Antero-Posterior Translation of Mobile-Bearing in Mobile-Bearing Unicompartmental Knee Arthroplasty

[1]Takahiro Arakawa, [1]Kenichi Kono, [2]Tetsuya Tomita, [1]Shuji Taketomi, [1]Ryota Yamagami, [1]Kohei Kawaguchi, [1]Tomofumi Kage, [1]Ryo Murakami, [3]Hiroshi Inui, [1]Sakae Tanaka

1. Department of Orthopaedic Surgery, Faculty of Medicine, The University of Tokyo
2. Graduate School of Health Science, Morinomiya University of Medical Sciences
3. Department of Orthopaedic Surgery, Saitama Medical Center

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Disclosure of Conflict of Interest

Presenter's names:

Takahiro Arakawa, Kenichi Kono, Tetsuya Tomita, ◎Shuji Taketomi, Ryota Yamagami, Kohei Kawaguchi, Tomofumi Kage, Ryo Murakami, Hiroshi Inui, Sakae Tanaka
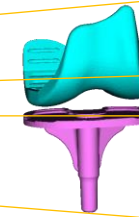(◎= representative)

Introduction

In knee arthroplasty, in vivo prosthetic kinematics is important
to improve clinical outcomes, surgical procedures,
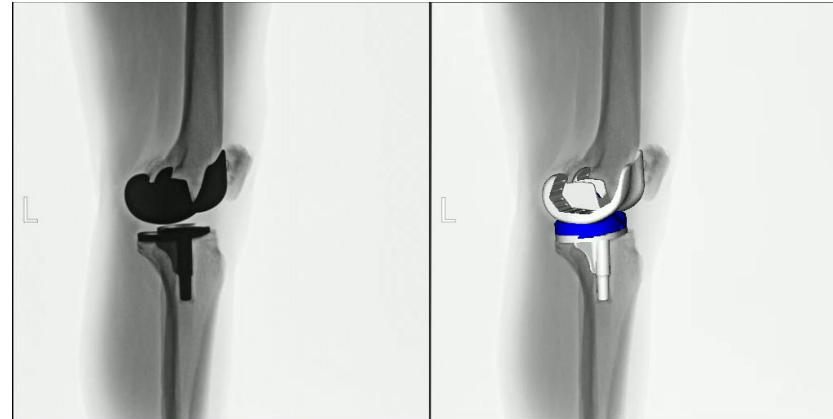and prosthesis design. [1-3]

X-ray focus

2D3D registration technique is one of the methods to measure
the 3D kinematics by matching 3D computer models (so called CAD)
to 2D silhouettes [4,5]

Introduction

Traditionally, there are 2 ways of matching.
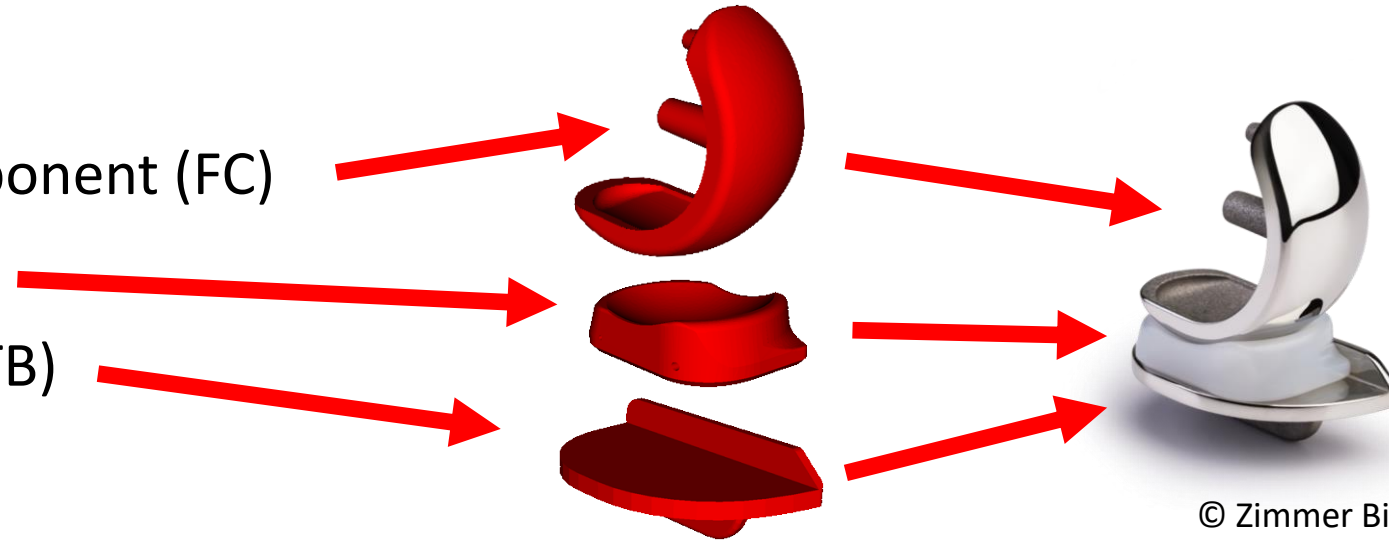
✓ Implant matching
(using implant CAD) [6,7]

