

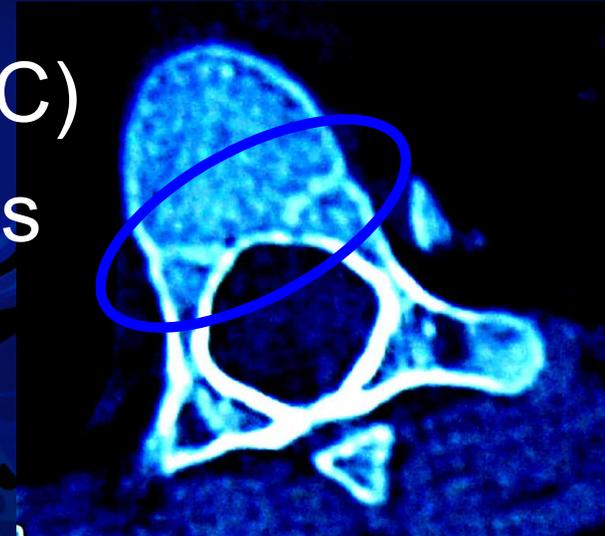
**Effect of Anterior Vertebral Instrumentation
On Spinal Canal Dimension
In Children Age 1 And 2 Years**

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**ICEOS November 2009
Istanbul**

Neuro Central Cartilage NCC

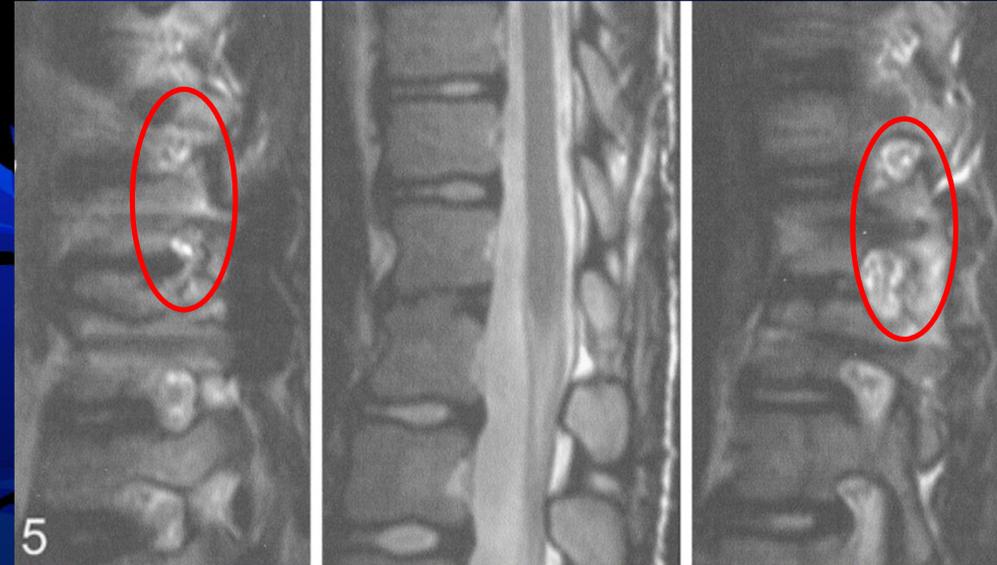
- The neurocentral synchondrosis (NCC) located in the posterior vertebral body is responsible for the development of posterior vertebral body and pedicle , thereby contribute to development of spinal canal.
- Unilateral trans pedicular screw fixation that traverses the NCC in a growing-pig model can create scoliosis. *Zhang H and Sucato DJ; JBJS 2008*



NCC Controversy “No Major Effect”

Pedicle Screws in 1 and 2 Year Old Children
Technique, Complications, and Effect on
Further Growth.

