

The effect of hubbing on the pull-out strength of lateral mass screws in the cervical spine: A biomechanical experiment

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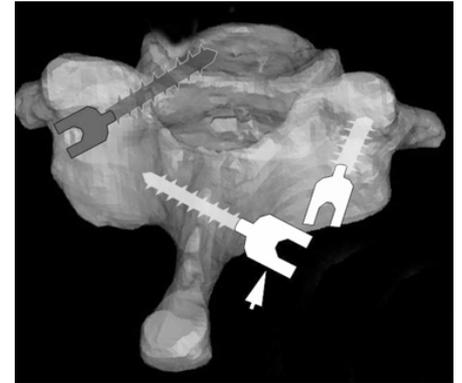
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- Nothing to disclosure
- None of the authors has any conflict of interest.

Introduction

□ Lateral mass screw fixation

- It has been widely indicated for stabilization of various cervical instabilities.
- It is relatively safer, simpler, and more effective than other fixation techniques in cervical spine.



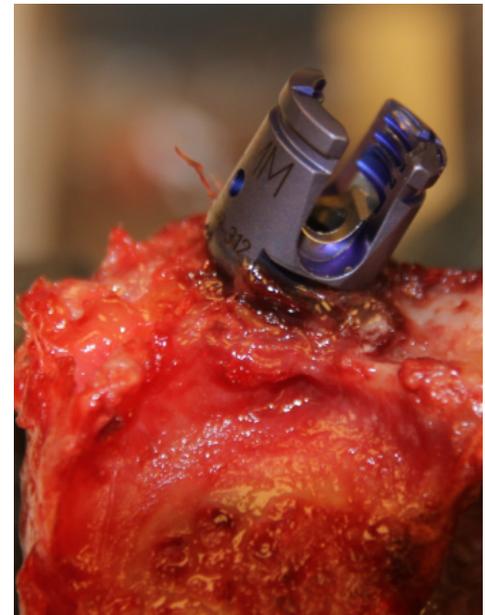
□ Fixation strength of Lateral mass screws

- It depends on a number of factors, such as bone mineral density, cortical fixation, pedicle morphology, screw orientation and insertion technique, screw design etc (*Heller JG, 1996, Inoue S, 2012*).

Introduction

□ *Hubbing ?*

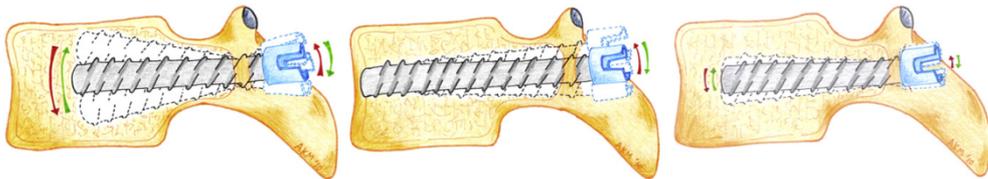
- It means the deep-seated screw head against the dorsal laminar cortex for the feeling of 'firm fixation'.
- Some surgeons try to get a feeling of 'firm fixation' during the insertion of the screw. They continue to twist their screw driver when the head of screw touches the laminar.



Introduction

□ ***Hubbing in thoracic spine*** (Paik H, 2012).

- It has been postulated to reduce the moment arm, providing a load-transfer effect to the neighboring cortical bone, and reduce the cephalo-caudad toggling.



- However it results in a significant decrease in the pull-out strength of screw.
- They reported it might result in a iatrogenic fracture of the laminar, pedicle, and SAP.

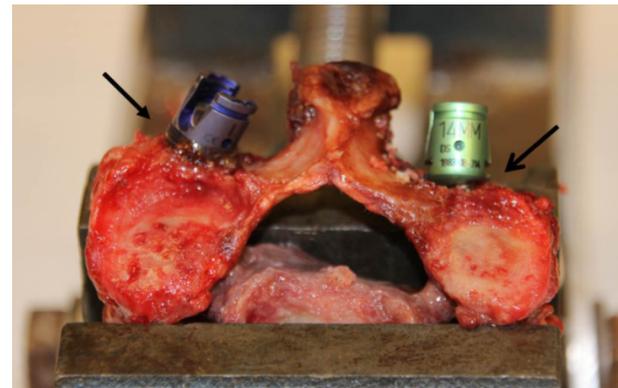
✓ However , there is no study about the effect of hubbing on pull-out strength in cervical lateral mass screw .

