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Appropriate patient selection based on joint line convergence angle minimizes difference in mechanical axis between standing and supine positions after high tibial osteotomy

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COI Disclosure Information

Presenter：Naosuke Nagata

I have no financial relationships to disclose.

Introduction

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Factors of correction error with high tibial osteotomy(HTO)

- Inaccurate preoperative planning *1,Shin et al et al, Arthroscopy. 2020
- Inaccurate X-ray *2, Jud et al, Knee Surg Sports Traumatol Arthrosc. 2020
- Intraoperative errors *3, Park JG et al, Knee Surg Sports Traumatol Arthrosc. 2020
- Difference in coronal alignment between the standing and supine

Caused by → Joint laxity, body mass index(BMI), advanced osteoarthritis, etc.

→ Joint line convergence angle (JLCA)

Large preoperative JLCA may indicate postoperative differences in mechanical axis(MA) between the standing and supine positions postoperatively.

Purpose

- The extent of postoperative differences in MA between the standing and supine position is unclear.
- The degree of preoperative JLCA to achieve acceptable differences in MA between postoperative standing and supine positions is unknown.

Purpose

To evaluate the differences in MA between the standing and supine positions in patient who received HTO under the surgical indication based on JLCA.

Hypothesis

Appropriate surgical indication and patient selection may minimize the difference in mechanical axis between standing and supine position.

Materials & Methods

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- 2016～2021 open wedge HTO or distal tuberosity osteotomy(DTO)

69 cases, 71 knees（37 males, 32 females）
Average age：58.5 ± 7.8
HTO 46 cases, DTO 25 cases

Exclusion criteria

- ✓ Preoperative JLCA> 6° in standing position
- ✓ The difference in preoperative JLCA between standing and supine positions> 3°

Materials & Methods

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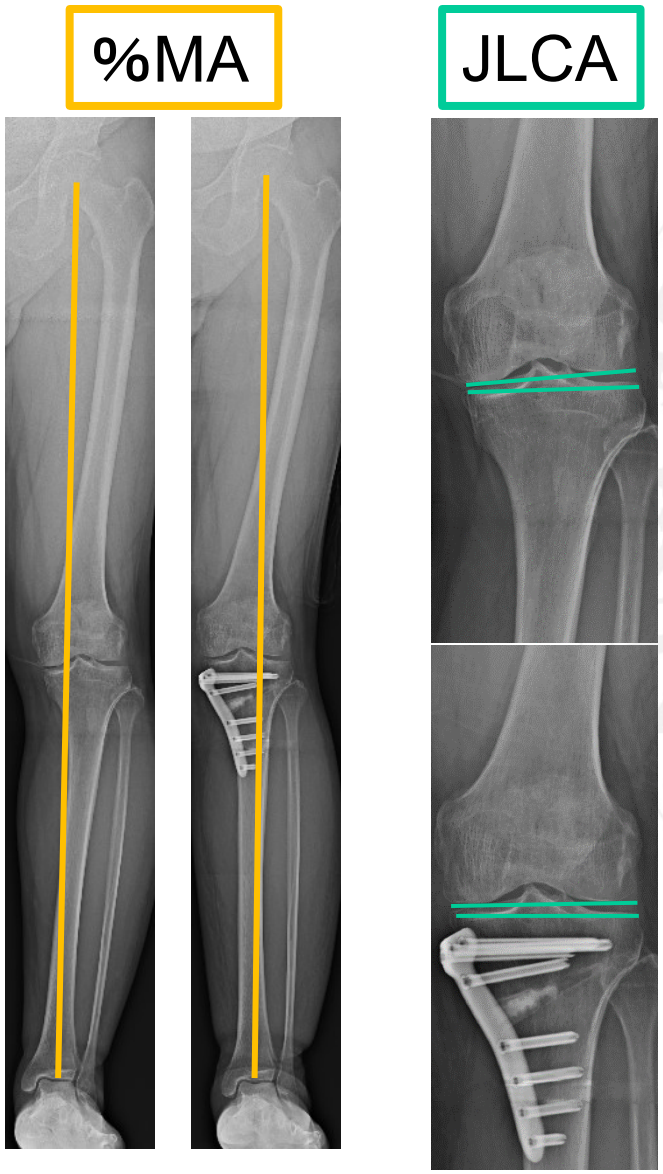

Pre & Postoperative

- %MA, JLCA
  standing and supine
- Δ%MA, ΔJLCA
  standing - supine

- standing vs supine (paired *t* test)
- The distribution of Δ%MA, ΔJLCA

Results %MA, JLCA

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	%MA (Average ± SD)		JLCA(°) (Average ± SD)	
	Standing	Supine	Standing	Supine
Pre-op	23.8 ± 9.5 *	28.7 ± 8.0	2.9 ± 1.4 *	1.6 ± 1.4
Post-op	58.8 ± 6.9 n.s	59.0 ± 6.2	1.7 ± 1.0 *	1.5 ± 1.1