Ruf M and Harms J Spine 2002

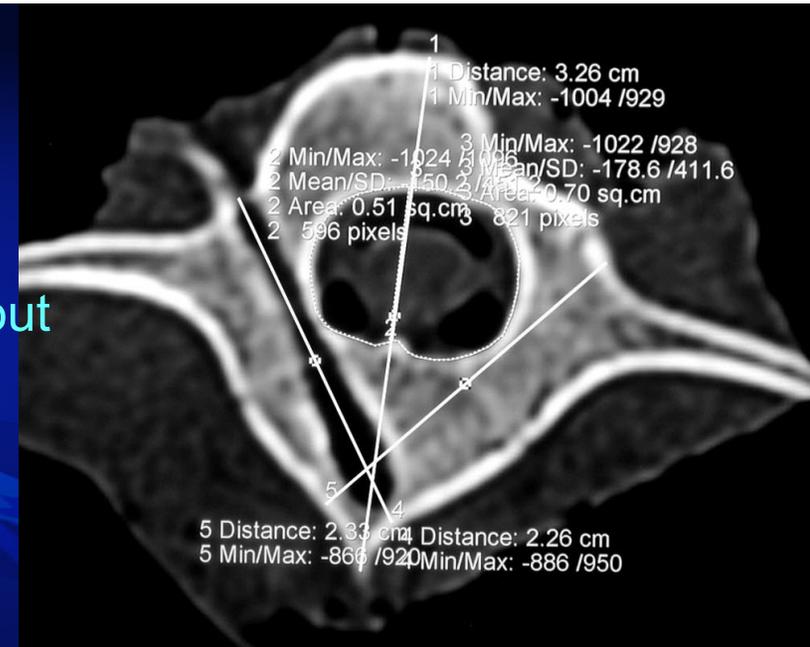


No MAJOR narrowing of the spinal canal after pedicle screws instrumentation.

Evidence was limited: MRI was performed in 3 children with steel implants; only one boy, had his steel implants changed to titanium.

NCC Controversy “Significant Effect”

The Effect of Pedicle Screw Placement With or Without Application of Compression Across the Neurocentral Cartilage on the Morphology of the Spinal Canal and Pedicle in Immature Pigs. *Cil A et al Spine 2005*



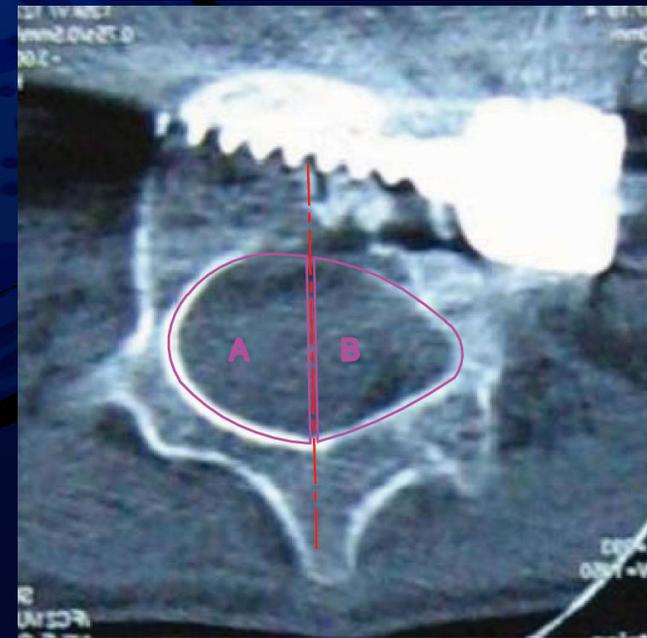
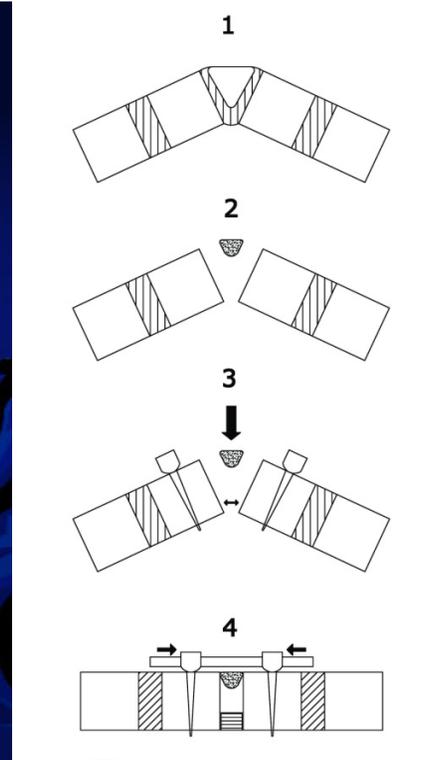
- Even without compression, pedicle screws passing through the NCC in immature pigs disturb spinal canal growth **SIGNIFICANTLY**, with inherent risk of iatrogenic spinal canal stenosis with 20% to 26% narrowing of the hemi-canal areas.

