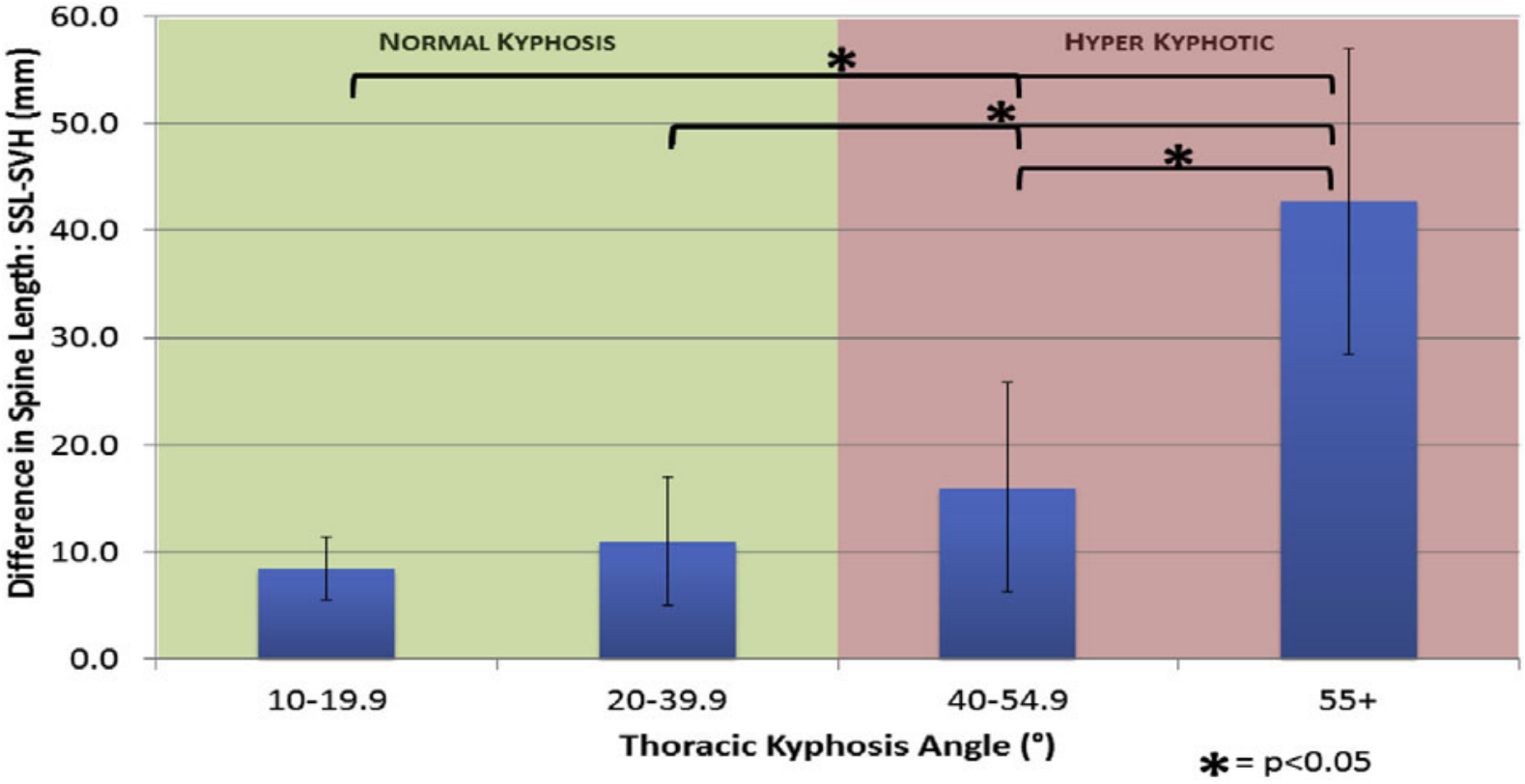