Results Δ%MA

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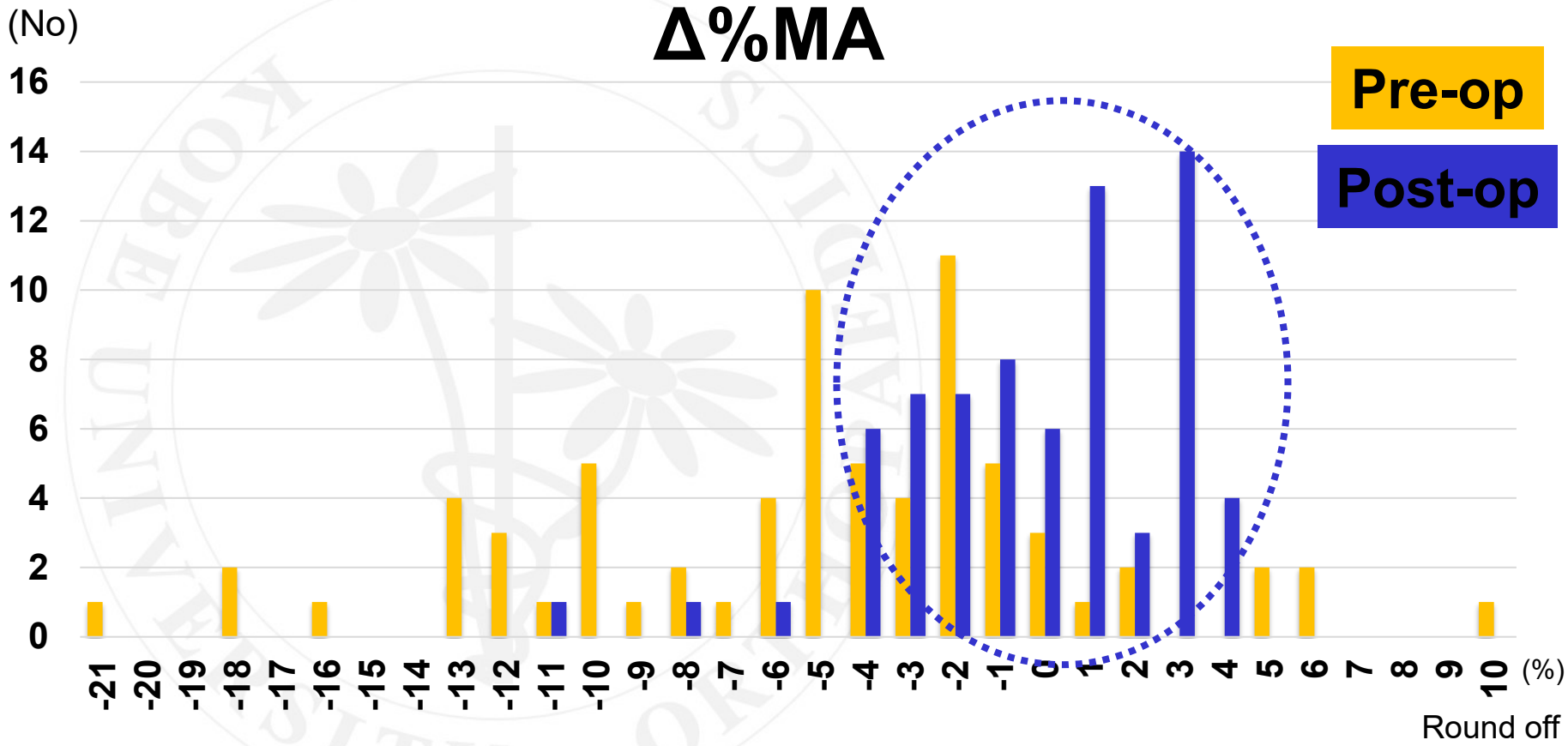
Average Δ%MA (95%CI)	
Pre-op	**-4.9** (-6.3 — -3.5)
Post-op	**-0.2** (-0.9 — 0.5)



