Investigation of Factors Predicting Postoperative Alignment in Unicompartmental Knee Arthroplasty for Knees with Over 10 Degrees of Varus Deformity.

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Faculty Disclosure Information

Nothing to disclosure

Introduction

Indication for medial unicompartmental knee arthroplasty (UKA)

- Preoperative varus deformity <10°
- Should be performed in cases that can be corrected to neutral alignment

(Kozinn et al. JBJS Am 1989)

Good results with postoperative mild varus alignment

- Postoperative hip-knee-ankle angle (HKA) <varus 7°

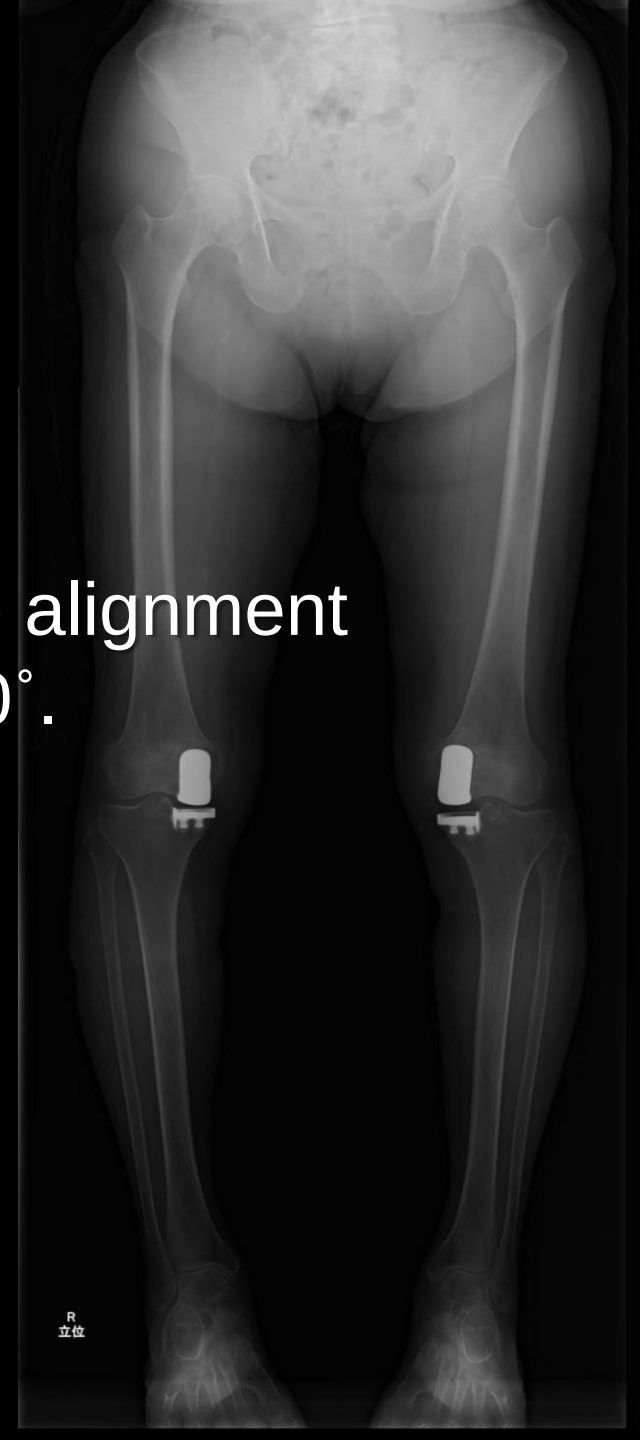
- Vasso et al. Knee 2015
- Kleeblad et al. J Arthroplasty 2018

Expanded indications for cases with large preoperative varus deformity

It is difficult to determine if preoperative correction is possible in patients with large varus deformity

Purpose

We investigated factors that predict postoperative alignment in knees with preoperative varus deformity of ≧10˚.



