Sagittal Spinopelvic Parameters in Children with Achondroplasia

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Background

- Sagittal spinal deformity is common in children with achondroplasia

- Little data on the normative parameters

- The aim of this study is to report the natural history of sagittal spinopelvic parameters in children with achondroplasia

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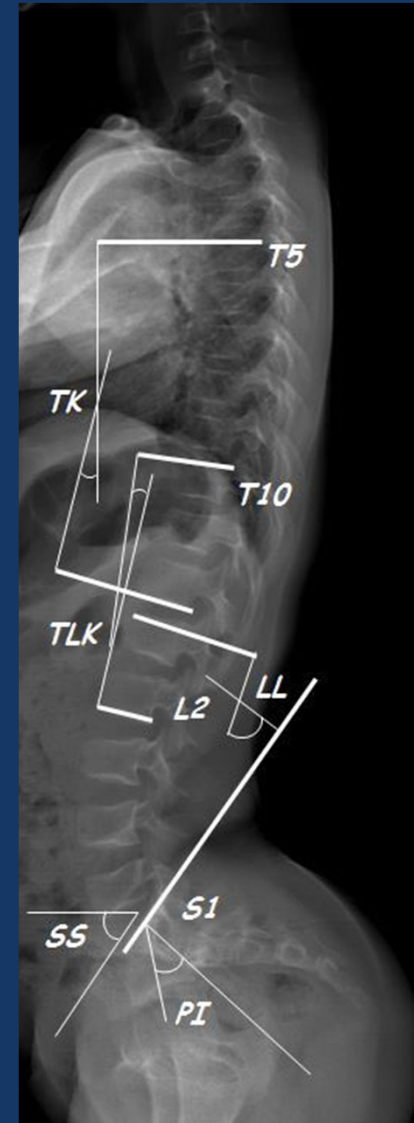Hospital for Children

Study Population

- Records of all children (315 children) with achondroplasia, seen at our institution between 2004 and 2015, were reviewed.

- Children who had surgery (33 children) on their thoracolumbar spine were excluded.

- 745 Lateral spine radiographs in the standing position were reviewed.

- Only one radiograph per patient per year was reviewed.

Radiographic Measurements

- **Thoracic Kyphosis T5-T12**
- **Lumbar Lordosis L1-S1**
- **Thoracolumbar Kyphosis T10-L2**

- **Sacral Slope**
- **Pelvic Tilt**
- **Pelvic Incidence**

- **T1 Pelvic Angle**
- **Sagittal Balance**

Longitudinal Analysis

• 81 Children with a minimum follow up of 5 years.

• Mean follow up 8.7 years (5-19 years).

• Between age 4.4 years and 13.1 years.

• LL, TLK, PI, TPA, and SVA changed significantly.

Children with minimum 5 year follow up (81 Children)	First Radiograph		Last Radiograph		p values
	Mean	SD	Mean	SD	
Age	4.4	3.3	13.1	4.3	<0.0001
TK	18	12	16	10	0.221
LL	57	17	63	18	0.037
TLK	22	15	12	13	<0.0001
SS	48	12	52	13	0.058
PT	-5	13	-3	14	0.259
PI	43	15	49	16	0.016
TPA	-5	11	-9	8	0.010
SVA	7	28	-8	26	0.0004

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Longitudinal Analysis

• **19 Children with a minimum follow up of 10 years**

• **Mean follow up 13.8 years (10-19 years).**

• **Between age 3.3 years and 17 years.**

• **LL, TLK, PT, and PI changed significantly.**

Children with minimum 10 year follow up (19 Children)	First Radiograph		Last Radiograph		p values
	Mean	SD	Mean	SD	
Age	3.3	2.4	17	3.3	<0.0001
TK	16	10	14	11	0.579
LL	49	19	61	16	0.037
TLK	25	16	12	14	0.012
SS	44	14	49	14	0.283
PT	-11	13	2	13	0.002
PI	33	13	51	16	0.0004
TPA	-8	13	-7	7	0.785
SVA	7	16	-4	34	0.233

