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The Contributions of the Osseous and Non-Osseous Structures to Anterior Spinal Overgrowth in Idiopathic Scoliosis

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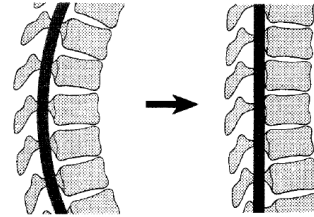
Relative anterior spinal overgrowth in adolescent idiopathic scoliosis (AIS)

Eur Spine J (2001) 10:473–481
DOI 10.1007/s005860100311

REVIEW

The pathogenesis of idiopathic scoliosis: uncoupled neuro-osseous growth?

Richard W. Porter



A. Reduction of thoracic kyphosis



Relative anterior spinal overgrowth in adolescent idiopathic scoliosis

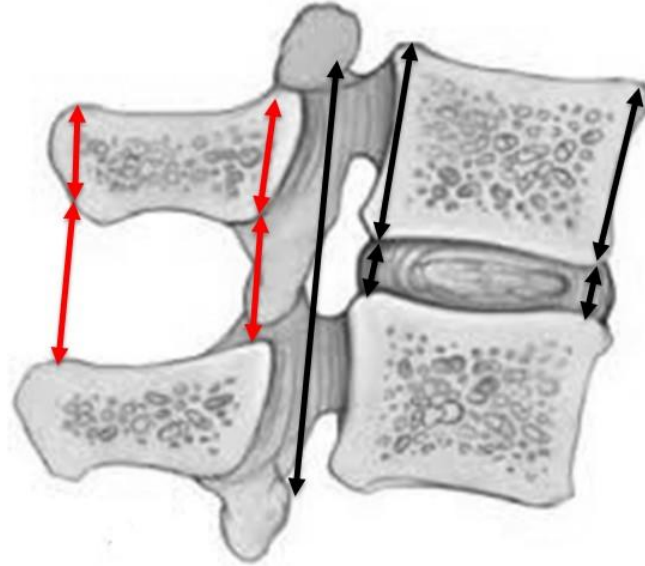
RESULTS OF DISPROPORTIONATE ENDOCHONDRAL-MEMBRANOUS BONE GROWTH

X. Guo, W.-W. Chau, Y.-L. Chan, J. C.-Y. Cheng

Relative anterior lengthening **or** relative posterior shortening?



Objective



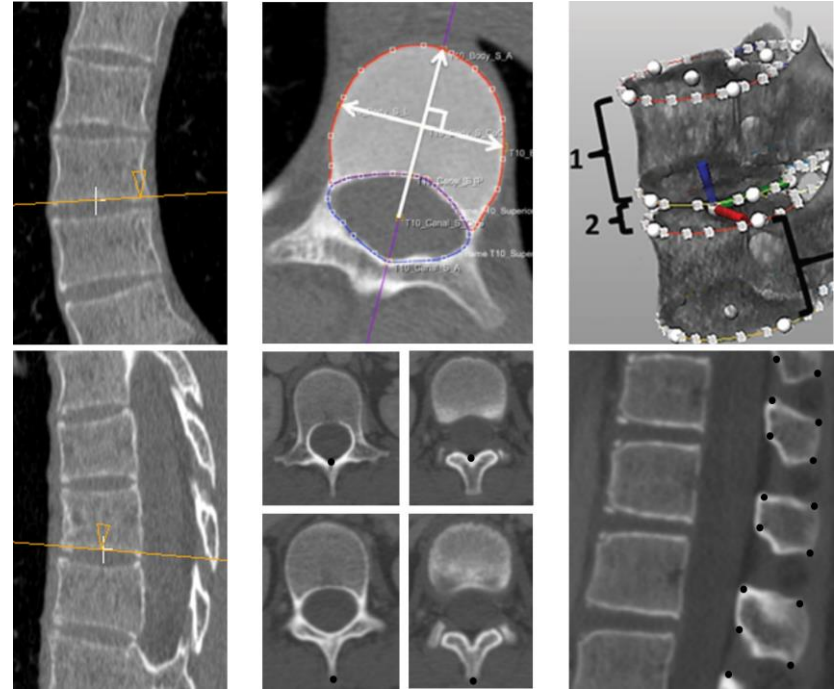
To define the discrepancy of the 3D CT measured anterior-posterior length of the thoracic spinal column in AIS versus controls.



