

Cortical Bone Trajectory at L5 Lumbar Level  
Had Potential Risk for L4/5 Facet Joint  
Violation in Elderly Patients  
: a Simulated Morphometric Analysis using 3D-CT.

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- Cortical bone trajectory (CBT) is a pedicle screw trajectory which follows a caudocephalad path sagittally and a laterally directed path in the transverse plane.
- This novel screw insertion technique has reported to provide greater holding screw strength by increased cortical bone contact.

Santoni, Hynes : Spine journal 2009

But **anatomical risks for some clinical concerns of CBT** are well not known.

- ✓ pedicle breach
- ✓ pars fracture
- ✓ facet joint violation

**In the present study, anatomical feature of the trajectory was investigated using originally developed 3D-CT based simulation software.**

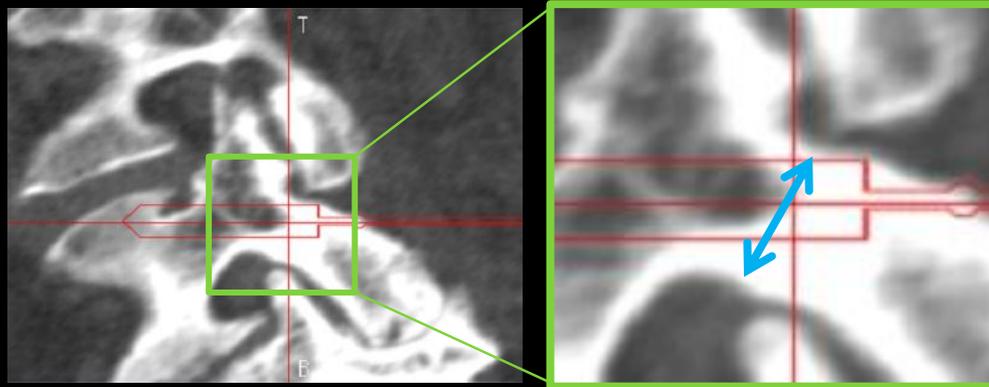
# Materials

- A total of 25 adult patients **older than 60 years old** who were taken CT scans of lumbar spine were enrolled.
- 11 male, 14 female
- Averaged age was 69.4 years old (range: 60 - 84).

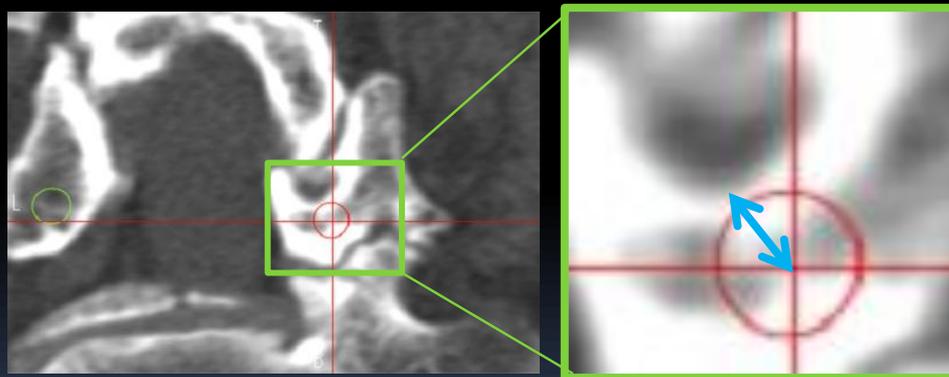
# Methods

- 4.5mm diameter screws were placed on the **originally developed CT based 3D-simulator** (Zedview VEGA, Robert Reid-LEXI, Tokyo).
- Following parameters were measured 3-dimensionally
  1. CCW: caudocephalad width of cortical bone
  2. FSD: distance between cephalad facet joint and screw center axis

