



How Could Plate Geometry & Screw Insertion be Optimized for a Balanced Stability of the Fixator and the Lateral Hinge in Open-wedge HTO?

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I have no financial conflicts to disclose.



Introduction

- ❖ Lateral hinge should be intact to create a fulcrum during the OWHTO
- ❖ However, lateral cortical hinge fractures are considered as one of the most common complications
- ❖ Accordingly, disruption of the lateral hinge may result in a marked instability at the osteotomy site, loss of angular correction, delayed union or nonunion of the osteotomy, & implant failure

Agneskirchner 2006 KSSTA, Dixel 2015 KSSTA, Martin 2014 AJSM, Meidinger 2011 KSSTA, Miller 2009 Arthroscopy, Yacobucci 2008 AJSM

Introduction

- ❖ Most failures occur at the relatively lesser-supported lateral hinge area
- ❖ Therefore, inserting the screws from the central area of the medial side to the hinge area of the lateral side would be favorable

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Clinical Biomechanics

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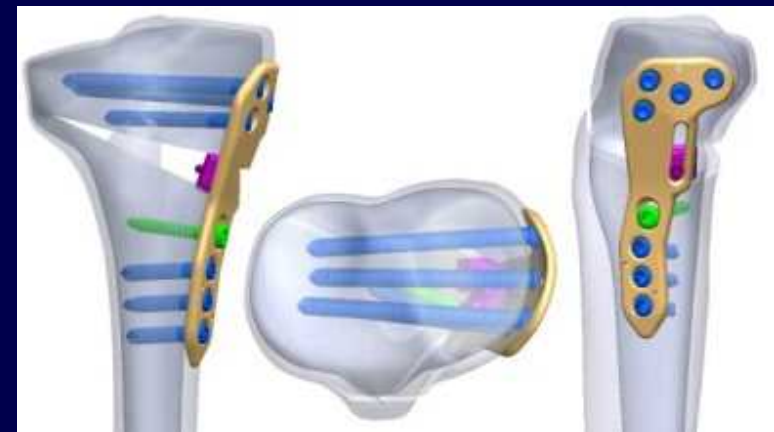
CLINICAL BIOMECHANICS

Evaluation of the screw position and angle using a post-contoured plate in the open wedge high tibial osteotomy according to the correction degree and surgical technique

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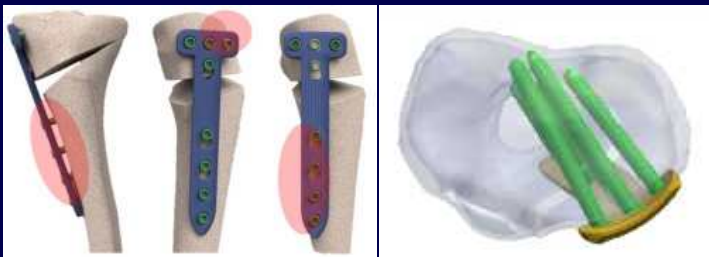
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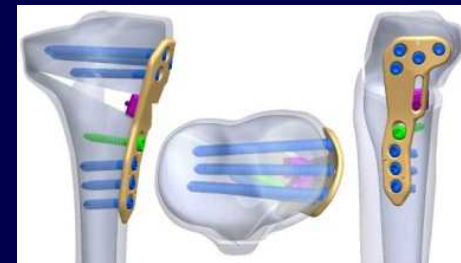
*Han 2014 KSRR, Luo 2015 Comput Methods Biomech Biomed Engin,
Nelissen 2010 IO, Yoo & Lee 2016 Clin Biomech*

Purpose & Hypothesis

- ❖ To compare our new fixator with conventional fixator in terms of the **balanced stability** between **fixator** and **lateral hinge**
- ❖ New fixator (LCfit, Corentec, Korea) could optimize for the balanced stability between fixator & lateral hinge