3D semi-automatic CT image processing technique

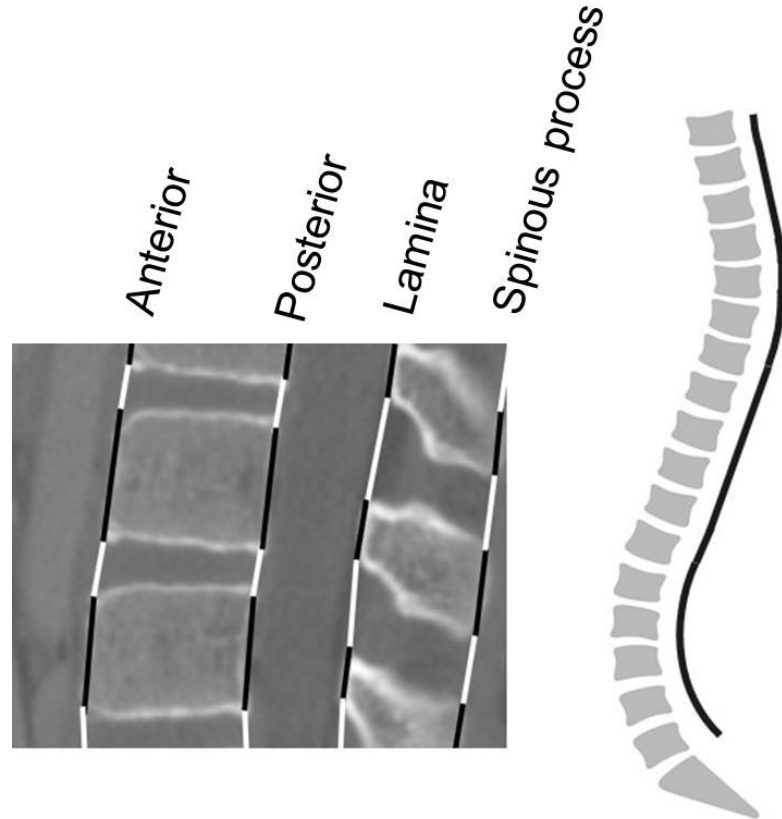
CT scans of:

- 80 AIS patients
 - Made for navigation purposes
 - Mean Cobb angle: $69 \pm 12^\circ$
- 30 matched controls