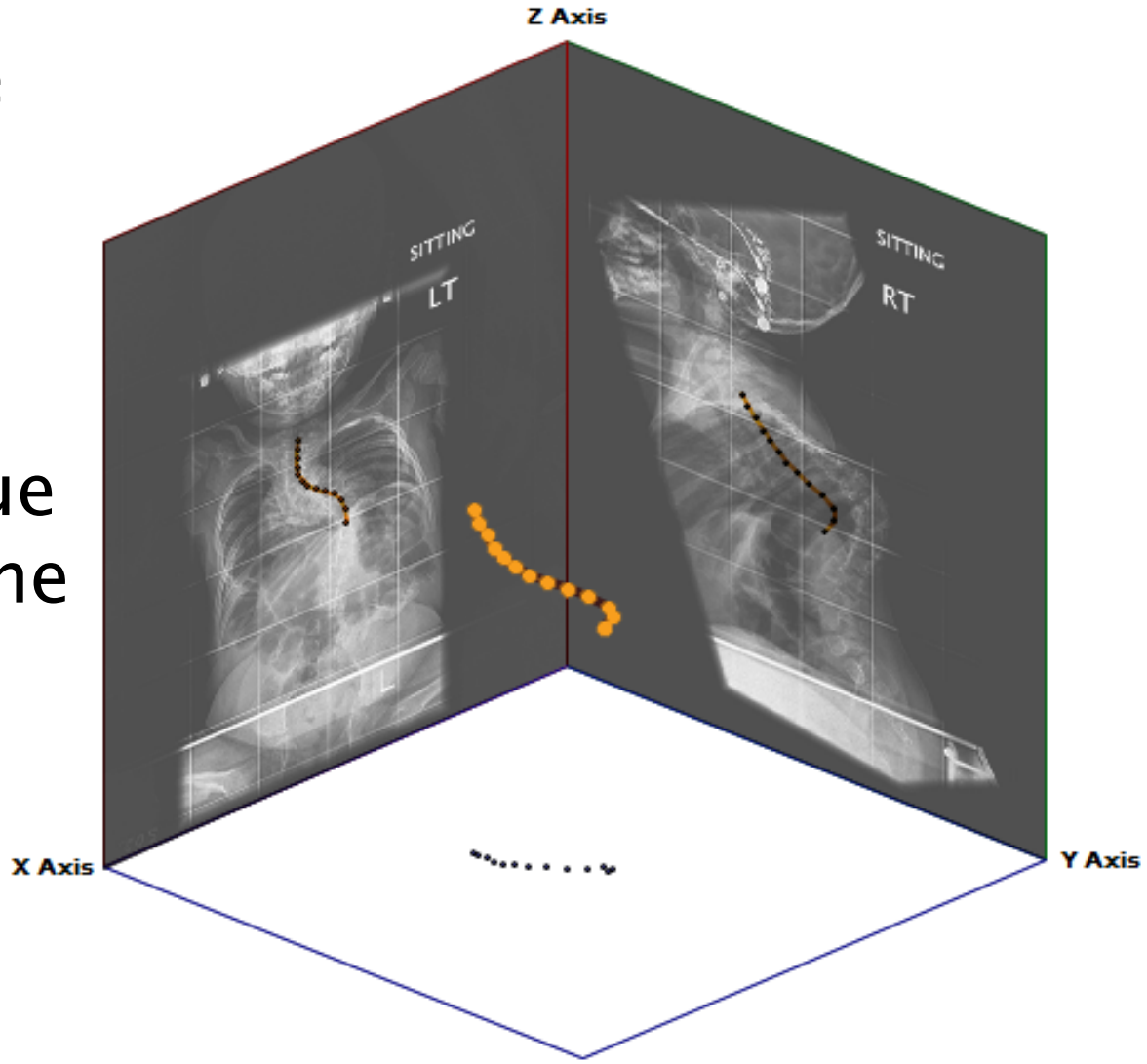