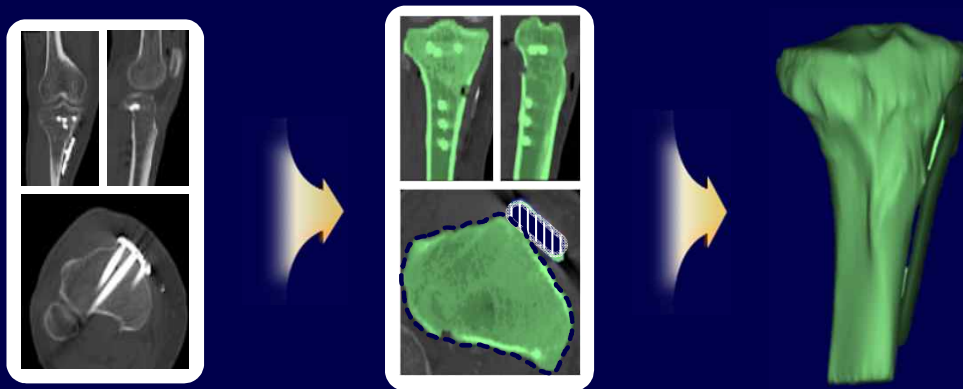
Conventional Plate



LCfit

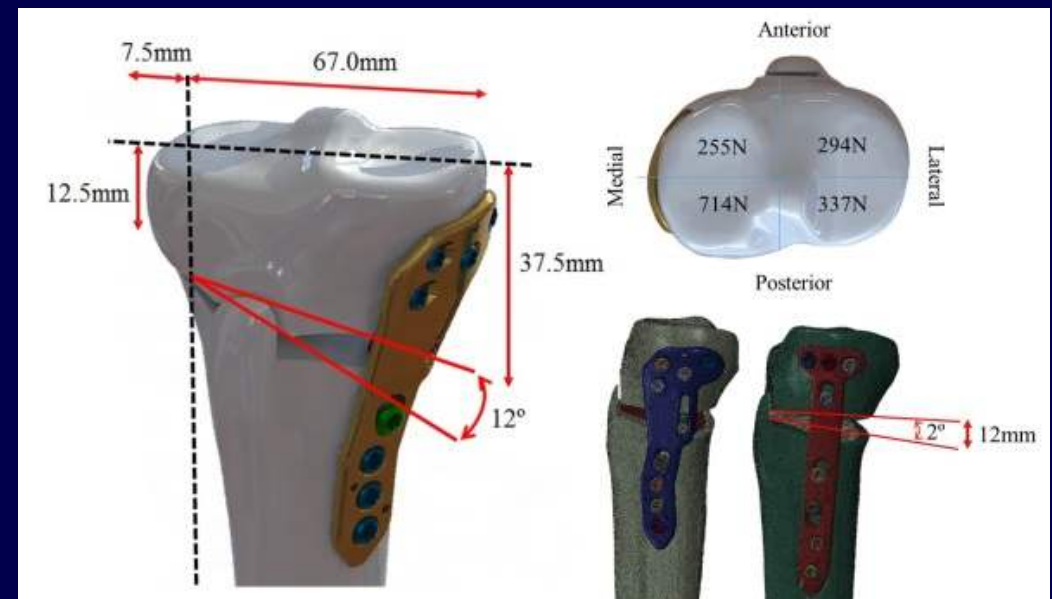
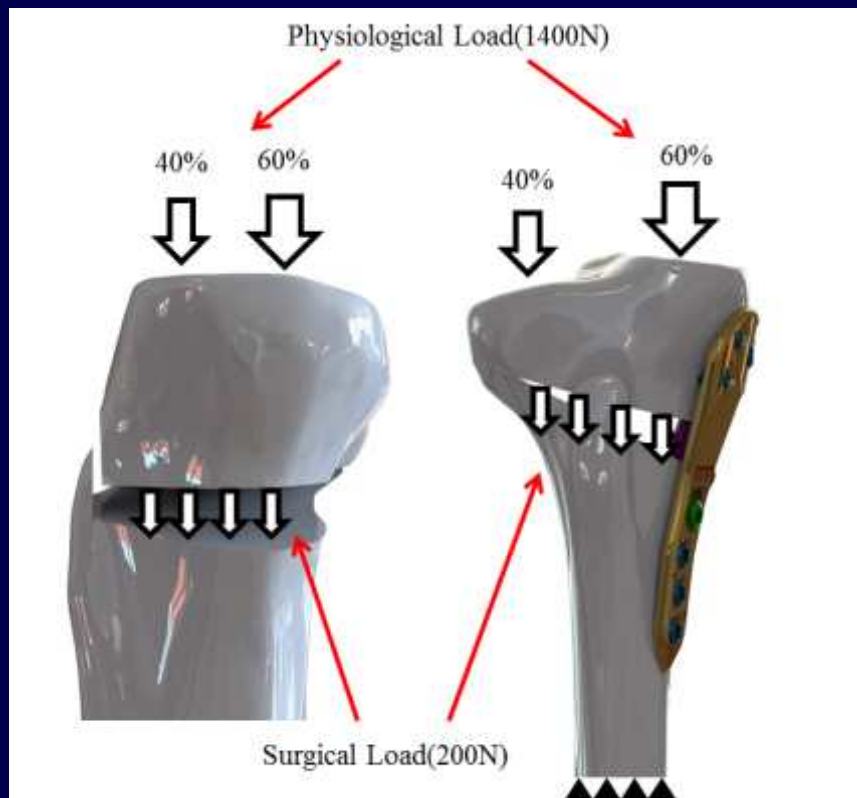
Materials & Methods