NCC Controversy ??

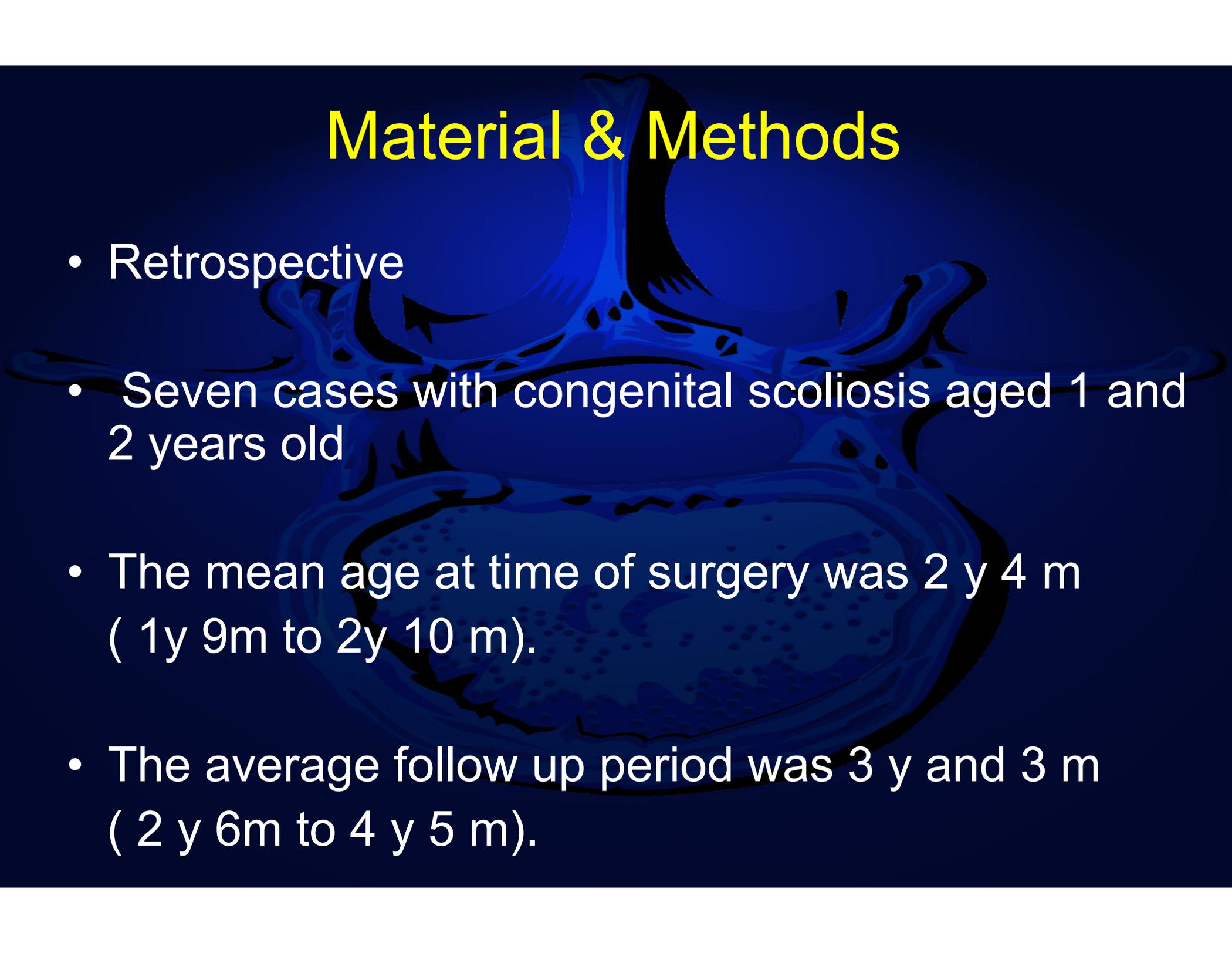
Anterior instrumentation and correction of congenital spinal deformities under age of four without hemivertebrectomy: A new alternative.