Spine Deformity 2016

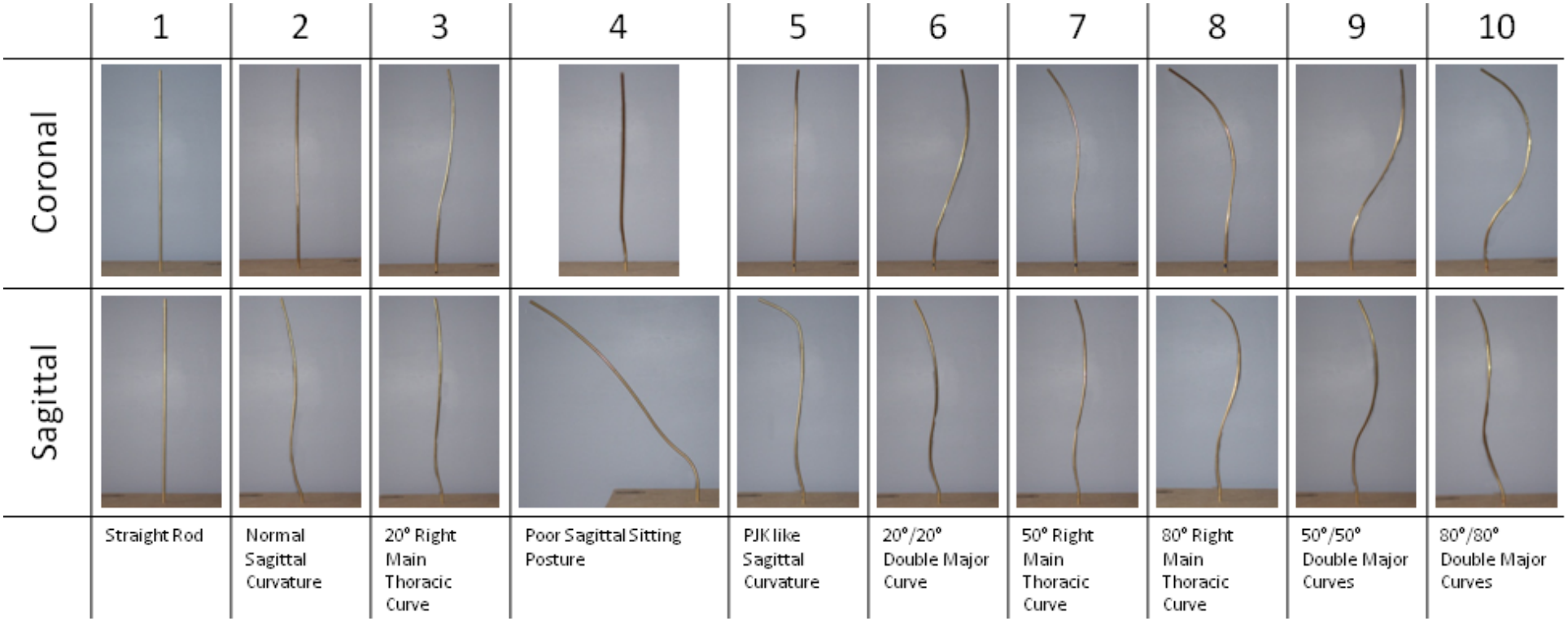
3D True Spine Length (3D-TSL)

- Biplanar, Three Dimensional Measurement Technique
- Follows the True Path of the Spine



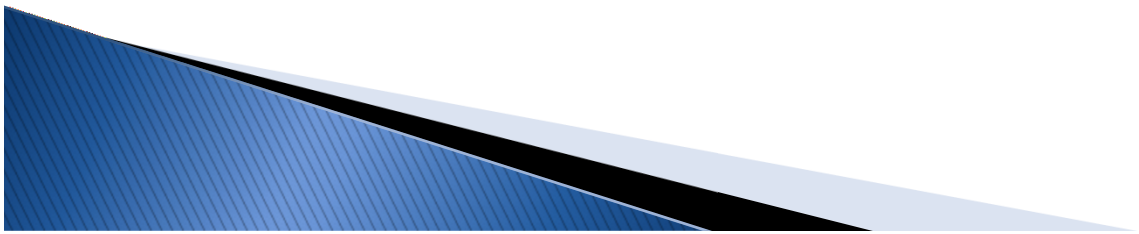
Accuracy Validation – Methods

- 3D-TSL Measurement of 10 physical rod configurations
- Assessed by 5 reviewers



Accuracy Validation – Results

- Mean Physical Rod Length: 267.7 mm
- Mean 3D-TSL Measurement: 268.0 mm
- Mean Error: 1.2mm (SD: 0.9, Range: 0.0–3.0)
  - Percent Error: 0.4% (SD: 0.5%, Range: 0.0%–1.1%)
- Reliability: 0.999
- Repeatability: 0.997