Post-op

ΔMA%= -5～ 5% : 68/71 knees (95.8 %）

Results ΔJLCA

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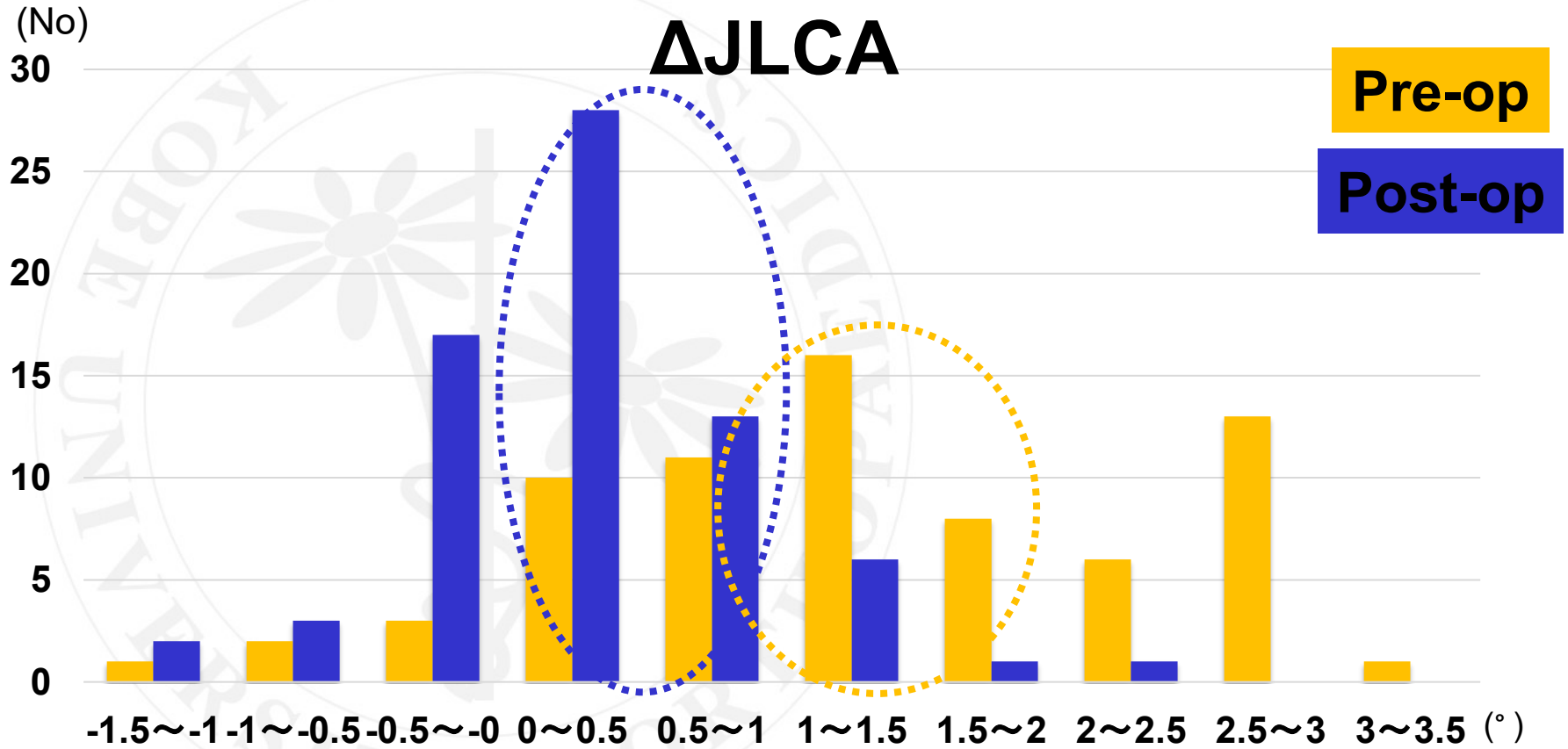
Average ΔJLCA (95%CI)	
Pre-op	**1.3** (1.1 – 1.6)
Post-op	**0.3** (0.1 – 0.4)



Discussion

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The differences in MA between the standing and supine positions postoperatively.

		Standing	Supine	The cause of differences
*4, Tsuji et al.	HKA	− 4.3 ± 2.5°	− 3.8 ± 1.8° (*)	Preoperative JLCA
*5, Jang et al.	%MA	63.9 ± 2.9%	57.9 ± 2.1% (*)	Preoperative JLCA, BMI
This Study	**%MA**	**58.8 ± 6.9**	**59.0 ± 6.2 (n.s)**	

This study

In most cases(95.8%), the differences between standing and supine postoperative MA were between -5% and 5%. Appropriate patient selection could be done.

Discussion

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Joint line convergence angle

- Preoperative JLCA≦6° achieved optimal postoperative JLCA.

**6, Weiping et al, Arch Orthop Trauma Surg. 2019*

- Lower preoperative JLCA in the standing position resulted in smaller differences in HKA between intraoperative navigation system and postoperative radiograph.

**4, Tsuji et al, Arch Orthop Trauma Surg. 2020*

- Difference in JLCA between the supine and standing positions is the most important predictive factor of coronal correction error after HTO.

**7, So SY et al, Knee Surg Sports Traumatol Arthrosc. 2020*

This study

Preoperative standing JLCA <6° and preoperative ΔJLCA <3° resulted in a smaller postoperative MA difference between the standing and supine positions.

Conclusion

- Appropriate surgical indication and patient selection may minimize the difference in mechanical axis between standing and supine position.

- The differences in mechanical axis between the standing and supine positions after HTO were minimal in patient with preoperative standing JLCA <6° and ΔJLCA <3°.

References

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*4 Tsuji M, Akamatsu Y, Kobayashi H, Mitsugi N, Inaba Y, Saito T (2020) Arch Orthop Trauma Surg 140:707–715.
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*6 Ji W, Luo C, Zhan Y, Xie X, He Q, Zhang B (2019)Arch Orthop Trauma Surg 139:743–750.
*7 So SY, Lee SS, Jung EY, Kim JH, Wang JH (2020) Knee Surg Sport Traumatol 28:1516–1525.