Elsebaie H et al. (Spine, in press)

- The first human study looking at the spinal canal dimension using CT scan after Anterior Instrumentation and fusion .
- Anterior Instrumentation and fusion can encroach on the NCC causing its growth retardation and disturbance in the development of spinal canal in the very young age group.

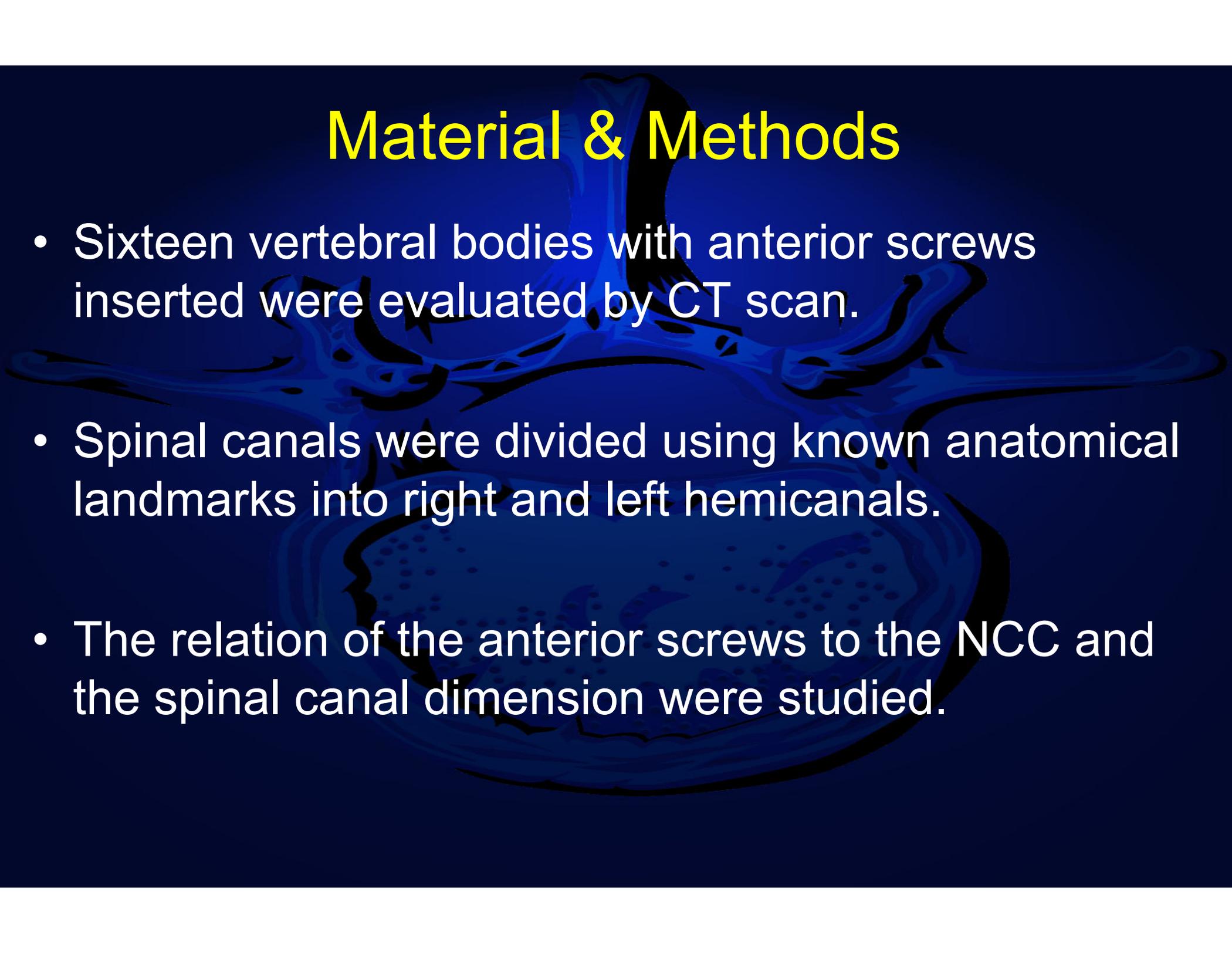


Material & Methods



- Retrospective
- Seven cases with congenital scoliosis aged 1 and 2 years old
- The mean age at time of surgery was 2 y 4 m (1y 9m to 2y 10 m).
- The average follow up period was 3 y and 3 m (2 y 6m to 4 y 5 m).