✓ Bone matching
(using bone CAD) [8,9]

Introduction

MB UKA consists of

✓Circular femoral component (FC)

✓Mobile bearing (MB)

✓Flat tibial baseplate (TB)

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Silhouette of MB UKA is **quite smaller** than TKA, and FC is **symmetric** and **single radius**. Therefore, implant matching of MB UKA has large error margin, i.e., implant 3D kinematics was unknown.
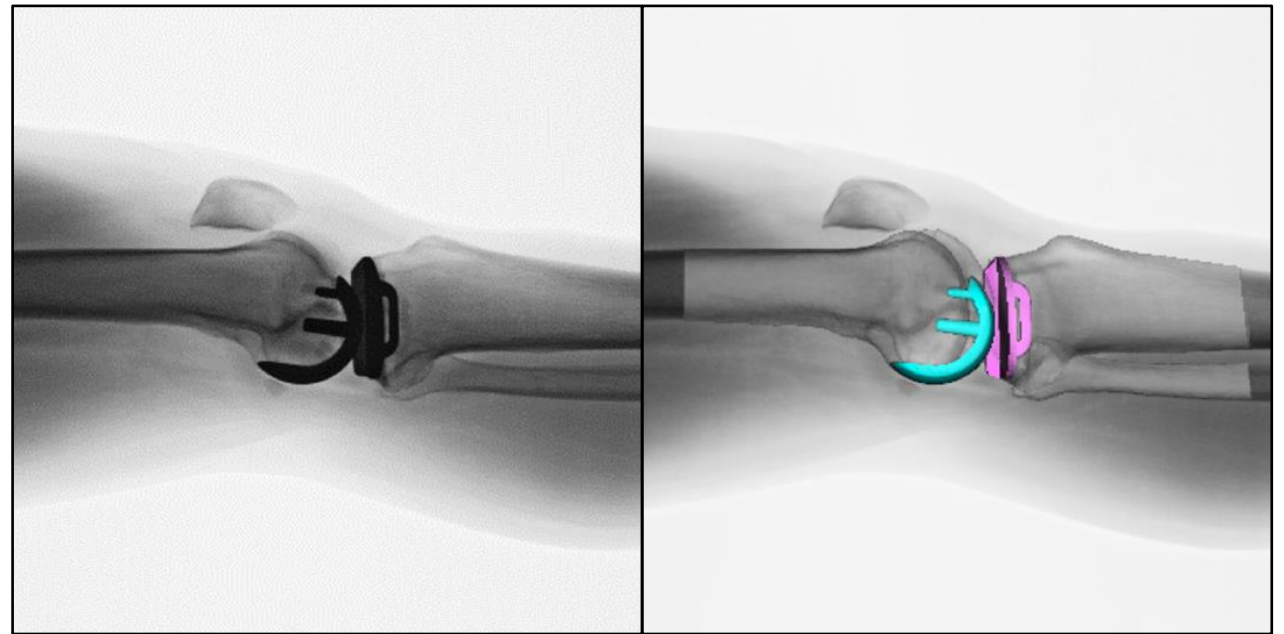
The same silhouette

Materials and Methods

Our new method: Matching both **bone** and **implant** simultaneously by using 3D model that combines bone and implant (created from pre and postoperative CT)
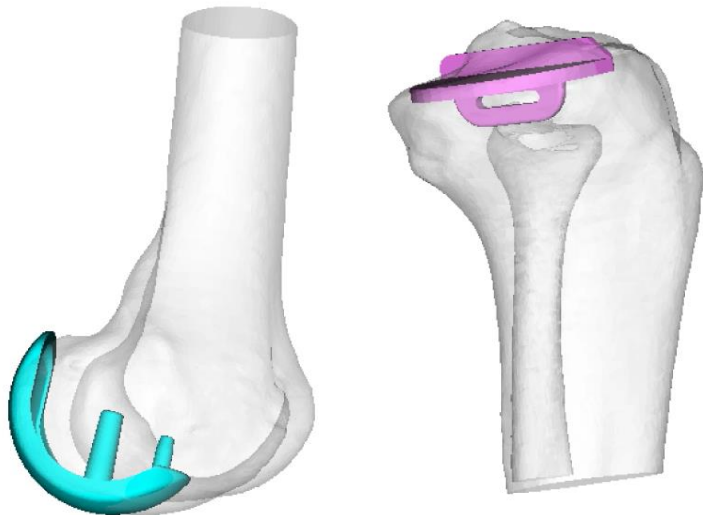
Combined 3D models