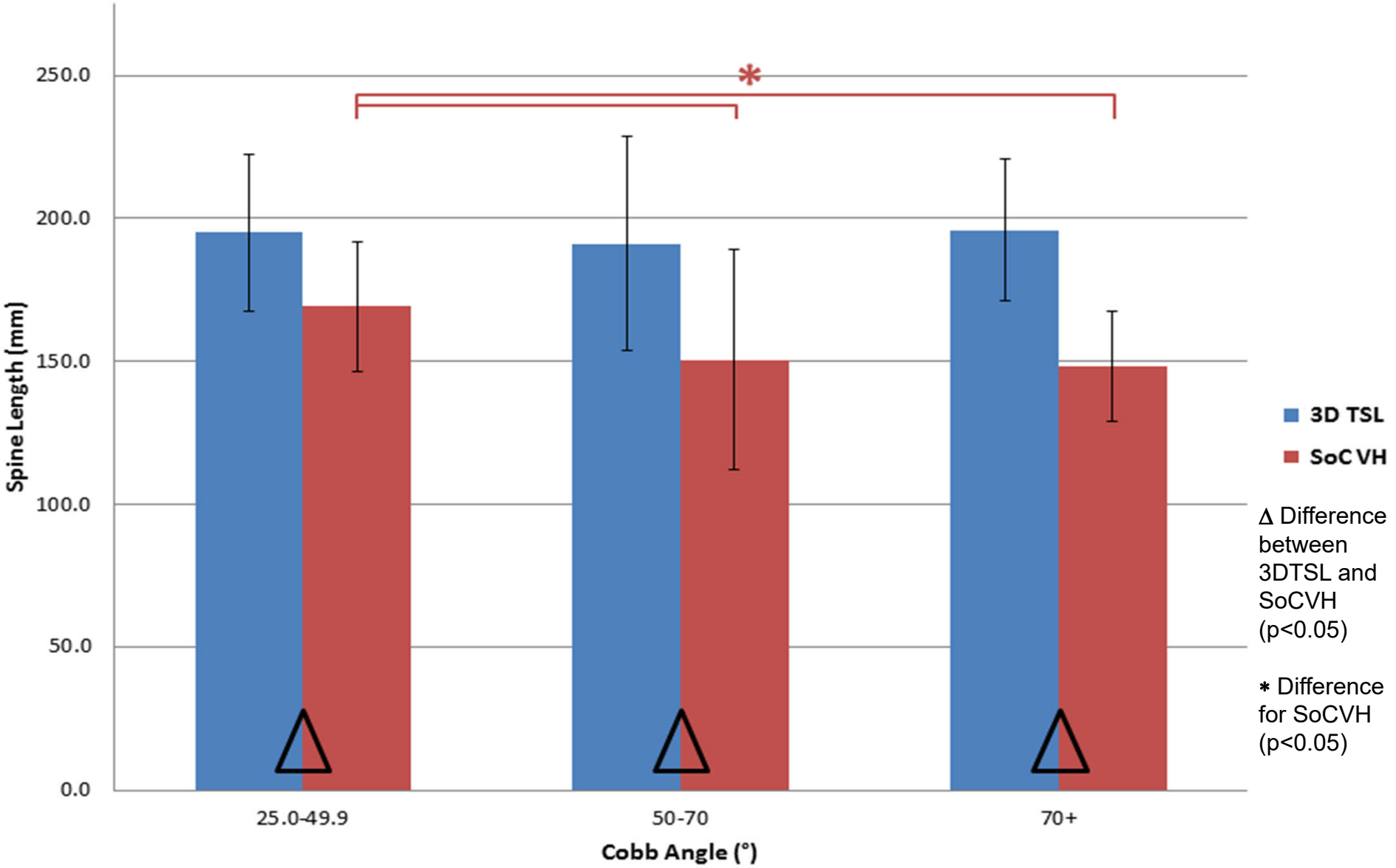
Clinical Validation – Methods

- SoCVH and 3D-TSL measurements of the T1-L1 lengths of 23 pre-operative EOS patients
  - Mean age: 5.6 years 12M/11F
  - Mean Cobb: 68° (22°-102°)
  - Mean Kyphosis: 37° (5°-85°)
  - 7 syndromic, 7 congenital, 6 idiopathic, and 3 neuromuscular
- Six Reviewers