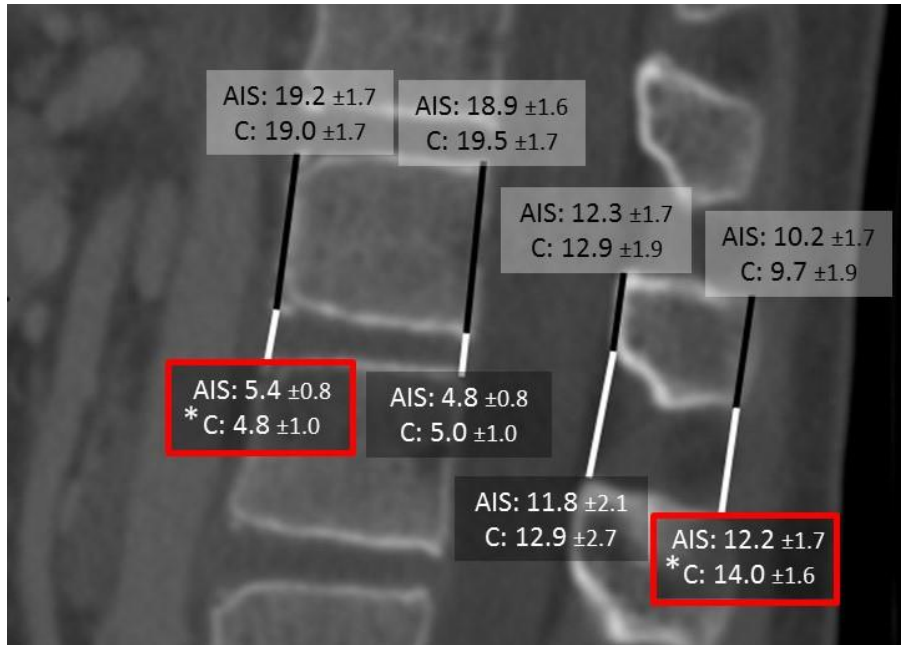


3D semi-automatic measurements

Black: osseous parts
White: non-osseous parts



Absolute heights: AIS versus controls



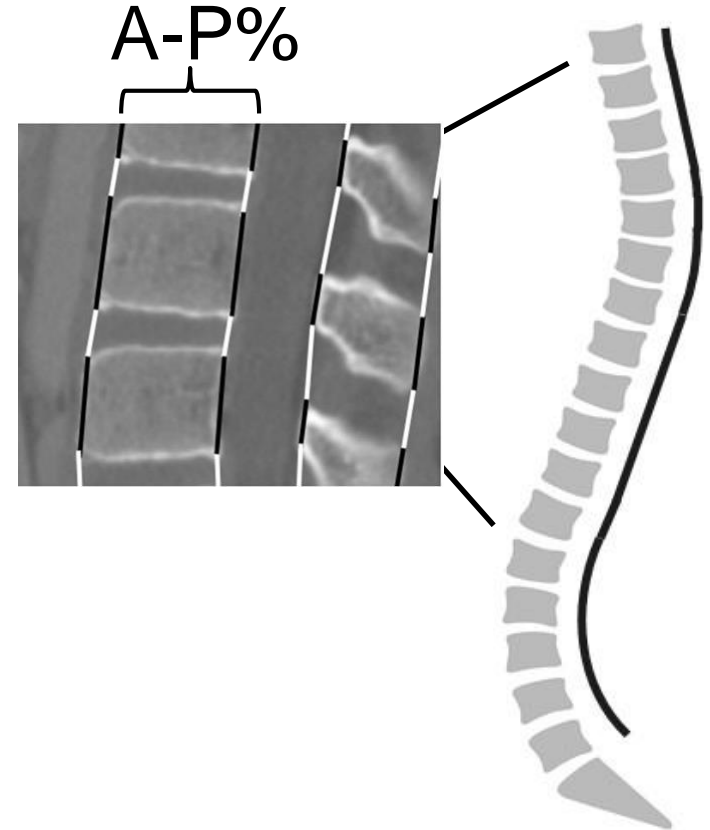
The anterior side of the disc was higher in AIS than controls, whereas the interspinous space was smaller in AIS.

Length in millimeters

* = significant difference between AIS and controls (C).



