Mechanical Axis Changes and its Related Factors on the Whole Leg Preoperative Planning X-Rays under Bilateral and Unilateral Weight Bearing in HTO Patients

Dept. of Joint Surg. and Sports Med., Tokyo Medical and Dental University

Tomomasa Nakamura, Takashi Hoshino, Hiroki Katagiri, Aritoshi Yoshihara, Masaki Amemiya, Mai Katakura, Yusuke Nakagawa, Nobutake Ozeki, Hideyuki Koga

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COI Disclosure

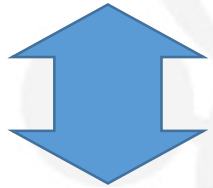
Presenter's name(s): ◎Tomomasa Nakamura, Takashi Hoshino, Hiroki Katagiri, Aritoshi Yoshihara, Masaki Amemiya, Mai Katakura, Yusuke Nakagawa, Nobutake Ozeki, Hideyuki Koga

We have no financial relationships to disclose.

Background

- HTO --- common surgery
  - Improvements in surgical techniques and fixation devices

Kim KI et al. Am J Sports Med. 2017



- 30% needs transfer to TKA in post-op 10y

W-Dahl A et al. Acta Orthop. 2012

- Requires improvement: long-term results and recurrent OA

Niinimäki TTJ et al. Bone Joint Surg Br. 2012

- Representative factor --- **Insufficient correction**

Van den Bempt M et al, Knee. 2016

Accurate pre-op planning REQUIRED

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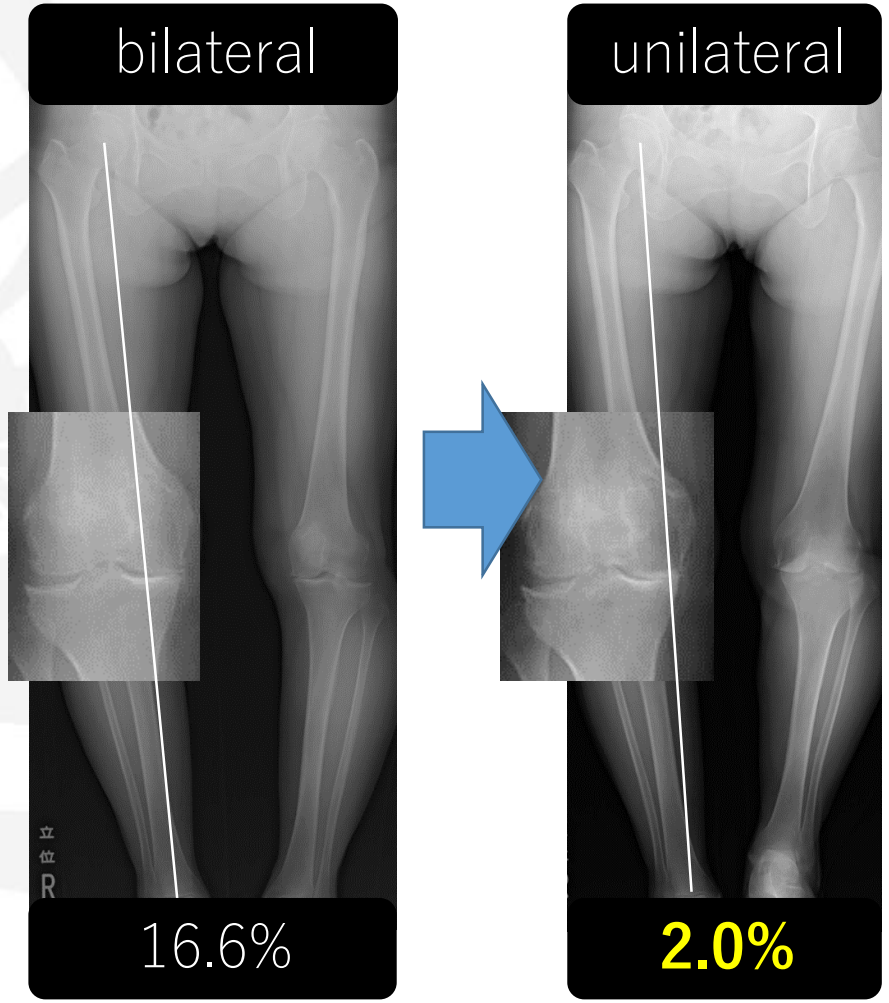
Background – Mechanical Axis Shifting

- Preoperative planning
  - based on the mechanical axis (MA) in whole leg x-ray

but

Alignment in bilateral leg loading and unilateral leg loading is usually different

What should we do?