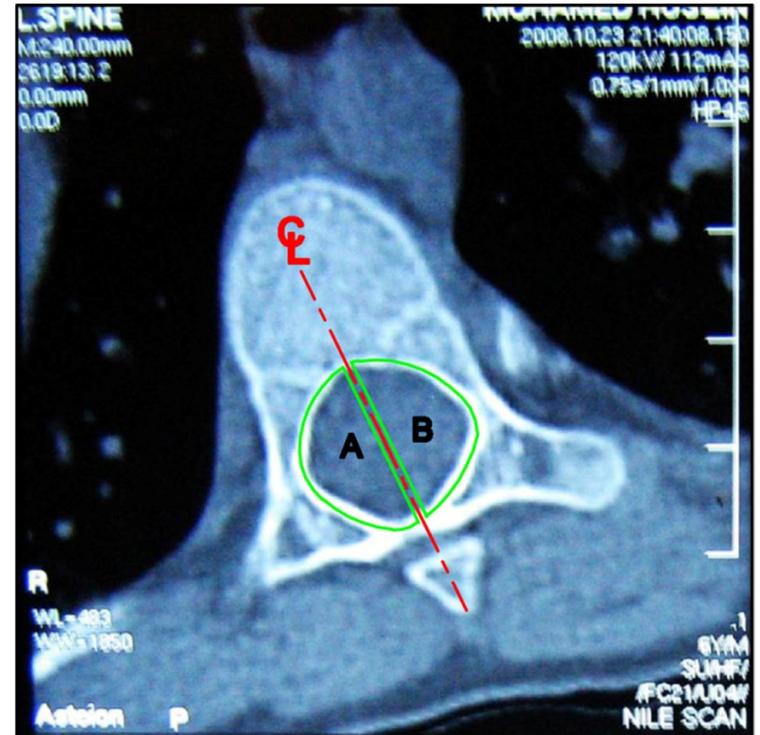
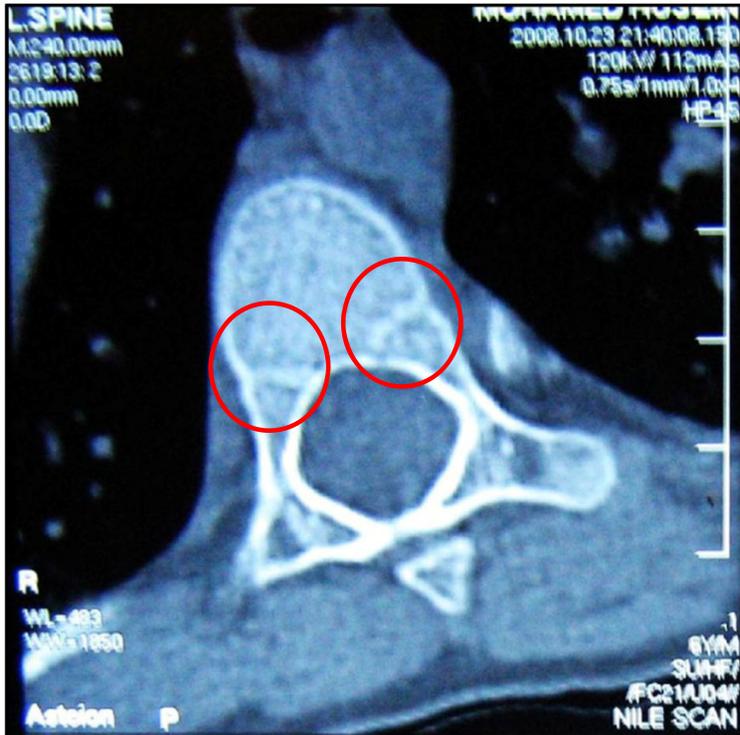
Material & Methods



- Sixteen vertebral bodies with anterior screws inserted were evaluated by CT scan.
- Spinal canals were divided using known anatomical landmarks into right and left hemicanals.
- The relation of the anterior screws to the NCC and the spinal canal dimension were studied.