Subject

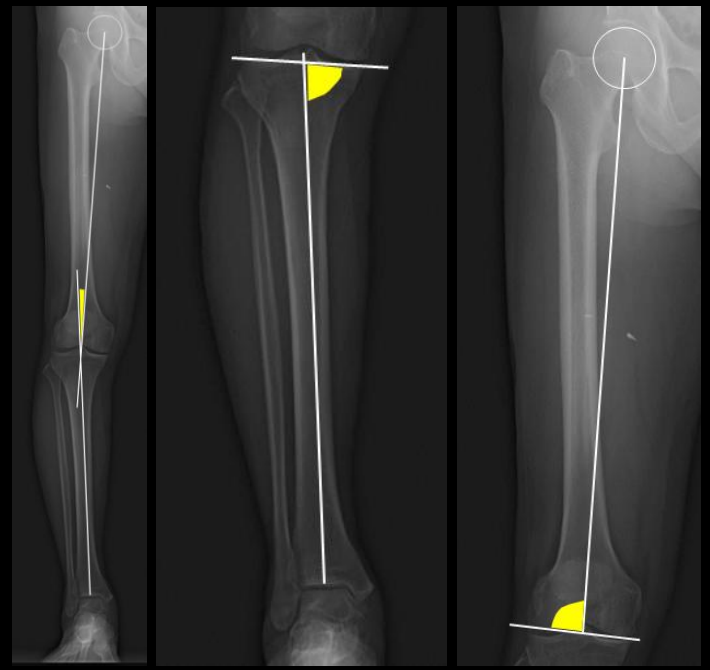
Medial UKA 110 knees

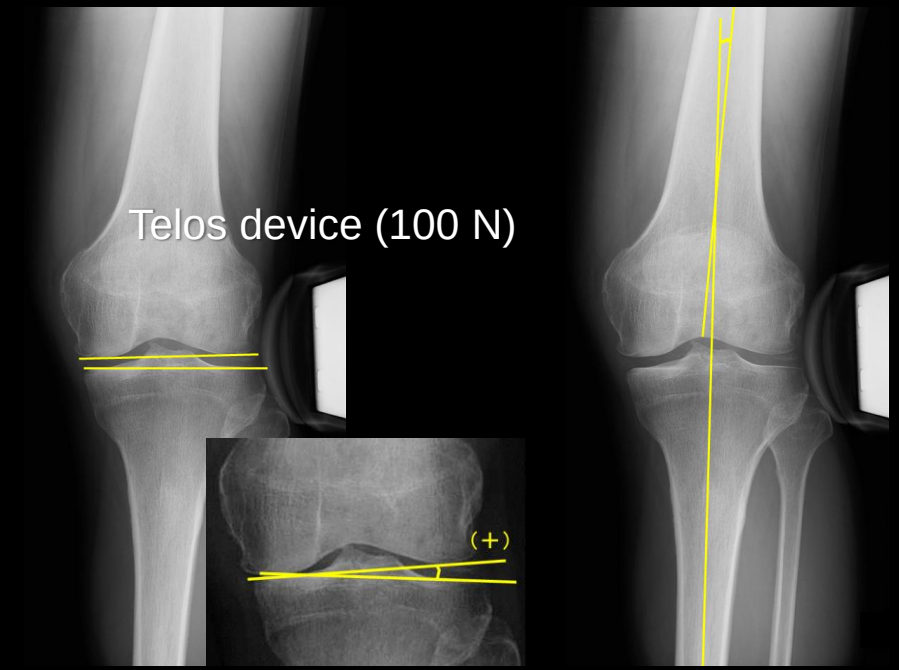
- 2009–2014
- Preoperative HKA ≧varus 10°