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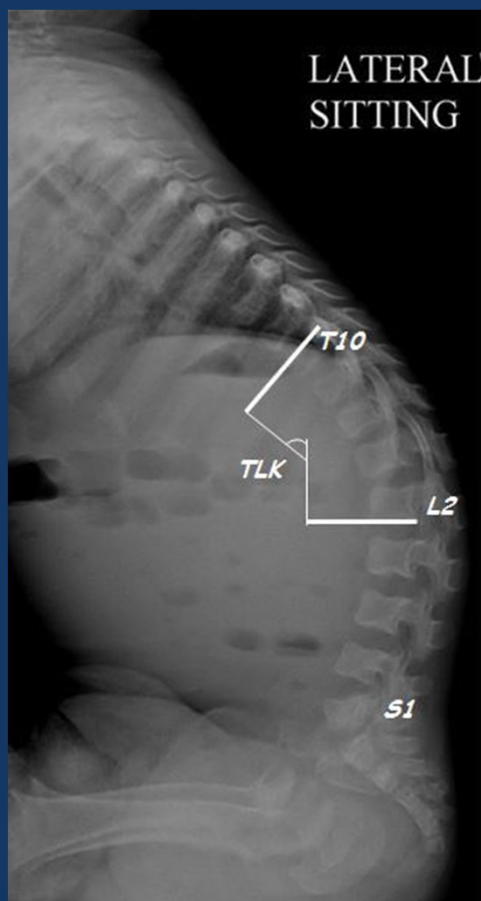# Radiographs of a Boy with Achondroplasia
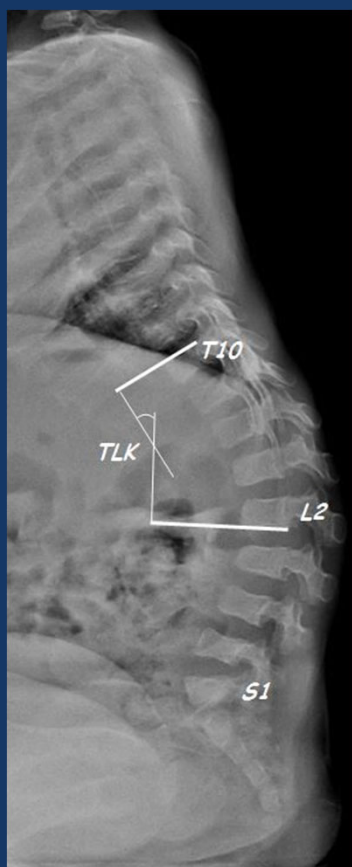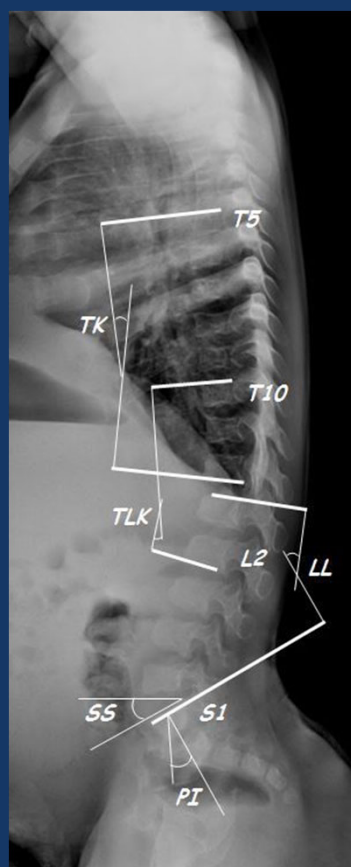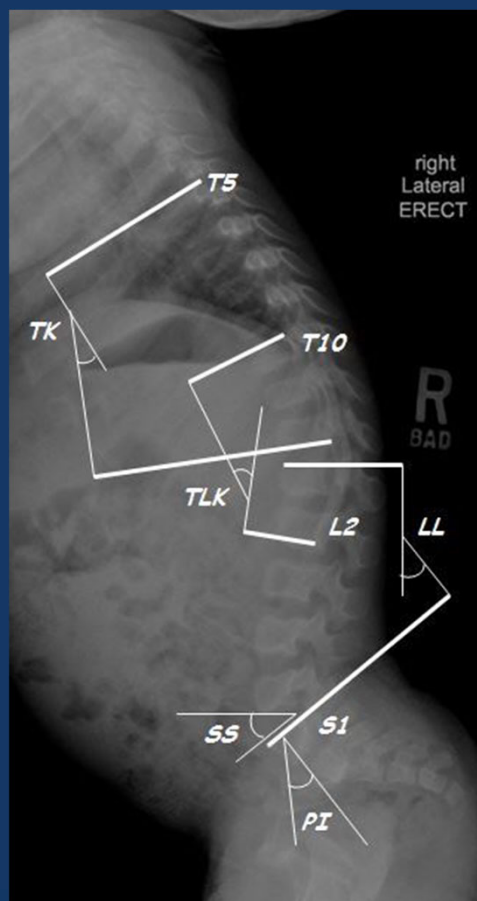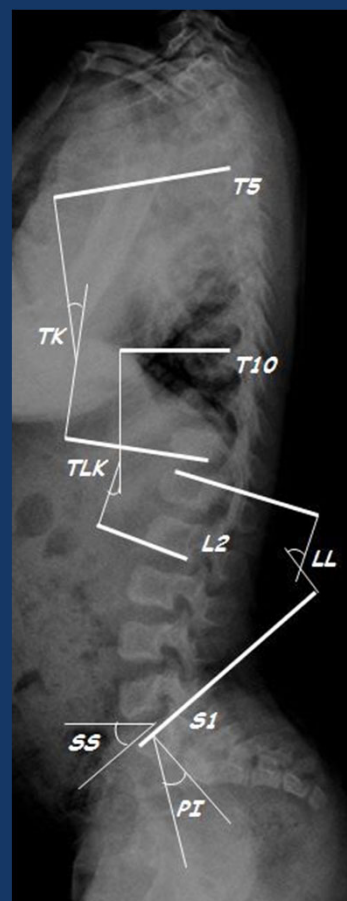

