ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Three-Dimensional Evaluation of Distal Femoral Valgus Angle Using Whole Leg CT in Total Knee Arthroplasty

Atsushi Sato, Toshiharu Miyazawa, Marika Mukunoki, Misako Takizawa, Reo Nagasaka, Kanako Izukashi, Masataka Ota, Jun Oike, Takayuki Okumo, Saki Yagura, Takayuki Koya, Koji Kanzaki

Showa University Fujigaoka Hospital, Yokohama, JAPAN

Faculty Disclosure Information

- Nothing to disclosure

- Atsushi Sato, MD, PhD
- Department of Orthopedic Surgery, Showa University Fujigaoka Hospital, Yokohama, JAPAN.

Introduction

- Proper implant positioning is important to get correct leg alignment in total knee arthroplasty (TKA). However, the **three-dimensional evaluation** of accurate lower limb alignment is still controversial.
- Therefore, we performed a three-dimensional evaluation of the **distal femoral valgus angle (DFVA)** using full-leg CT before TKA.

Materials & Methods

- Consecutive 372 patients (282 females, 90 males, mean age: 74.8 y.o), yielded 512 knees were included in this study.
- CT-based patient-specific 3D femur model by ZedKnee software (LEXI®) was used to define a mechanical axis and distal anatomical axis of the femur.
- The case where the angle deviates from the DFVA by ± 3 ° was defined as the outlier, and the ratio of the outlier was evaluated.

Table1. Patients Demographics

Number of Patients	**372**
Gender	
Female	**282**
Male	**90**
Number of knees	**512**
Mean age (y/o)*	**74.8 ± 7.6**
Mean BMI (kg/m^2)*	**26.1 ± 4.4**

Materials & Methods

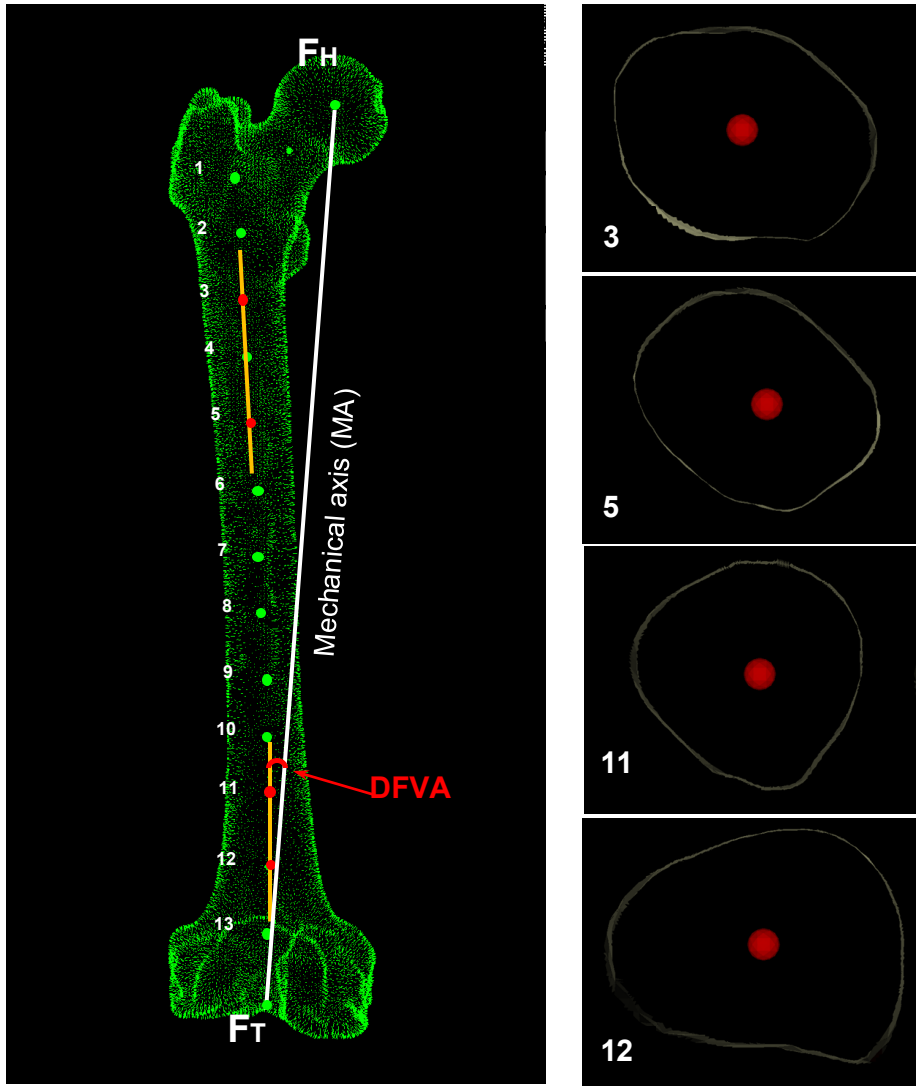


Fig. 1 Determination of DFVA

Divide FH and FT into 14 equal parts. Proximal femoral anatomical axis (PFA) is determined as the line connecting the centroids between the 3rd and 5th cross-sections of the femur. In the same way, distal femoral anatomical axis (DFA) is determined between the 11th and 12th sections. Distal femoral valgus angle (DFVA) is calculated as an angle to the mechanical axis of the femur (MA). *FH: femoral head center, FT: femoral trochlea