Purpose of This Study♪

- The purpose of this study was to compare the pull-out strength either hubbed or not hubbed when inserted into the lateral mass in the cervical spine.

Materials and Methods

- Preparation and instrumentation of specimens
 - Fifteen vertebrae (C3-7) were harvested from 5 fresh cadavers and prepared for this study. Each specimen was carefully disarticulated into individual vertebrae with all preserved osseous anatomy.
 - Lateral mass screws were inserted using the trajectory described in the modified Margerl technique. Polyaxial screws 3.5mm in diameter were used (Depuy Spine, Raynham, MA).
 - Hubbing vs Non-hubbing
 - : Randomization of insertion side each vertebra.



Materials and Methods♪

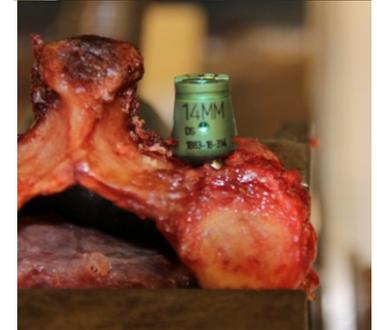
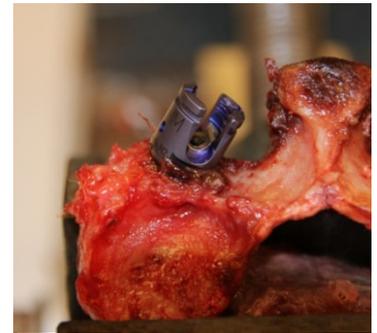
□ Randomization of insertion side each vertebrae

- **Hubbed screws** : On one side screws 12mm in length were inserted until the screw head touched the lateral mass, then they were turned 2.5 more times until they were fully hubbed.

- **Non-hubbed screws** : On the other side the non-hubbed screws were 14mm in length and inserted until the screw head just touched the lateral mass.

- The 2mm difference in length in the screws (12 or 14mm) was

to ensure that the screws were buried to **the same length** when inserted as hubbed or non-hubbed.



Materials and Methods

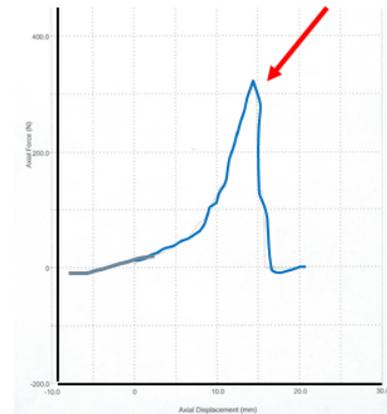


□ Biomechanical Study

- The anchoring screw was inserted to vertebral body. All specimens were embedded in an end cap 10 diameter using dental cement.
- They were clamped in the testing machine (858 Mini Bionix Test System).
- The peak load to failure was measured in the load-displacement curve.

□ Statistics

- The difference in pull-out strength between the hubbed and nonhubbed screws was evaluated using a nonparametric paired test (Wilcoxon signed rank test), which compared side to side on each vertebra. SPSS version 12.0 was used.