1 year of age

2 years of age
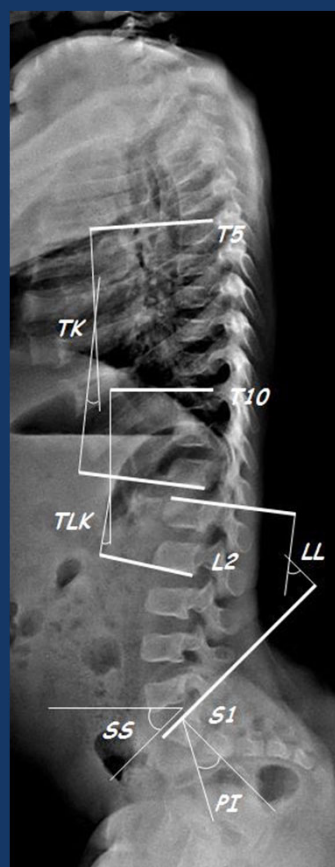
3 years of age
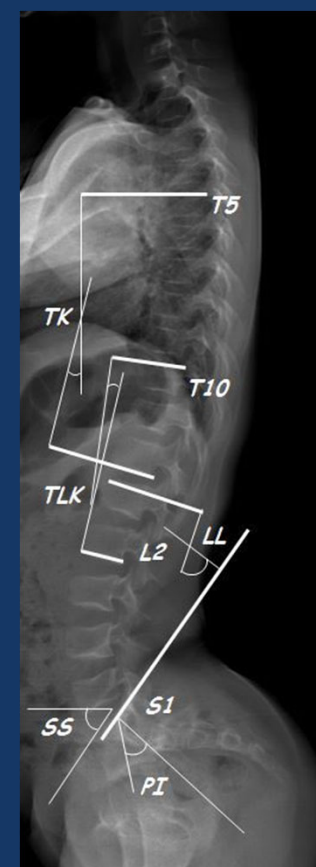
9 years of age