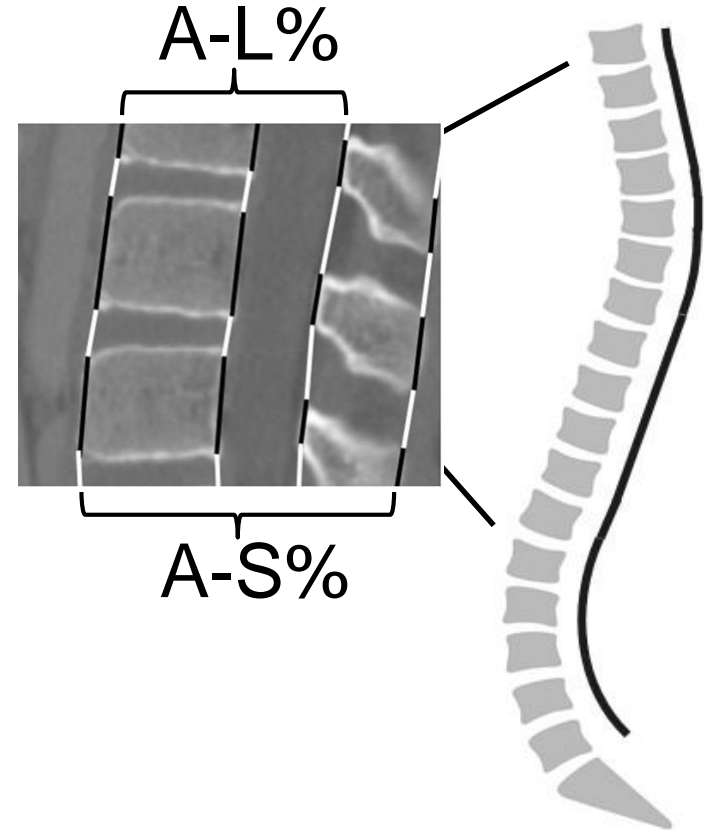
Anterior-posterior ratio (A-P%)



		AIS	Controls
A-P%	Total*	+3.4 (± 2.8)	-2.7 (± 2.5)
	Osseous*	+1.3 (± 3.3)	-2.4 (± 3.0)
	Non-osseous*	+14.1 (± 11.4)	-3.7 (± 7.6)
A-L%	Total*	+6.4 (± 6.1)	-2.9 ($\pm 5.1\%$)
	Osseous	+58.0 (± 22.4)	+50.6 (± 22.9)
	Non-osseous*	-53.2 (± 10.0)	-61.7 (± 11.5)
A-S%	Total*	+16.8 (± 22.2)	+7.4 (± 8.6)
	Osseous	+92.5 (± 37.7)	+100.9 (± 35.9)
	Non-osseous*	-54.6 (± 13.0)	-66.1 (± 6.5)

* = significant difference between AIS and controls.

Anterior-lamina (A-L%) and anterior-spinous (A-S%) ratio



		AIS	Controls
Total*		+3.4 (± 2.8)	-2.7 (± 2.5)
A-P%	Osseous*	+1.3 (± 3.3)	-2.4 (± 3.0)
	Non-osseous*	+14.1 (± 11.4)	-3.7 (± 7.6)
Total*		+6.4 (± 6.1)	-2.9 ($\pm 5.1\%$)
A-L%	Osseous	+58.0 (± 22.4)	+50.6 (± 22.9)
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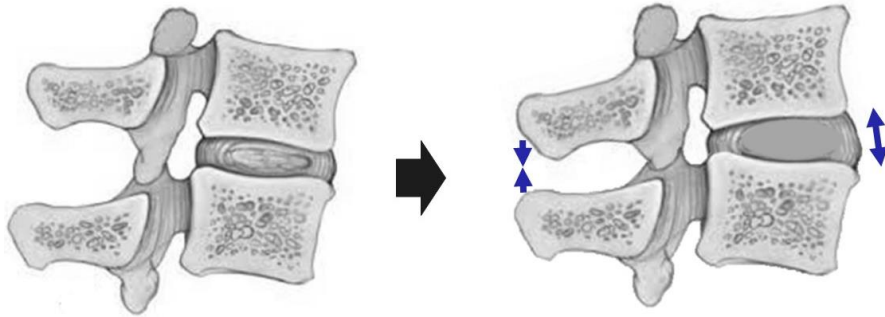
* = significant difference between AIS and controls.

Conclusions

The idiopathic scoliotic spine is longer anteriorly than posteriorly

Non-osseous structures contribute more than osseous structures

→ Anterior disc expansion + compression interspinous space



This suggests that the length discrepancy is an adaptation to altered loading, rather than a primary growth disturbance



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