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Purpose

- Compare the %MA between bilateral and unilateral leg loading
- Investigate the related factors in x-ray evaluation

Hypotheses

- MA shifts medially in unilateral leg loading compared with bilateral loading
- Preoperative MPTA is the related factor

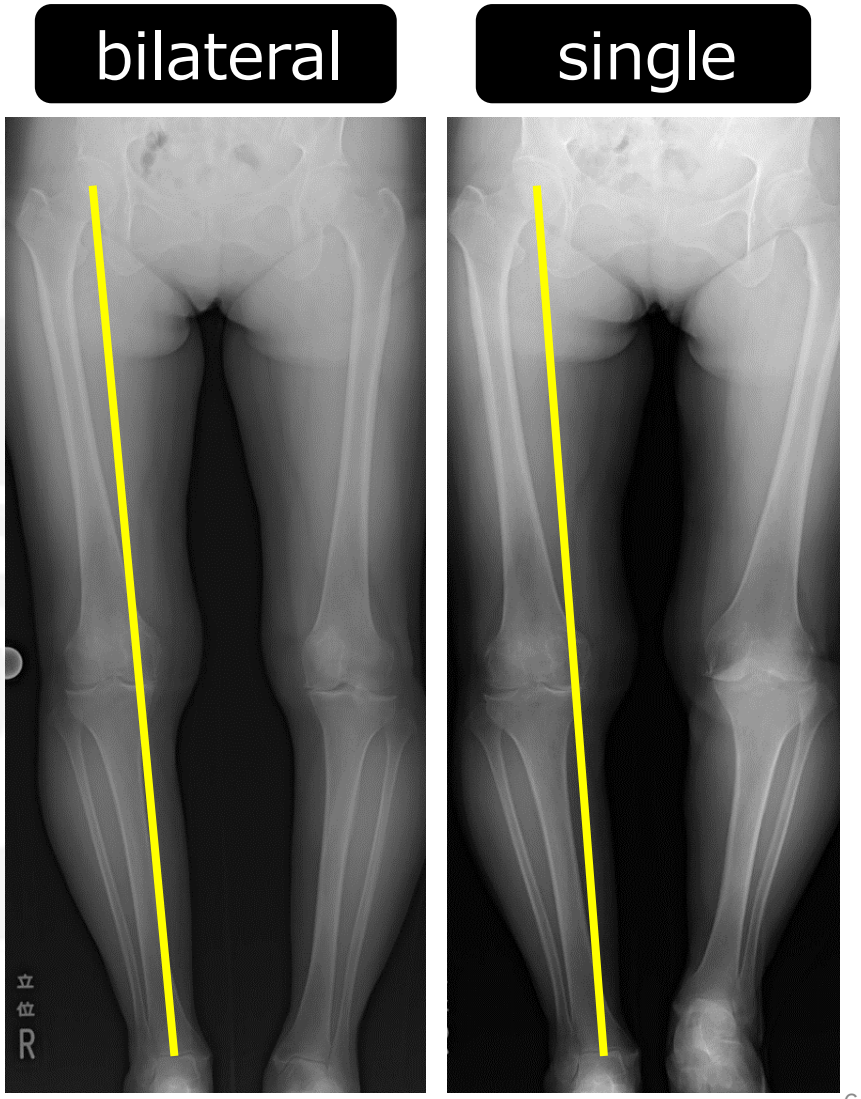
Retrospective Study

- Opening-wedge HTO cases

  Mar 2012 – Apr 2021

- Preoperative bilateral and unilateral whole leg x-ray available

125 cases
132 knees

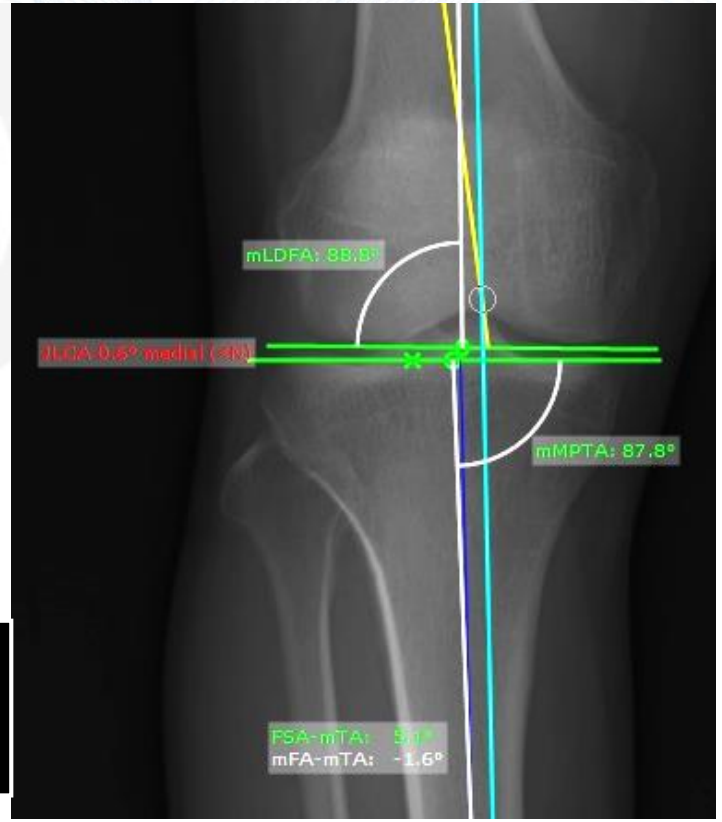


Methods - Measurements

- Digital planning software
  - mediCAD® (Hectec GmBH, Germany)
  - Semi-automatic
  - Identify the reference point manually