Results

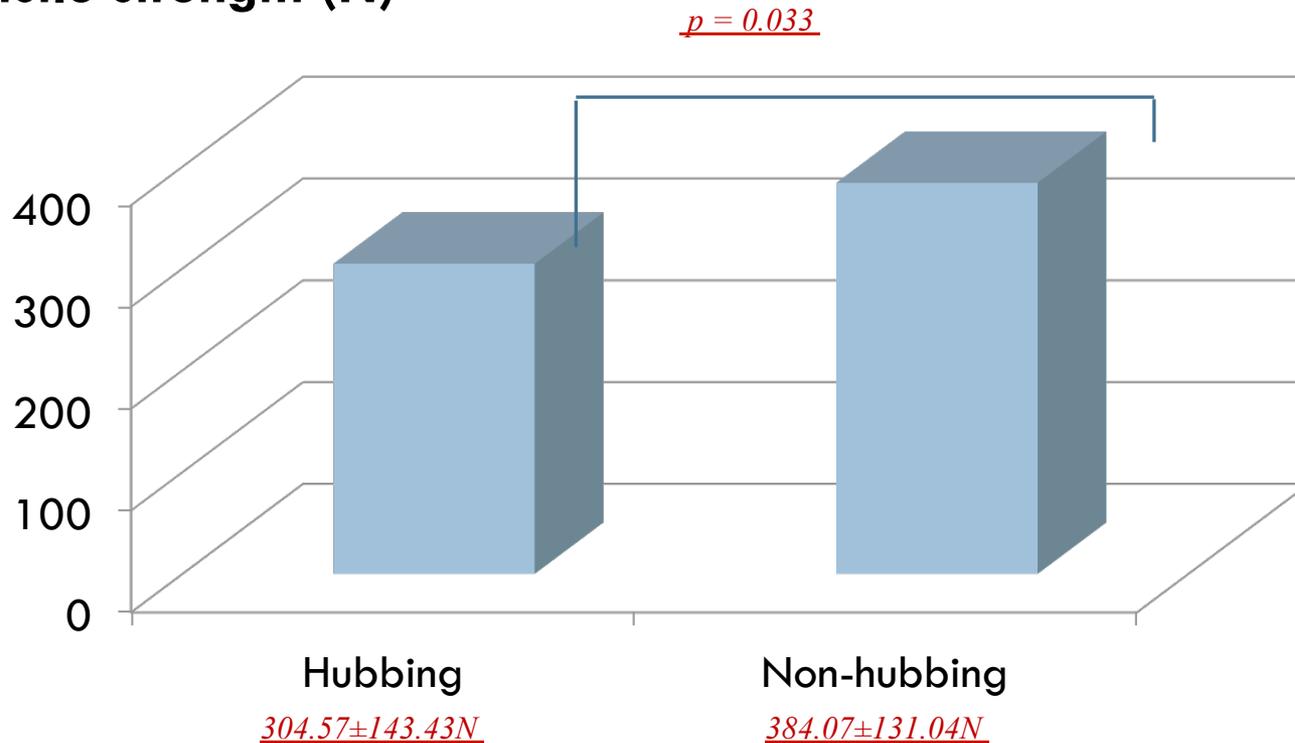
□ Gross examination before biomechanical testing

- 4 cases (4 / 15) in hubbed group showed small fractures or cracks around the screw hole after screw insertion in gross examination.
- However, there was no fracture or crack in non-hubbed group.
- One specimen was excluded because of cement breakage during the biomechanical testing.
- A total of 14 vertebrae were tested. The Wilcoxon signed rank test showed significant difference in side to side comparison ($p=0.033$).



Results : Mechanical Study

Tensile strength (N)*



- The Wilcoxon signed rank test showed significant difference in side to side comparison ($p=0.033$); this means that the hubbed screws had significantly lower pull-out strengths as compared with the non-hubbed screws.

Discussion♪

- ***Why did the hubbed screws show lower pull-out strength?***
 - “Hubbing” could weaken the cortical bone around the screw hole
(causing small cracks or fractures)
 - Eccentric seating of the polyaxial screw heads in hubbed group could lead to iatrogenic laminar fracture during the biomechanical testing (The rod for tensile load should be connected to the screw heads)



Conclusions♪

- The effect of Hubbing on the Pull-out Strength of Cervical Lateral mass screws

: *Is it acceptable for the mechanical strength ?*

- Our Answer is “ *It is **Not acceptable***”

→ It lowered the pull-out strength of the screws and has some disadvantages.

- It is *not recommended* for secure fixation of screws

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Disclosure Information



- Nothing to disclosure.
- None of the authors has any conflict of interest.