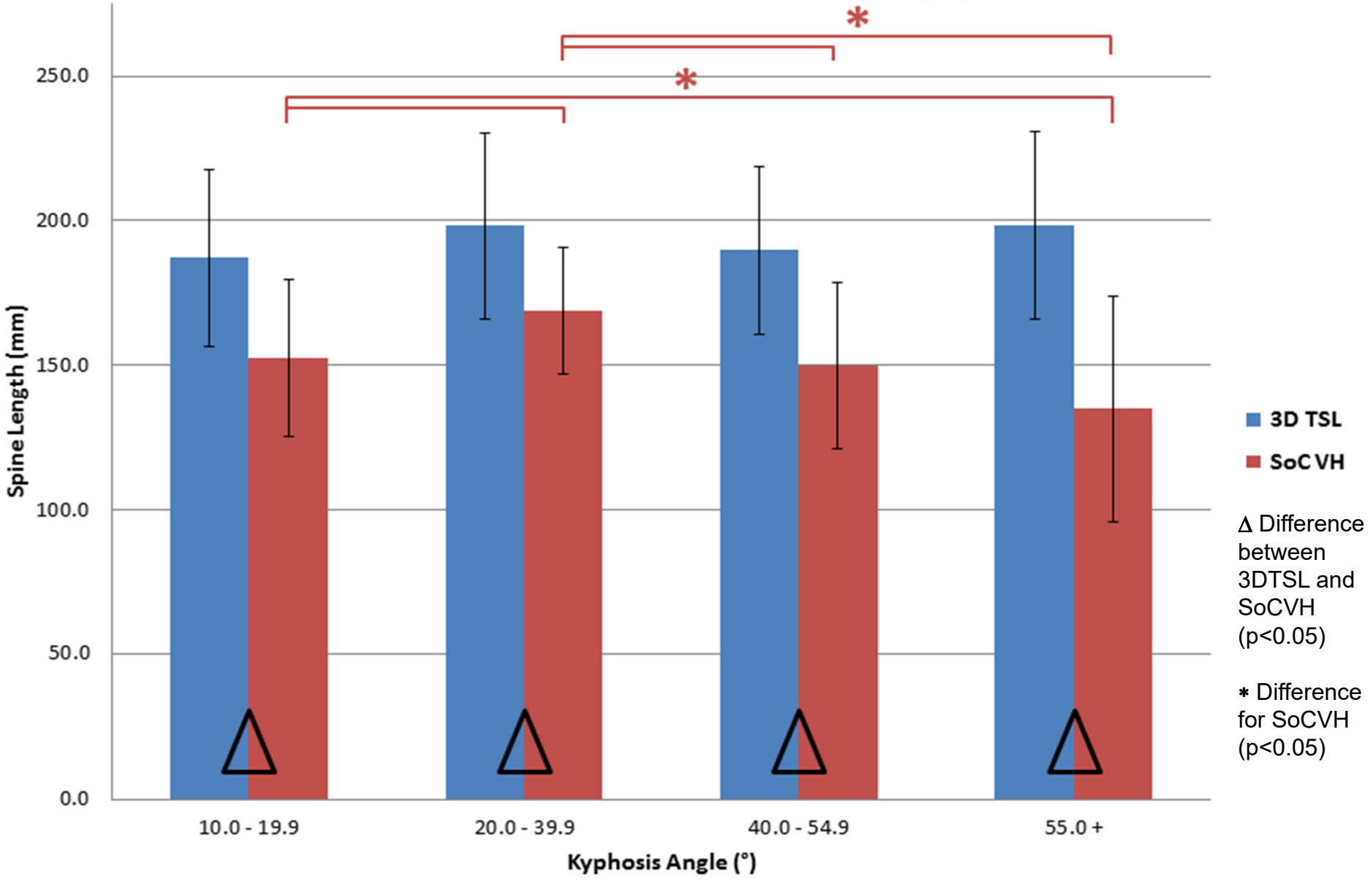
Clinical Validation – Results

	SoCVH	3DTSL
Reliability ICC	**0.975** (95% CI: 0.913 – 0.989)	**0.952** (95% CI: 0.882 – 0.982)
Repeatability ICC	**0.965** (95% CI: 0.910 – 0.986)	**0.944** (95% CI: 0.826 – 0.979)
Spine Lengths (mm)	**156.1mm** (SD: 29.7, Range: 74.7–207.3)	**193.9mm** (SD: 30.0, Range: 142.8–276.8)
Measurement Difference	**37.8mm** (SD: 21.4, Range: 1.3–95.4) (**p<0.0001**)	

Clinical Validation – Scoliosis



Clinical Validation – Kyphosis



Conclusions

- 3D-TSL is Accurate (0.4% error).
- 3D-TSL is Reliable (0.952).
- 3D-TSL is Repeatable (0.944).
- 3D-TSL results in greater spine length as compared to traditional coronal plane measures.
- 3D-TSL complements the traditional measurements used in the assessment of EOS.

Thank You