Parameters of knee alignment
%MA, mLPFA, mLDFA,
JLCA, MPTA, LDTA

Compare the parameters
btw bilateral leg loading and unilateral leg loading



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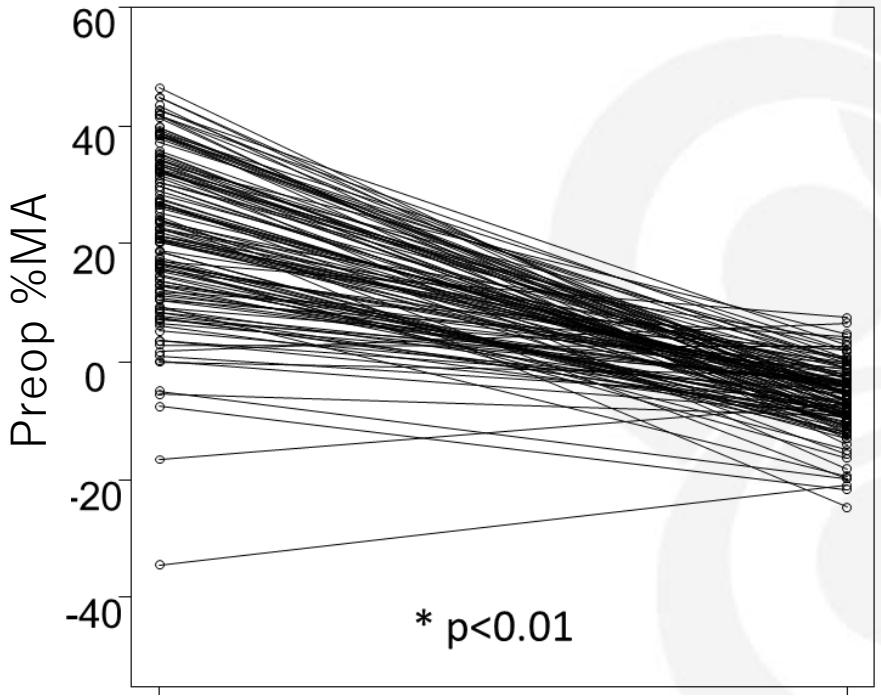
Results – Subjects' Data

	n=125 (132 knees)
Age, median (range)	61 (55-68) years
Sex (m/f)	58/67
Height, median (range)	161.6 (156.3-169.0) cm
Weight, median (range)	65.5 (58.4-75.0) kg
BMI, median (range)	25.1 (23.2-27.0) kg/m^2

Results - MA Shifting



Bilateral leg loading
22.2%
95%CI (19.9-24.6)

Unilateral leg loading
15.7%
(13.1-18.4)

- 6.5% medial shift
  Bilateral ➡ Unilateral
- 117 / 132 (**88.6%**)
  shifted medially

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Results – Related Factors (Multiple Regression Analysis)

	β (standardized regression coefficient)	p value
Age	-0.18	NS
BMI	-0.093	NS
Female	0.18	NS
mLPFA	0.17	NS
mLDFA	0.022	NS
JLCA	0.034	NS
MPTA	**-0.26**	**0.0072**
LDTA	0.086	NS

preop MPTA is a significant factor

Discussion - MA Shifting

MA shifts 6.5% medially in 88.6% preop legs

Preop planning based on the bilateral loading x-ray may result in insufficient correction

Discussion - Which should we use?

- Our OWHTO concept is aiming neutral alignment (%MA=57) with adequate MM functional repair

Surgical planning using unilateral leg loading x-ray

is better for avoiding insufficient correction

- In the case of standard correction (%MA>60), planning with bilateral leg loading may be better to prevent overcorrection

Conclusion

- MA shifts 6.5% on unilateral leg loading compared to bilateral loading
- 88.6% of cases shifts medially
- MPTA affects to the medial MA shifting

References

Kim KI et al. Am J Sports Med. 2017
W-Dahl A et al. Acta Orthop. 2012
Niinimäki TTJ et al. Bone Joint Surg Br. 2012
Van den Bempt M et al, Knee. 2016