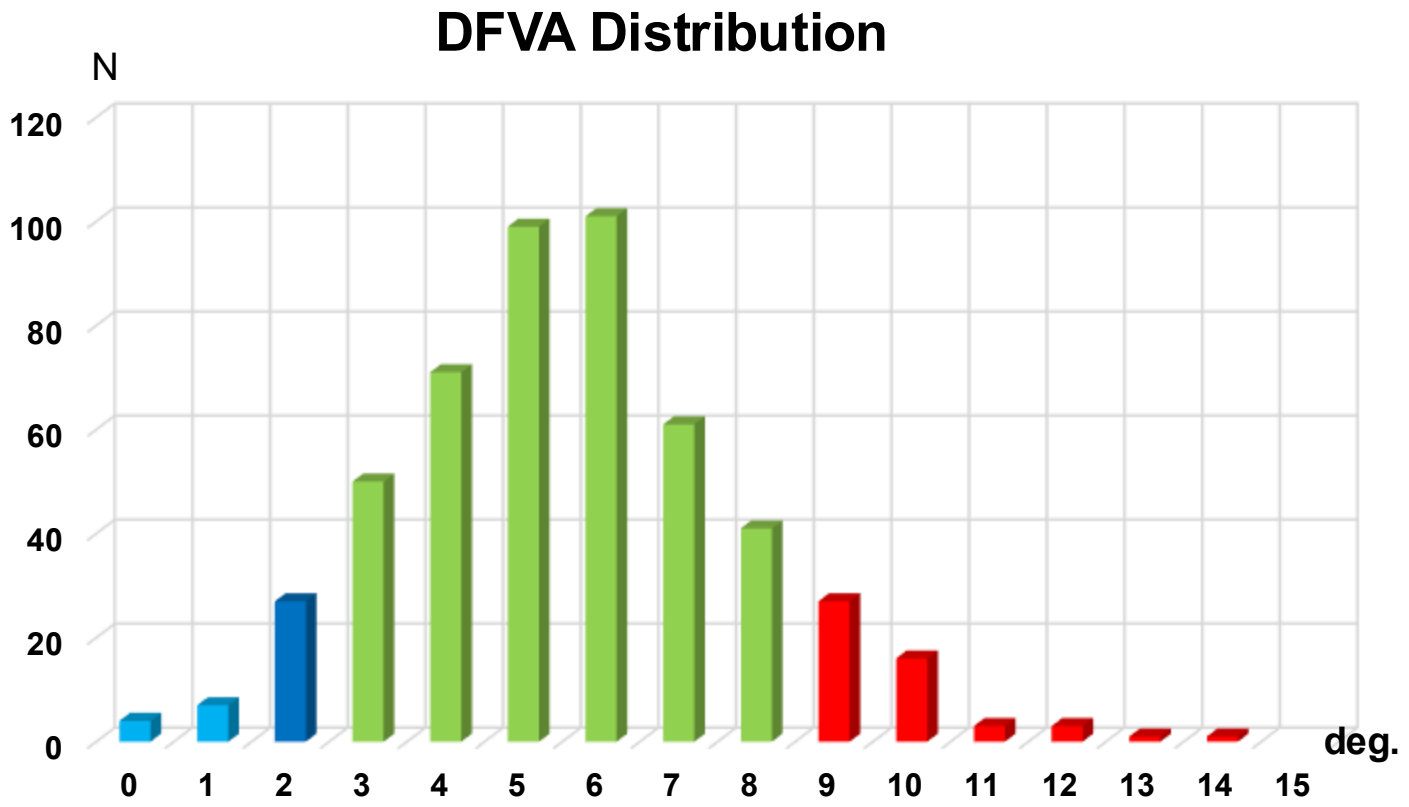
Results 1

Table 1. Femoral Valgus Angle compared to MA*	
Distal femoral valgus angle (DFVA)	6.0 ± 2.2°

Presented as mean±SD
*MA: mechanical axis

- Outliers were recognized in 89 knees (17.4%).

Results 2



- 38 (7.4%) had DFVA less than 3 °
- 51 (10.0%) had greater than 9 °

Discussion

- 3D-CT provides a more accurate limb alignment evaluation.

  → X-ray accuracy is affected by limb position. This study evaluated the **distal femoral valgus angle (DFVA) in 3D using patient-specific bone models.**

- Previous studies support our findings: DFVA varies among patients. [1,2,3,4,5]

  → **Using the same cutting angle in manual TKA may cause femoral component malposition.**

Significance

- **This study demonstrated variability in distal femoral anatomy.**

  → ***Surgeons should consider this to improve femoral component and limb alignment accuracy.***

- **However, further high-quality research is needed.**

References

[1] M. Miura et al. J Arthroplasty. 2018;33:1572-1578.

[2] K. Zhou, et al. Int. J Surg. 2018;50:87-93.

[3] H. Yazdi et al. Arch Bone Jt Surg. 2018;6:289-293.

[4] G. Meric et al. J Arthroplasty. 2015;30:1835-1838.

[5] T. Higuchi et al. Cent. Jpn. J. Orthop. Traumat. 2015;58:373-374.