# Influence of Different Standing Position on Anatomical Parameters of Coronal Whole-leg Weightbearing Radiographs in Preoperative Planning for High Tibial Osteotomy

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# INTRODUCTION

- Coronal whole-leg radiographs are used in the preoperative planning for HTO [1].
- In general, the anteroposterior long-leg view is obtained with the patella centred on the femoral condyles.
- Although weight-bearing coronal whole-leg radiographs are essential, the effect of standing position has not been clarified.

# PURPOSE

- To assess the differences in lower-limb anatomical parameters according to different weight-bearing standing positions with the legs spread or closed.

# MATERIALS

- Digital radiographs were obtained from 176 patients with Kellgren-Lawrence (KL) grade I, II or III varus knee OA [2].
- Mean age was 64.6 years old (16-92 years old), a tola of 60 males and 116 females were included.
- Patients with flexion contractures or those unable to stand with full weight bearing were excluded.

| | | |
|---|---|---|
| *Number of cases* : | grade 0 | *33* |
| | grade I | *63* |
| | grade II | *51* |
| | grade III | *58* |

# METHODS

- Full weight-bearing coronal whole-leg radiographs with the patella centred on the femoral condyle were taken.
- Each patient was assessed in two standing positions: legs spread and legs closed.
- The symptomatic leg was examined.

legs spread

legs closed

# Radiographic Measurements

- mLDFA *(mechanical lateral distal femoral angle)*
- MPTA *(medial proximal tibial angle)*
- FTA *(femoral tibial angle)*
- JLCA *(joint-line convergence angle)*
- %WBL *(% weight-bearing line)*
- HKAA *(hip-knee-ankle angle)*

## Statistical Analysis

- Student's t test was used to compare the two standing positions.
- Significant level was set at 0.05.

# RESULTS

Radiographic parameters with KL grade 0

| | Legs spread standing | Legs closed standing | *p value* |
|---|---|---|---|
| mLDFA *(° )* | 86.7±2.1 | 86.6±2.3 | *0.417* |
| MPTA *(° )* | 85.1±2.4 | 84.9±2.6 | *<0.05* |
| FTA *(° )* | 176.3±2.9 | 176.6±2.5 | *<0.05* |
| JLCA *(° ,medial)* | 1.3±1.0 | 1.4±1.4 | *0.174* |
| %MA *(° )* | 35.9±13.0 | 35.0±11.0 | *0.165* |
| HKAA *(° ,varus)* | -2.6±2.8 | -2.7±2.5 | *0.247* |

average ± SD

# RESULTS

Radiographic parameters with KL grade I

| | Legs spread standing | Legs closed standing | *p value* |
|---|---|---|---|
| mLDFA *(° )* | 86.9±2.3 | 86.7±2.3 | *<0.05* |
| MPTA *(° )* | 84.9±2.1 | 84.7±2.0 | *<0.05* |
| FTA *(° )* | 176.2±3.2 | 176.4±3.1 | *0.109* |
| JLCA *(° ,medial)* | 1.5±2.3 | 1.3±1.1 | *0.282* |
| %MA *(° )* | 36.0±12.3 | 35.5±12.9 | *0.192* |
| HKAA *(° ,varus)* | -2.7±3.0 | -2.9±2.9 | *0.158* |

average ± SD

# RESULTS

Radiographic parameters with KL grade II

| | Legs spread standing | Legs closed standing | *p value* |
|---|---|---|---|
| mLDFA *(° )* | 87.2±2.2 | 87.0±2.2 | *0.053* |
| MPTA *(° )* | 85.4±2.4 | 85.0±2.4 | *<0.01* |
| FTA *(° )* | 177.0±2.9 | 177.4±2.8 | *<0.05* |
| JLCA *(° ,medial)* | 1.9±1.2 | 1.9±1.0 | *0.323* |
| %MA *(° )* | 32.9±10.8 | 32.3±10.9 | *0.159* |
| HKAA *(° ,varus)* | -3.6±2.6 | -3.7±3.0 | *0.076* |

average ± SD

# RESULTS

Radiographic parameters with KL grade III

| | Legs spread standing | Legs closed standing | *p value* |
|---|---|---|---|
| mLDFA *(° )* | 88.0±1.5 | 88.3±2.3 | *0.227* |
| MPTA *(° )* | 83.8±2.3 | 83.7±2.1 | *0.205* |
| FTA *(° )* | 180.6±3.9 | 180.9±3.6 | *0.209* |
| JLCA *(° ,medial)* | 3.3±1.8 | 3.3±1.8 | *0.486* |
| %MA *(° )* | 16.8±14.1 | 16.2±13.5 | *0.239* |
| HKAA *(° ,varus)* | -7.6±3.2 | -7.4±3.2 | *0.238* |

average ± SD

# DISCUSSION

- Current study indicated %WBL and HKAA showed no significant change, regardless of the standing position.
- A significant difference in %WBL was not found between double-leg and Single-leg weight-bearing conditions [3].
- The mean %WBL of standing position was significantly higher in standing than in supine radiographs [4].

➡ The %WBL is considered a useful parameter when preoperative planning is performed for HTO.

# CONCLUSIONS

- We investigated the differences in lower limb coronal alignment in different weight-bearing standing positions.
- The %WBL and HKAA were the same in different standing positions.
- It was suggested that the standing position should be taken into consideration in the planning for HTO

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