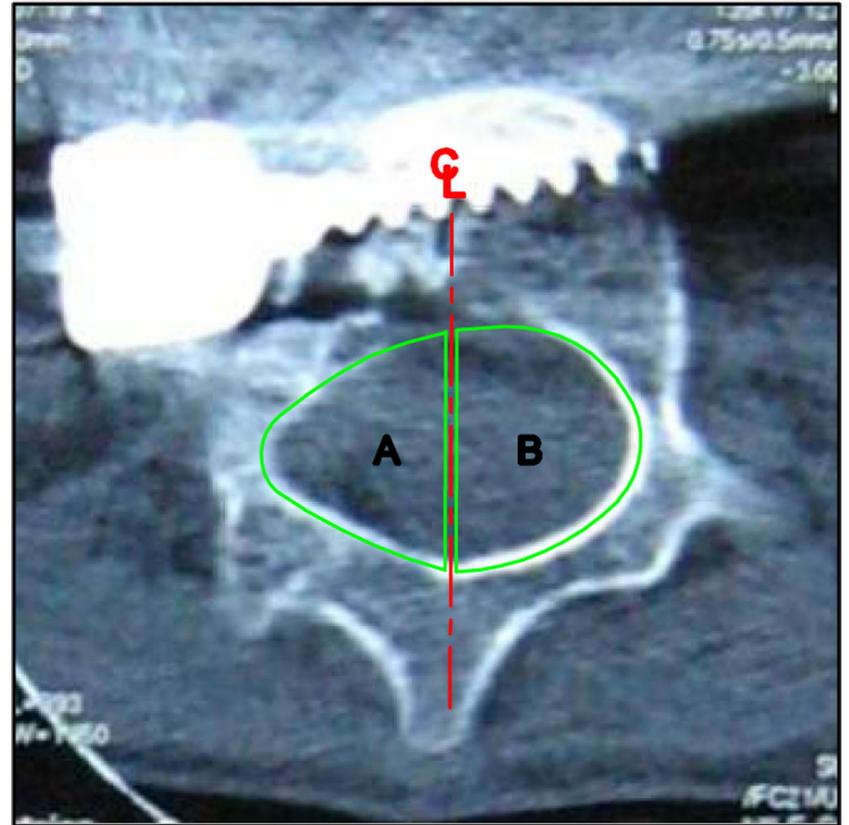
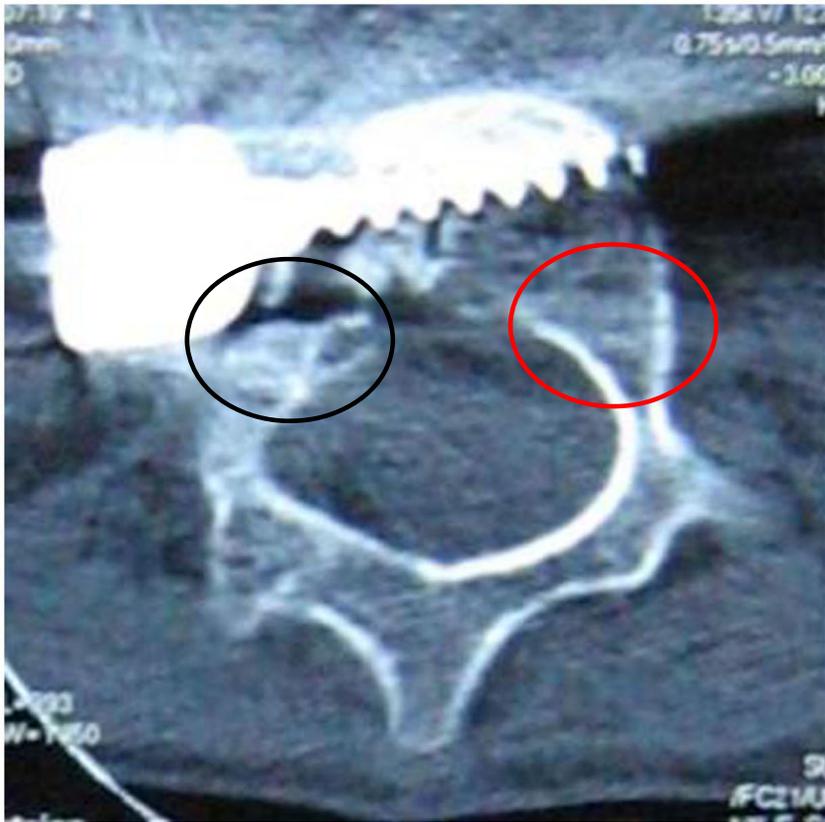
Results:

- Only 11 levels were suitable for measurements.
- In 6 levels the screws were passing through or encroaching on the NCC, there was significant reduction of 10 to 20% in the diameter of the ipsilateral hemicanals.
- The hemicanals were almost symmetrical (less than 3 % difference) in 4 levels with screw passing away from the NCC and in 1 level where the screw was encroaching on the NCC.