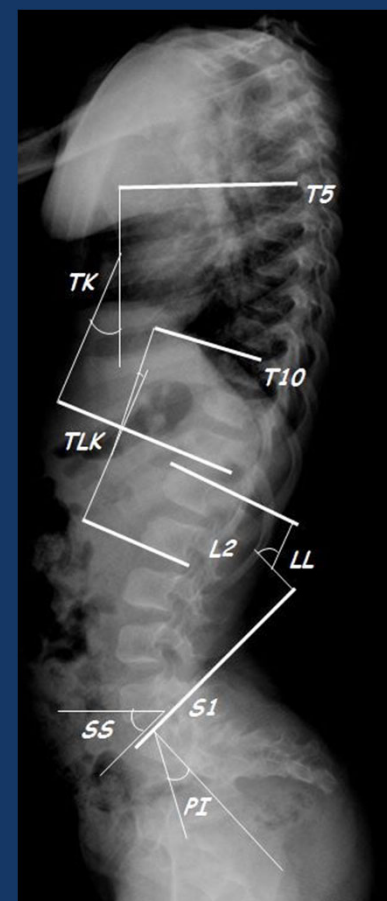# Radiographs of a Girl with Achondroplasia

1 year of age

1.8 years of age

2.6 years of age

4 years of age

Cross Sectional Analysis
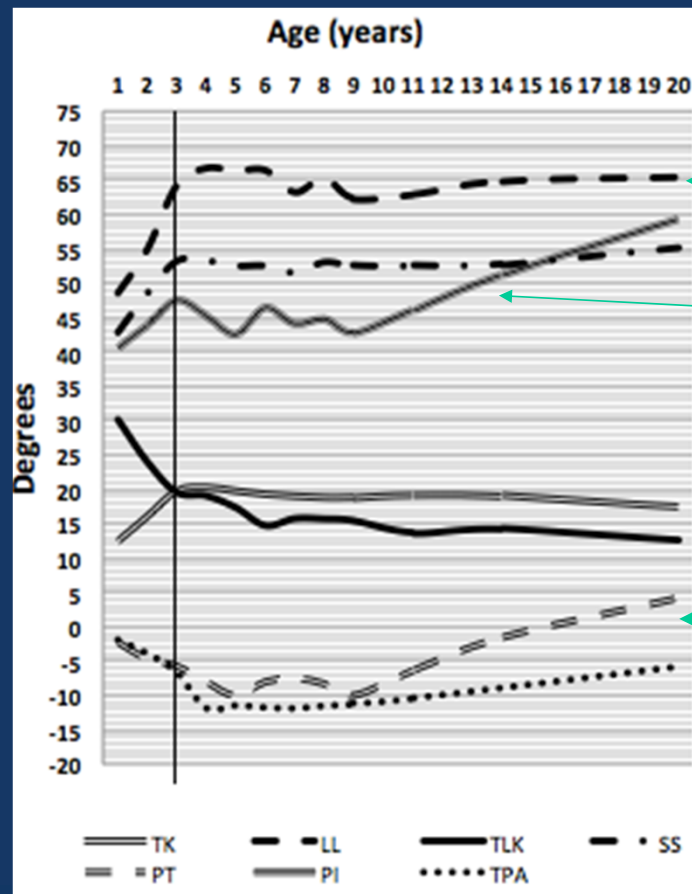
Conclusions

• Sagittal spinal curves in children with achondroplasia are interrelated in a complementary mechanism to support and maintain an economical, well balanced, posture.

• Reduction of thoracolumbar kyphosis is compensated for by hyperlordosis at the lumbosacral level.

• Pelvis alignment and hip positioning are directly affected by this compensatory mechanism.

Conclusions

• **Significant changes occur early in life suggesting the importance of early attention to sagittal malalignment to prevent any possible clinical effects of severe hyperlordosis.**

• **Deeper understanding of the pathology underlying thoracolumbar kyphosis, as well as the segmental alignment of the sagittal spine is essential to regulate the compensatory curves while preventing persistent or progressive kyphosis.**

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