Double-matching method

Materials and Methods

Analyses of NWB knee flexion were performed;

21 MB UKA in 20 patients.

Age (years)	75.0 (54 - 86)
Male / Female	3 / 17
Body mass index (kg/m^2)	25.2 $\pm$ 2.5
Osteoarthritis / Osteonecrosis	10 / 11
Postoperative knee extension angle (degrees)	-0.4 $\pm$ 3.8
Postoperative knee flexion angle (degrees)	131.7 $\pm$ 3.9
Duration from surgery to analysis (months)	13.8 $\pm$ 4.9

Values are shown as median (range), n, or mean $\pm$ SD.

Materials and Methods

The lowest point of FC was assumed to coincide with **the deepest point of MB**. Its AP translation was analyzed

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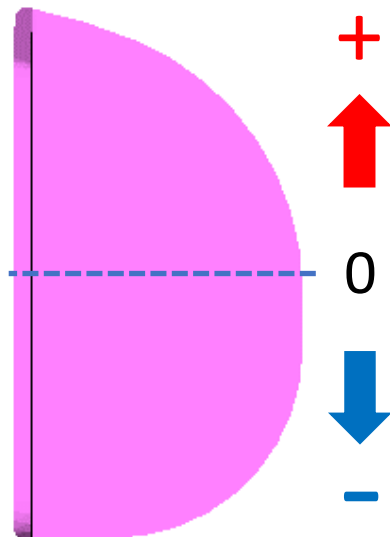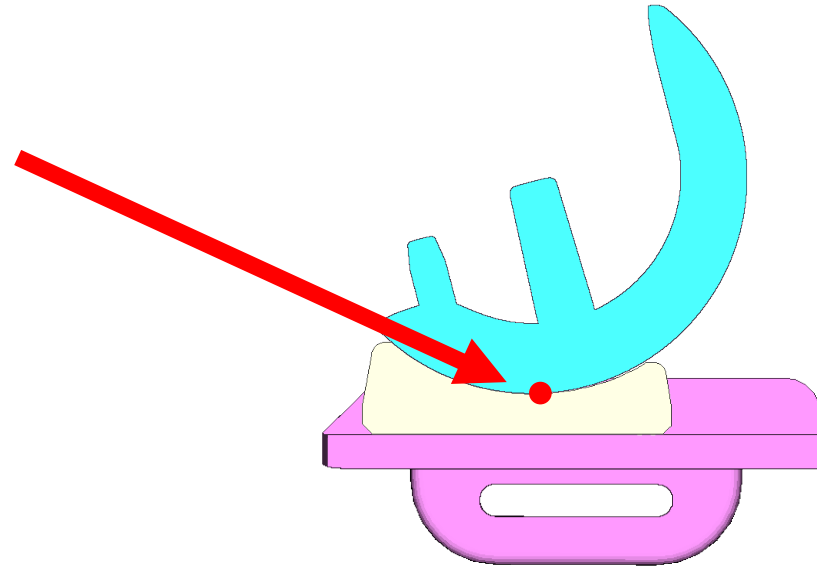
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AP midpoint of TB = zero position