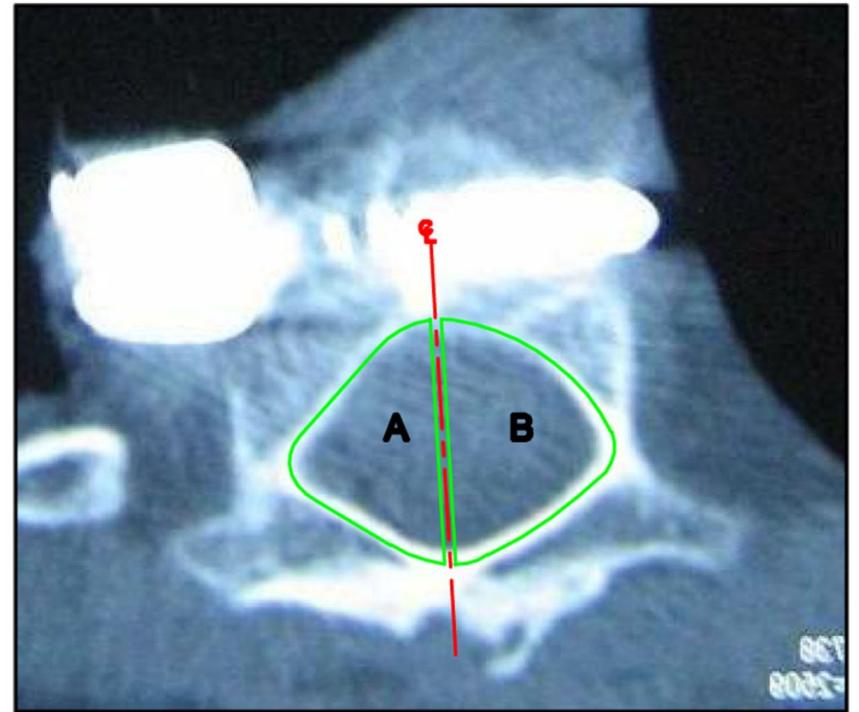
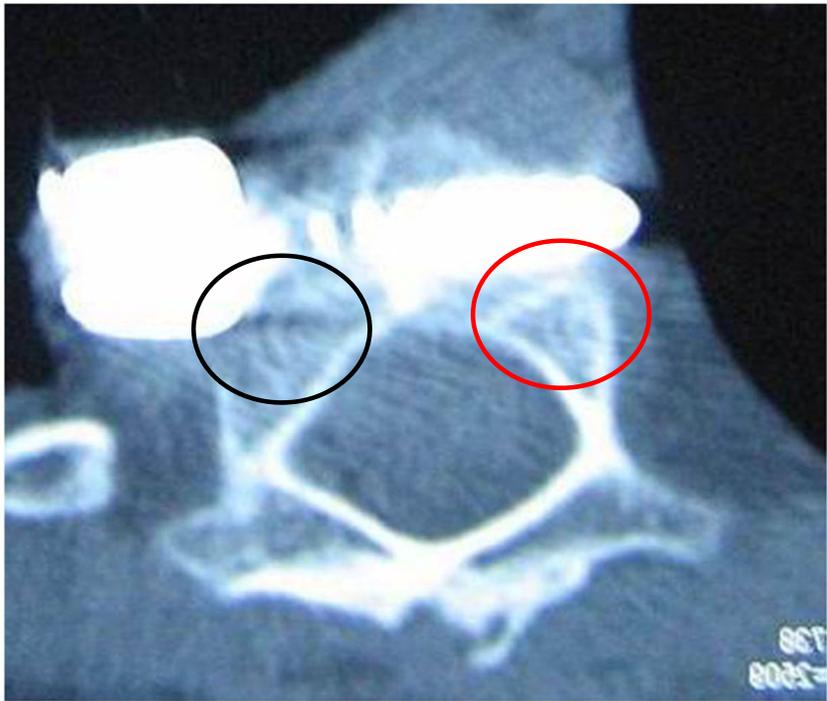
$$A / B = 0.99$$