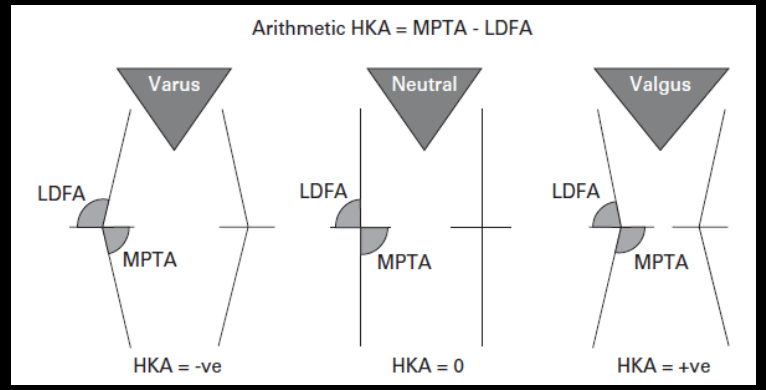
Sex（male: female）	23: 87
Age（y）	74.8±6.8 (52-87)
BMI（kg/m^2）	26.3±4.4
Disease	OA 107、ON 3
Implant	Fixed-bearing UKA in all cases Physica ZUK 103、TRIBRID 7

Radiographic measurements

- Mechanical HKA (mHKA): pre-op/post-op (varus: +)
- Medial proximal tibial angle (MPTA)
- Mechanical lateral distal femoral angle (mLDFA)
- Joint line convergence angle (JLCA): standing/valgus stress (medial convergence: +)
- Tibiofemoral angle (TFA): standing/valgus stress (varus: +)
- Arithmetic HKA (aHKA): MPTA - mLDFA (varus: +, for simplicity)
- Estimated HKA (eHKA): pre-op mHKA − standing JLCA (varus: +)





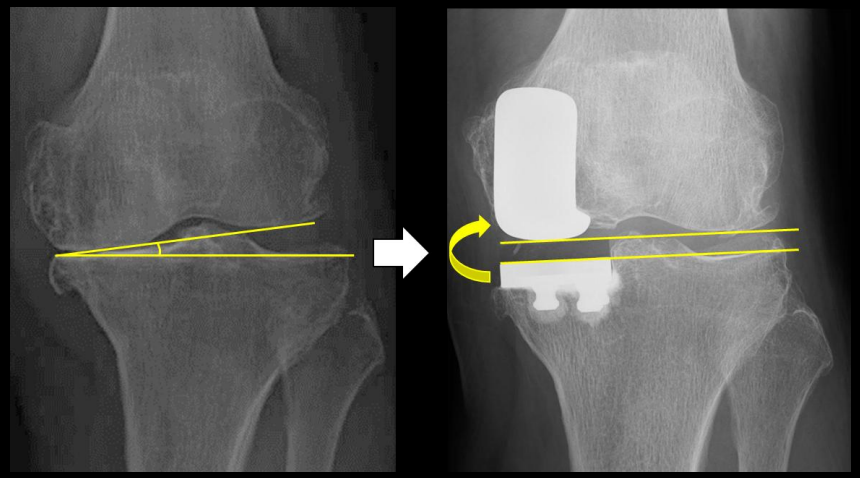


(MacDessi et al. Bone Joint J 2021)

Radiographic measurements

- Estimated HKA (eHKA): pre-op mHKA − standing JLCA (varus: +)

(Kleeblad et al. J Arthroplasty 2018)



Assumed that postoperative JLCA becomes 0°,
and correction equals the preoperative standing JLCA angle.

