Comparable Early Conversion Rates To Total Knee Arthroplasty Among Different Bony Deformity Locations After Medial Opening Wedge High Tibial Osteotomy: A North American Cohort Study

Takaaki Hiranaka[1], Takeo Tokura[1], Ryan Degen[1], Kevin Willits[1], Robert Litchfield[1], Alan Getgood[1,2]

[1] Fowler Kennedy Sports Medicine Clinic, Western University, London, Ontario, Canada.

[2] Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar

Disclosure of Conflict of Interest

We have nothing to declare for this study.

Introduction: deformity locations in varus alignment

Medial opening wedge high tibial osteotomy (MOWHTO)

is a knee realignment procedure for varus alignment.

Deformity locations in varus alignment

① Tibial deformity (mMPTA < 85°)

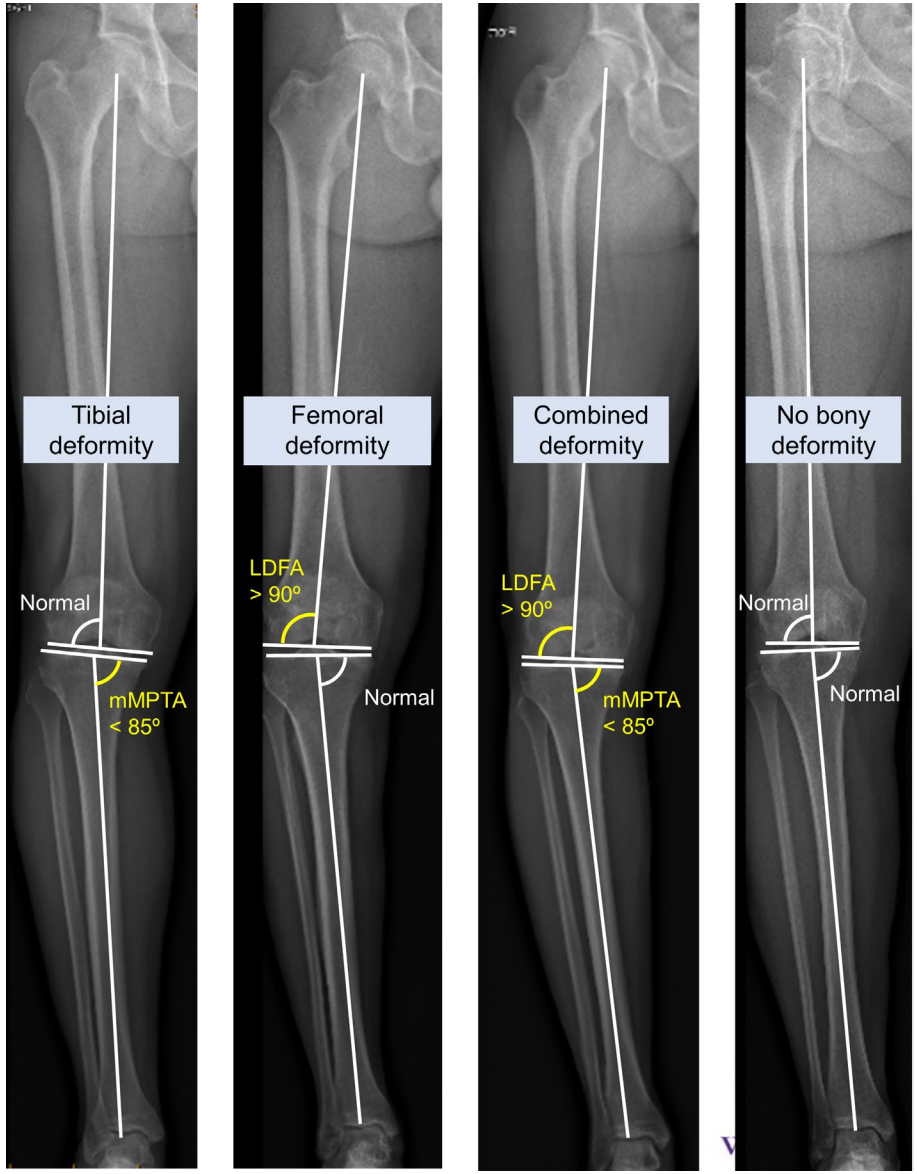
② Femoral deformity (mLDFA > 90°)