Symmetric NCC



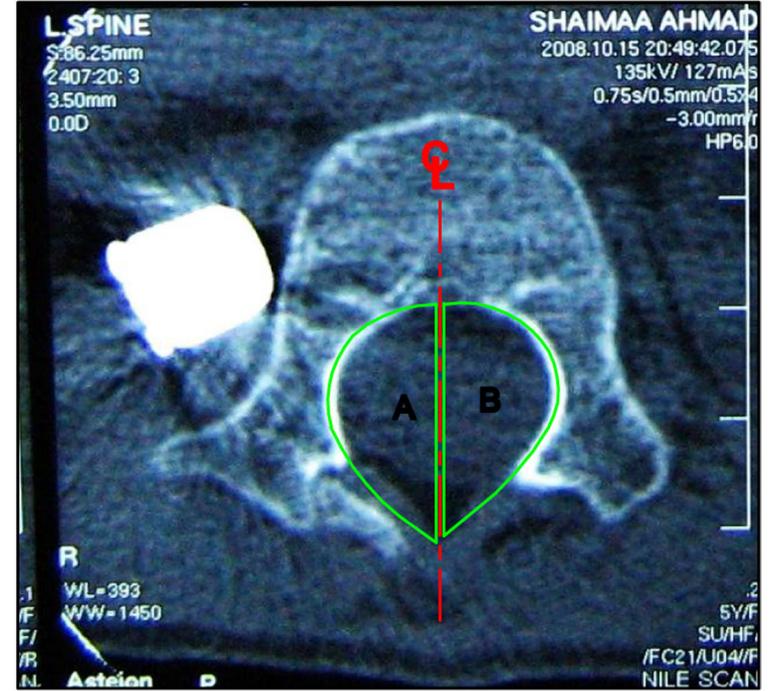
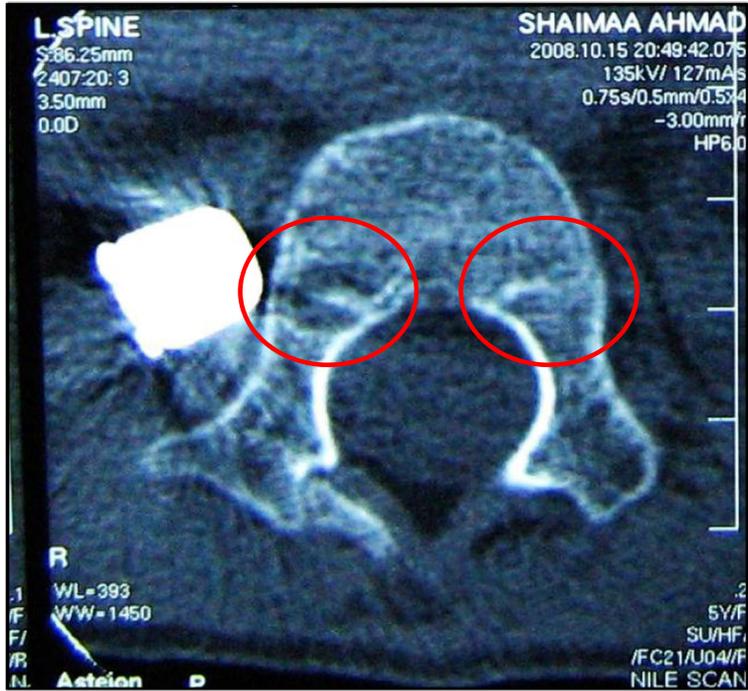
$$A / B = 0.82$$

Asymmetric NCC



$$A / B = 0.80$$

Asymmetric NCC



$$A / B = 1$$

Symmetric NCC

Conclusion

- Asymmetric growth at the NCC results in asymmetric dimension of the spinal hemi canals.
- Anterior vertebral body screws and fusion can encroach on the NCC in the very young age, this encroachment seems to cause decrease in the ipsilateral hemicanal dimension between 10 to 20% with growth.
- The long term clinical significance of this finding is yet to be evaluated.



Thank You