# 1. CCW: caudocephalad width of cortical bone



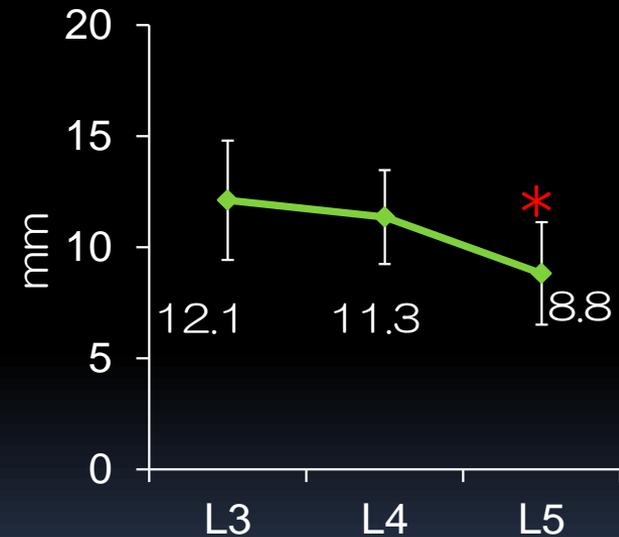
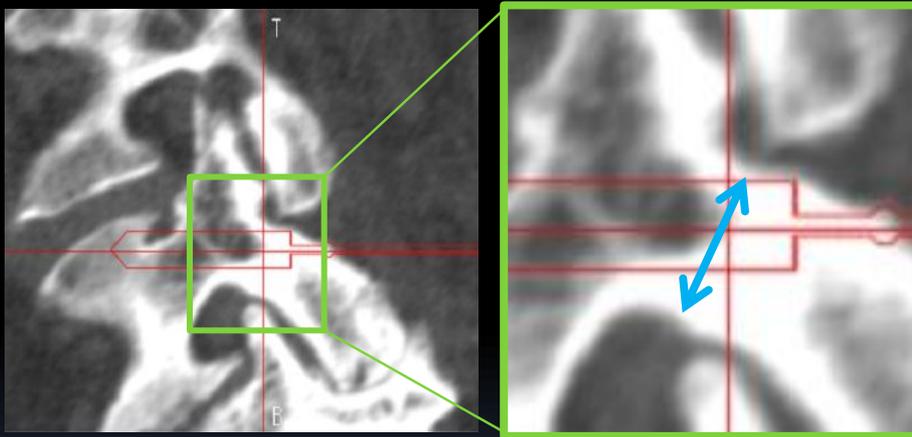
# 2. FSD: distance between cephalad facet joint and screw center axis



# Results

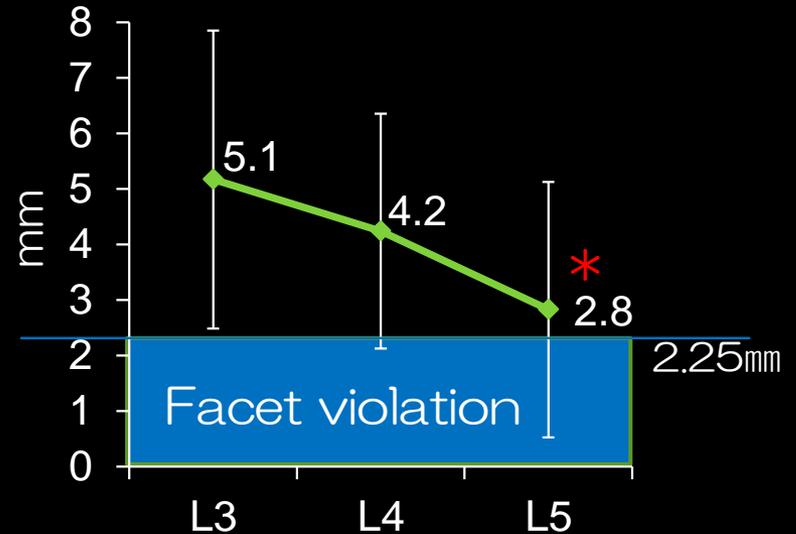
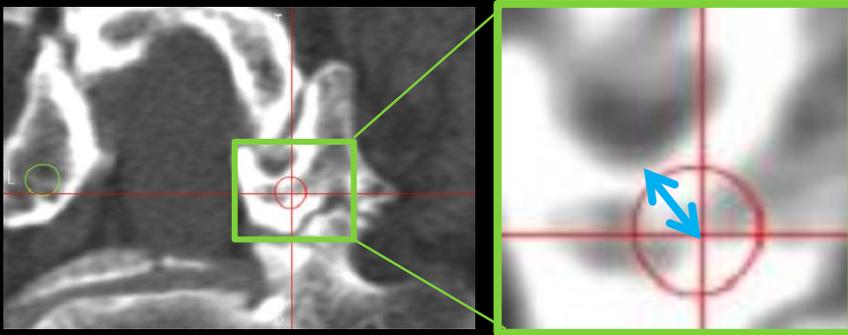
## 1) CCW

The mean caudocephalad width (CCW) gradually decreased from L3 to L5. CCW at L5 was significantly smaller than those at L3 and L4.