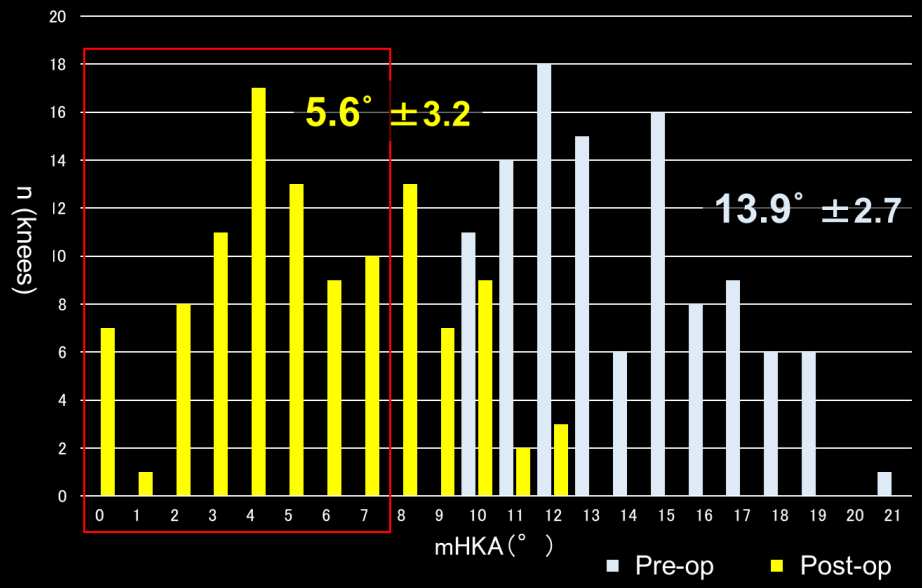
Statistical analysis

- Identify factors influencing postoperative mHKA using correlation analysis
- Construct a predictive formula for postoperative mHKA using multiple regression analysis (stepwise method)
- Determine cutoff values of predictive factors for undercorrection (defined as post-op mHKA ≥varus 7°) using ROC analysis

*Differences were considered significant at $p < 0.05$.

Results

- Correctable (post-op mHKA < 7˚): 71/110 knees (**64.5**%)



Postoperative mHKA correlation

Pearson's r	mean ±SD	r	p value
Pre-op mHKA (˚)	13.9 ±2.7	0.336	<0.001
MPTA (˚)	83.4 ±2.4	-0.019	0.847
mLDFA (˚)	90.8 ±2.6	0.319	<0.001
Standing JLCA (˚)	7.2 ±2.7	-0.137	0.153
Valgus stress JLCA(˚)	0.1 ±2.3	-0.102	0.287
Standing TFA(˚)	6.8 ±3.0	0.006	0.954
Valgus stress TFA(˚)	0.3 ±3.0	-0.193	0.053
Arithmetic HKA (˚)	7.4 ±3.3	0.264	0.005
Estimated HKA (˚)	6.7 ±2.8	0.466	<0.001

Results

Predictive factors for postoperative mHKA

Multiple regression analysis (stepwise method)

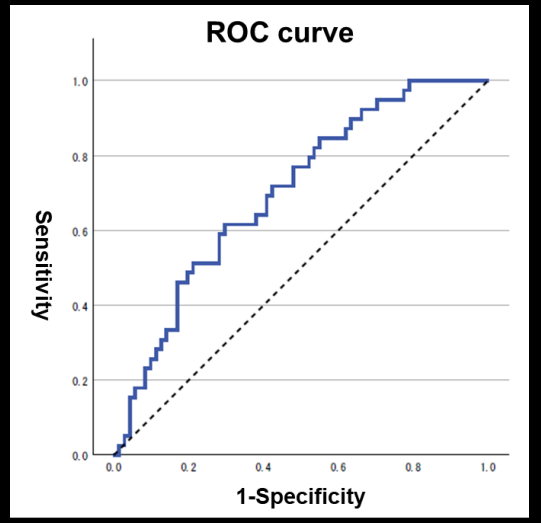
- Dependent variable: post-op mHKA
- Independent variables: pre-op mHKA, mLDFA, aHKA, eHKA, age, sex, and BMI

Post−op mHKA = 1.92 + 0.545 x eHKA

Parameter	β	p値	Adjusted R^2
eHKA	0.466	<0.001	0.21

Cutoff value of eHKA for undercorrection (post-op mHKA ≧ 7°)

Parameter	Cutoff	AUC	95%CI	P value	Sensitivity	Specificity
eHKA	7.4°	0.701	0.602-0.799	<0.001	70.4%	61.5%



Discussion

- **Predictive factors for postoperative alignment in UKA**

  Usefulness of Estimated HKA (eHKA) (Kleeblad et al. J Arthroplasty 2018)