Positive = anterior

Negative = posterior

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Results
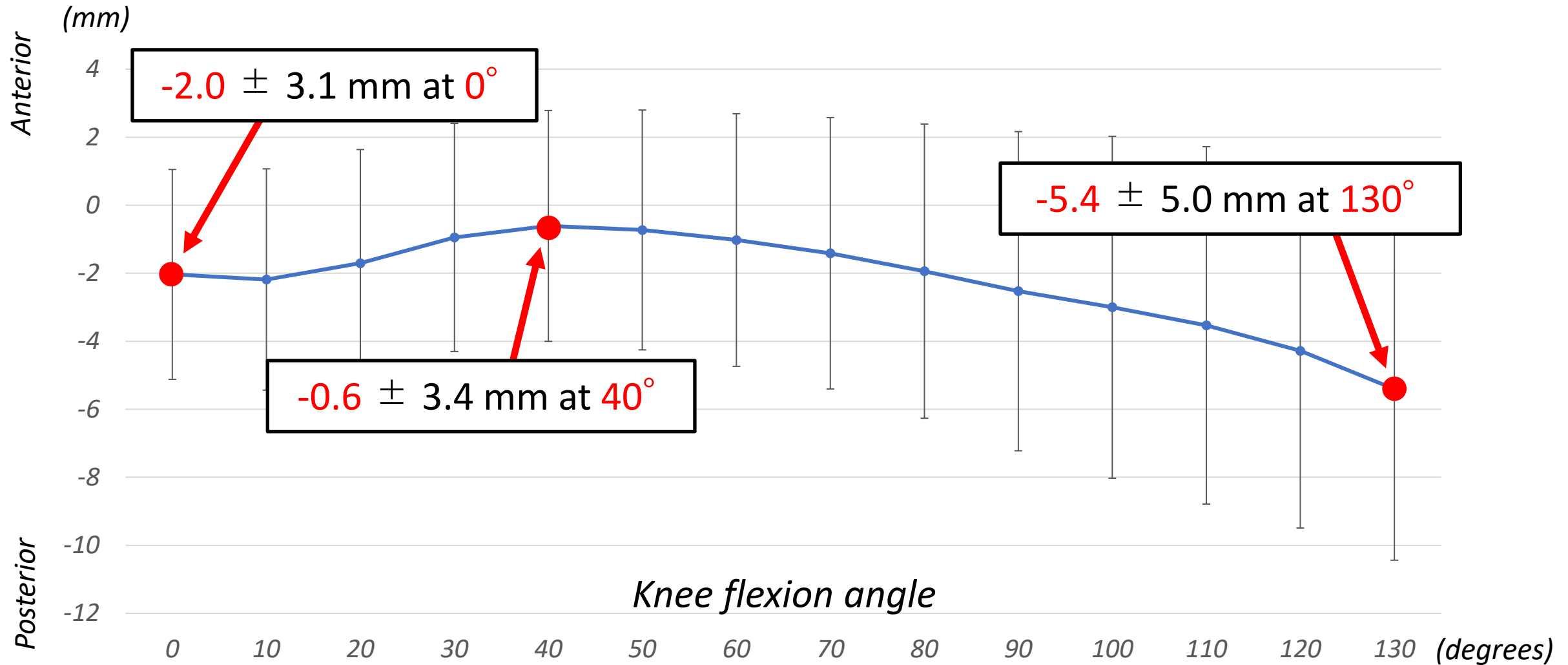
Discussions

The most important finding of this study is that MB moved forward once and then backward in vivo NWB knee flexion in MB UKA.

Previous kinematic studies of MB UKA have showed various results as follows;

✓ Medial sulcus of femur indicated posterior translation during NWB knee flexion. [10]

✓ All MB moved posteriorly during NWB knee flexion intraoperatively. [11]

✓ Medial condyle translated posteriorly
during NWB knee flexion in MB UKA.
The degree depended on patient consciousness. [12]
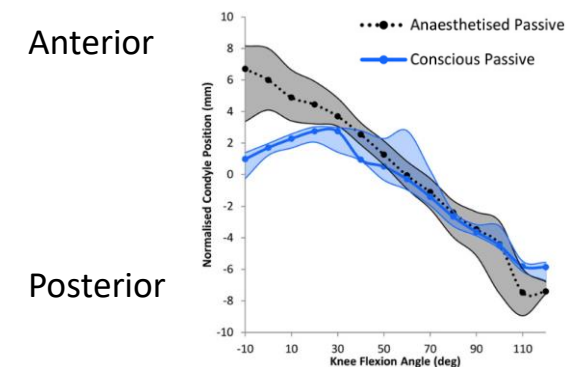
Limitations

✓ The MB movement was inferred from the FC, not the actual MB movement.

✓ The fluoroscopic images were taken from the side to improve the accuracy of the AP movement, making it difficult to evaluate the medio-lateral movements, which were out of plane.

✓ Osteoarthritis patients and osteonecrosis patients were mixed.

Conclusions

✓ "Double-matching method" enables analysis of implant kinematics of MB UKA.

✓ MB moved 1.4 mm forward from extension to 40° of flexion then moved 4.8 mm backward to 130° of flexion.

✓ The strength of this method is that it may be able to analyze various motions (e.g., squatting, walking, etc.).

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