## 2) FSD

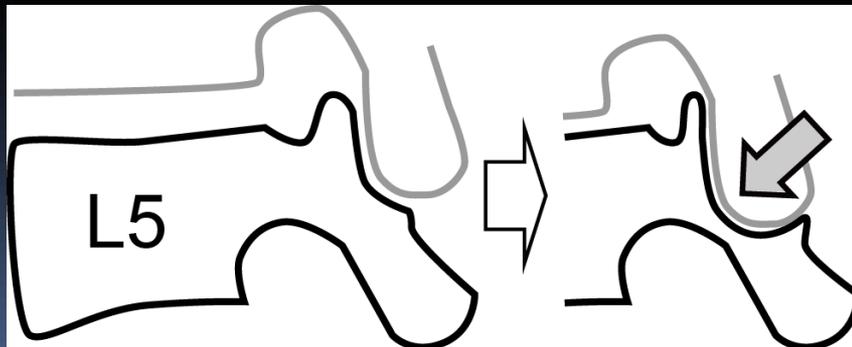
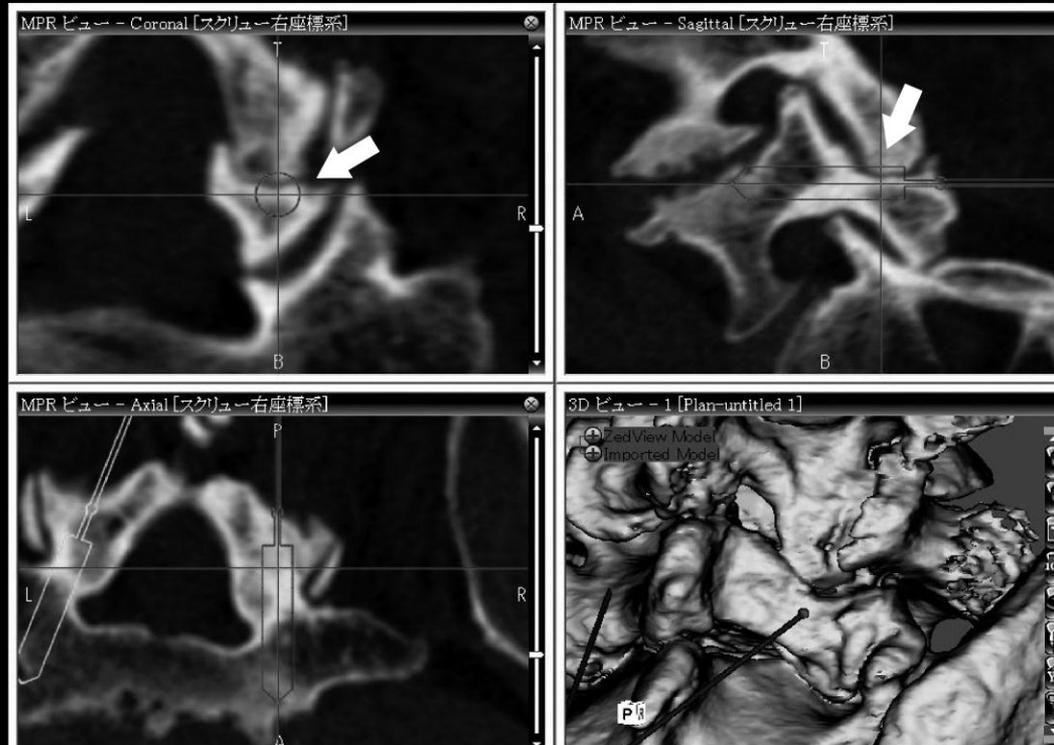
FSD (facet- screw axis distance) decreased from L3 to L5. FSD at **L5 was significantly smaller** than those at L3 and L4.



In 14 of all 25 patients, screw thread of L5 screw penetrated the surface of L5 superior facet.

Facet violation rate	L3	8%	2/25 pts.
	L4	8%	2/25 pts.
	L5	56%	14/25 pts.

# Screw thread of L5 screw penetrated the surface of L5 superior facet.



This trend was remarkable in the patient with **L4 degenerative spondylolisthesis**.

# Discussion

- Both lateral and caudocephalad diameters were larger than the screw diameter in all 25 patients in lumbar spine, therefore insertion of CBT screws itself considered to be safe and possible.
- Meanwhile, L5 CBT screw interfered L4/5 facet joint in 56% of patients.
- In case of L5/S1 fusion surgery using CBT, we should keep in mind that L5 CBT screw has higher risk for L4/5 facet violation in elderly patients.

# Disclosures

Yuichiro Abe, MD, PhD

Nothing to declare

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Nothing to declare

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Nothing to declare