- ❖ Total of 69 osteotomies
- ❖ Postoperative CT scans
- ❖ Median correction degree: 11 mm
- ❖ Bone model reconstruction



Materials & Methods

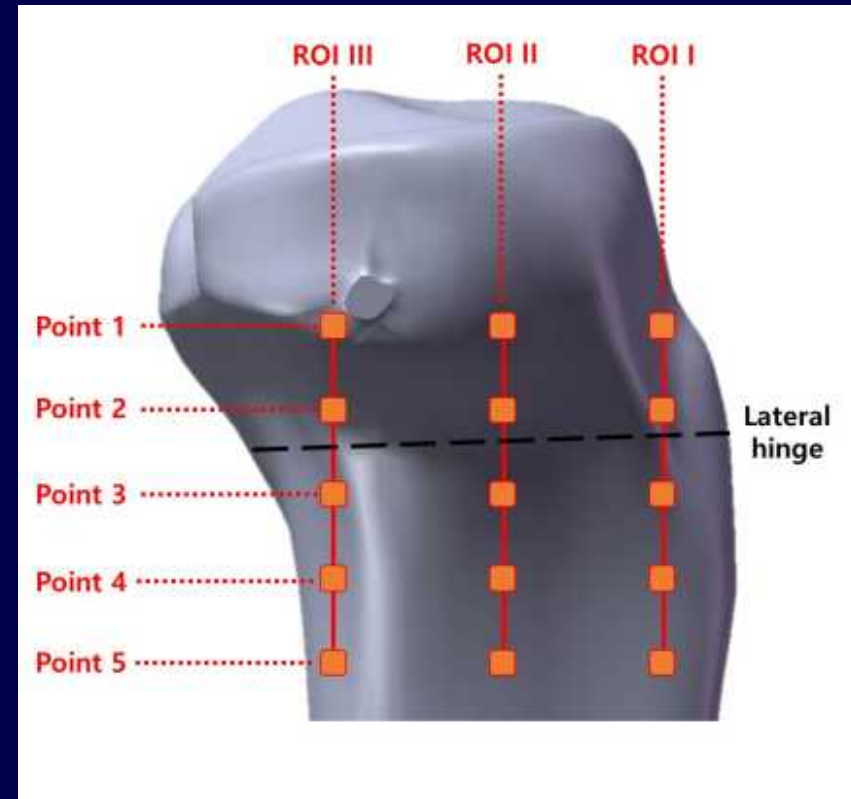
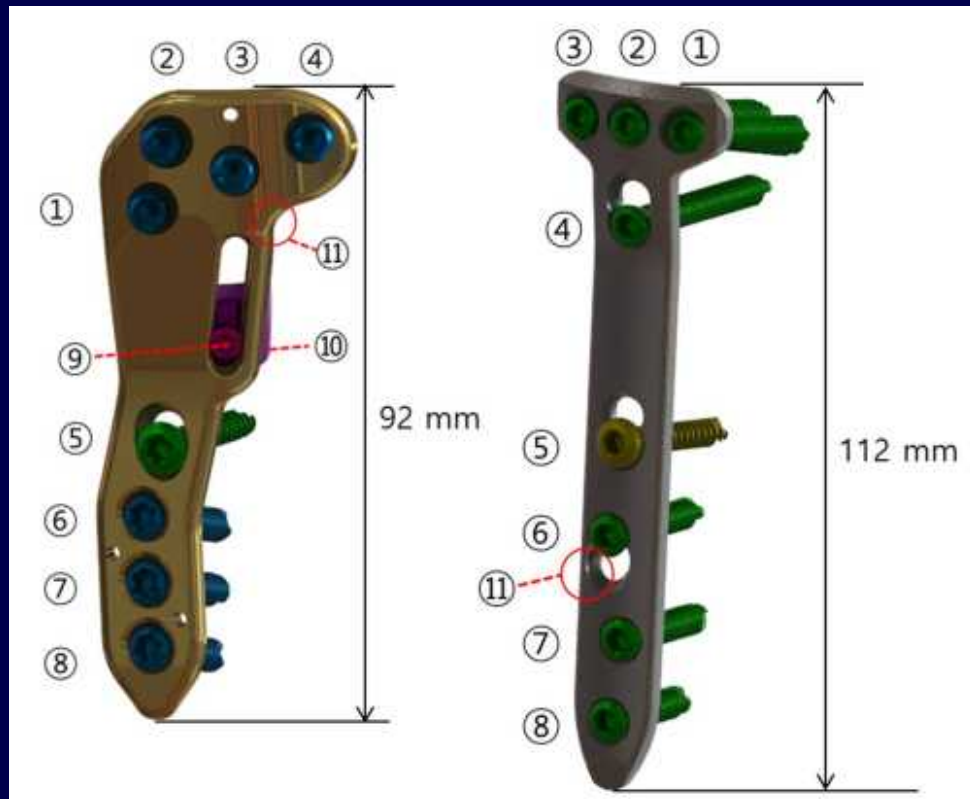
❖ Physiological load during single limb stance