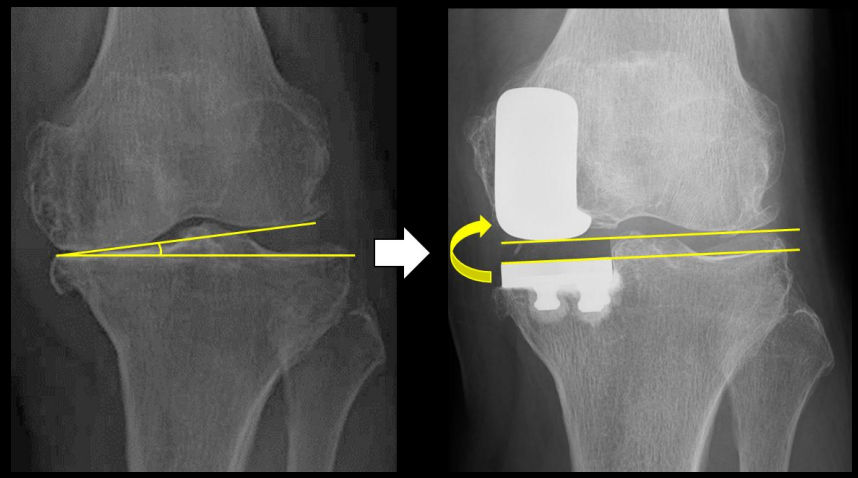
  Target: postoperative mHKA of 1–4° varus

  eHKA< 4° : predictive factor for achieving the target alignment
  eHKA> 6.5° : probability of achieving the target alignment is ≤ 50%

- **This study**

  Target: postoperative mHKA ≤ 7° varus

  eHKA cutoff: 7.4°



Discussion

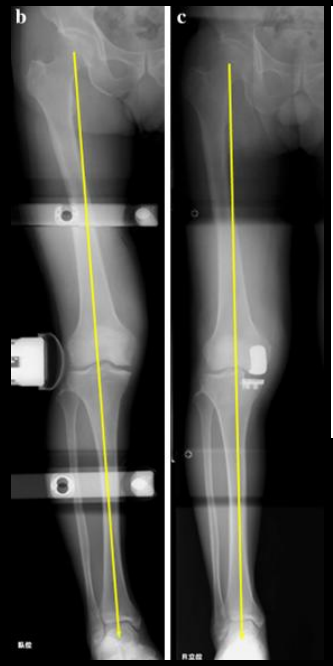
- **Method for predicting postoperative alignment after UKA**

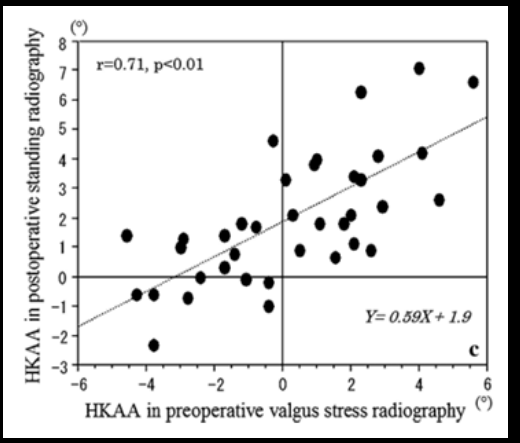
  Full-length valgus stress radiography

  (Tashiro et al. KSSTA 2014)

  Post-op mHKA = 1.9 + 0.59 x valgus stress HKA

  r=0.71, p<0.01





- **This study**

  Standing full-leg radiograph

  Post-op mHKA = 1.92 + 0.545 x eHKA

  r=0.466, p<0.001

Lower accuracy
Ease of use

Conclusion

In patients with preoperative varus deformity of ≧10˚,

eHKA was a simple indicator
that could be calculated with full-length weightbearing radiograph.

The cutoff value of eHKA
that could be corrected to postoperative HKA ≧7˚ was 7.4˚.

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