Materials & Methods

❖ ROI around Fixator

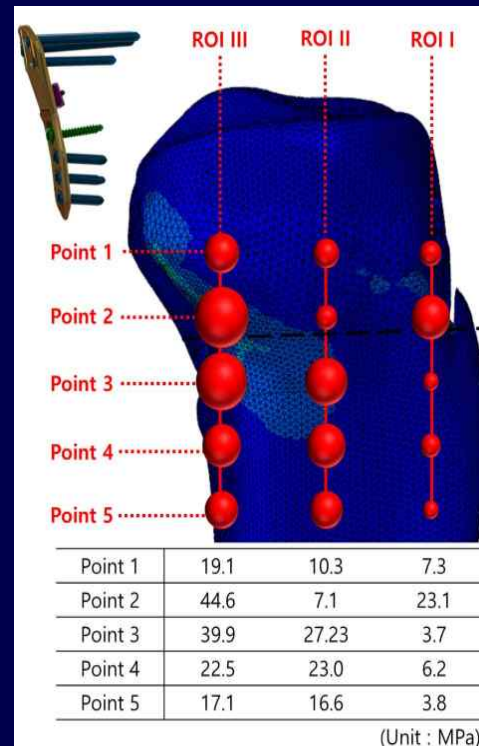
❖ ROI around Lateral hinge



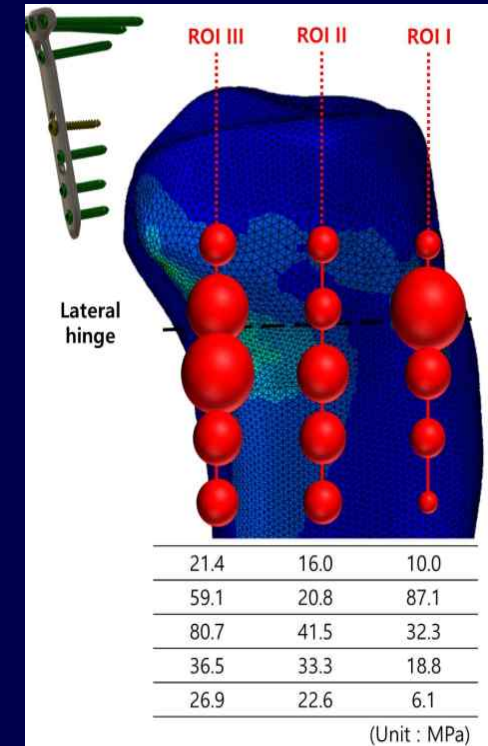
Results

❖ ROI around Lateral hinge area

- Stress measured at the 3 ROIs were generally lower in the LCfit than in the conventional plate
- Highest stress was observed in the ROI III (point 2&3) in both system



LCfit



Conventional Plate

Results

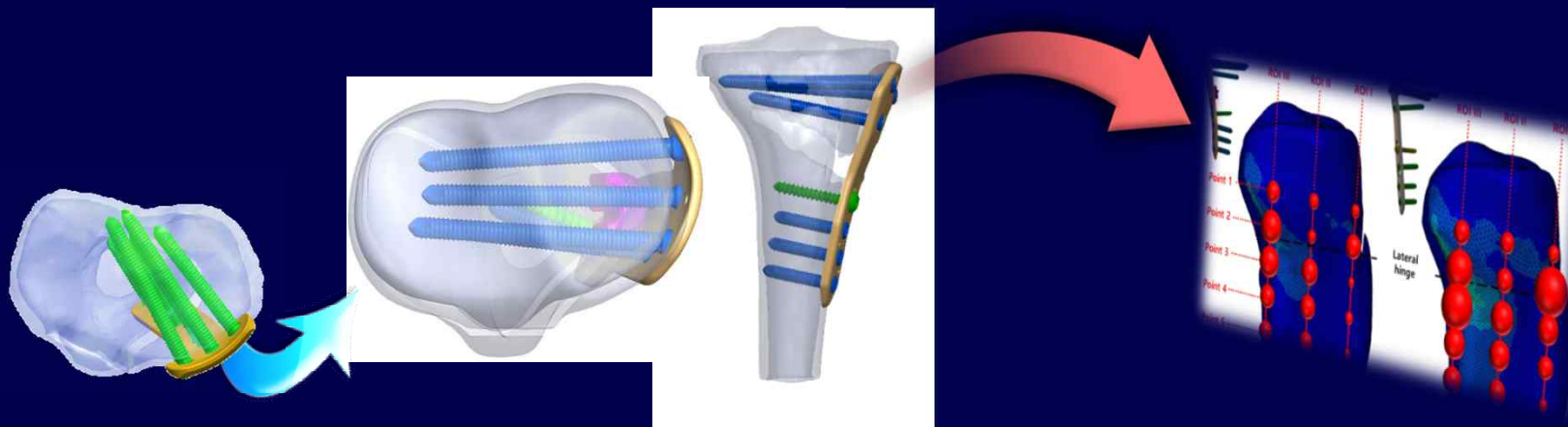
❖ ROI around Fixator

- Stress in the conventional plate tended to be concentrated in the screw
- Conventional plate showed an average of 75 % higher value at the screw than devised plate
- All stress values were lower than yield stress considering safety

Stress Riser Number	PVMS Value (MPa) of LCfit	PVMS Value (MPa) of Conventional plate	
Screw	1	118.1	255.9
	2	152.2	128.0
	3	117.0	93.7
	4	153.0	189.8
	5	31.1	187.9
	6	68.9	233.4
	7	74.5	212.6
	8	68.9	272.2
	9	92.3	N/A
Block	10	146.8	N/A
Plate	11	249.4	236.1

Conclusions

- ❖ By improving plate geometry & insertion angle of the screw, newly developed LCfit can be considered as a more favorable fixation system in terms of the **balanced stability** between fixator & lateral hinge
- ❖ However, this result was developed in theoretical models and needs to be validated in controlled clinical setting





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