③ Combined deformity (tibial + femoral)

} **Bony deformity**

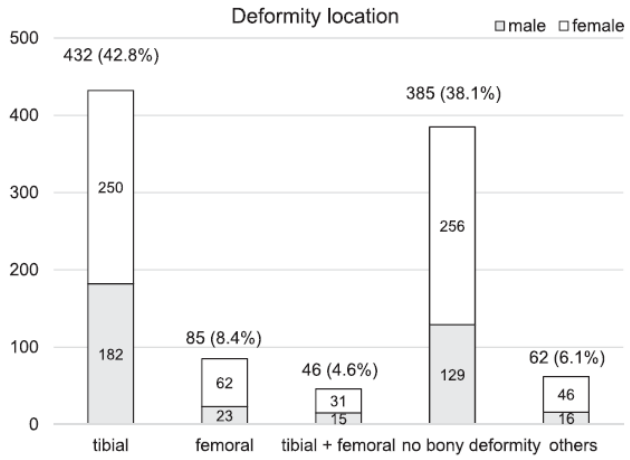
④ **No bony deformity**

(ligament laxity, intra-articular degeneration)



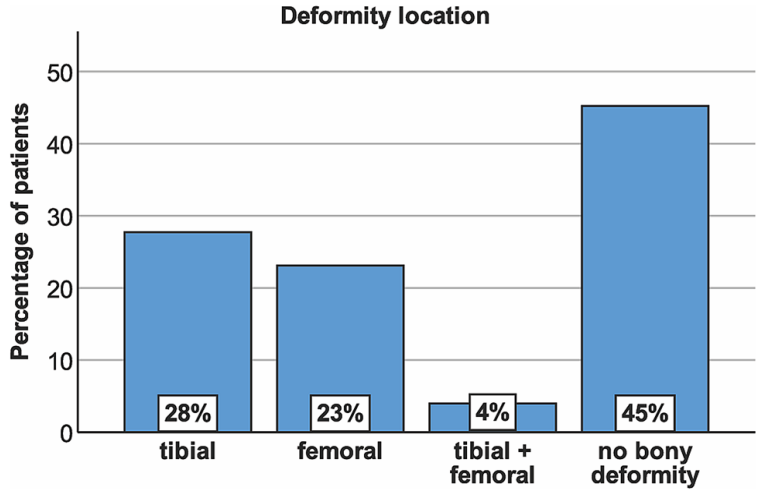
Introduction: deformity locations in varus alignment

Ethnic differences in varus deformity phenotypes



Asian population: Tibial deformity predominant (43%)

Abe et al KSSTA 2023



European population: Higher prevalence of femoral deformity (23%)

Feucht MJ et al. KSSTA 2021

Purpose

- To analyze **deformity locations** in **North American patients** with varus alignment undergoing MOWHTO
- To evaluate **TKA conversion rates** and **TKA-free survival** after MOWHTO based on bony deformity location

Methods: study design and patient selection

Study design

- 271 patients who underwent MOWHTO (January 2018 – July 2022)
- Mean age: 51.6 ± 8.4 years
- Mean follow-up: 3.6 ± 1.0 years (range: 2–6 years)

Inclusion criteria

- Age 18–60
- Medial knee OA, chondral defects, meniscal deficiencies, or joint restoration.

Exclusion criteria

- Previous osteotomy
- Torsional or sagittal correction osteotomy

Methods: deformity analysis

Software:

- mediCAD® (Hectec GmbH, Germany)

Radiographic parameters:

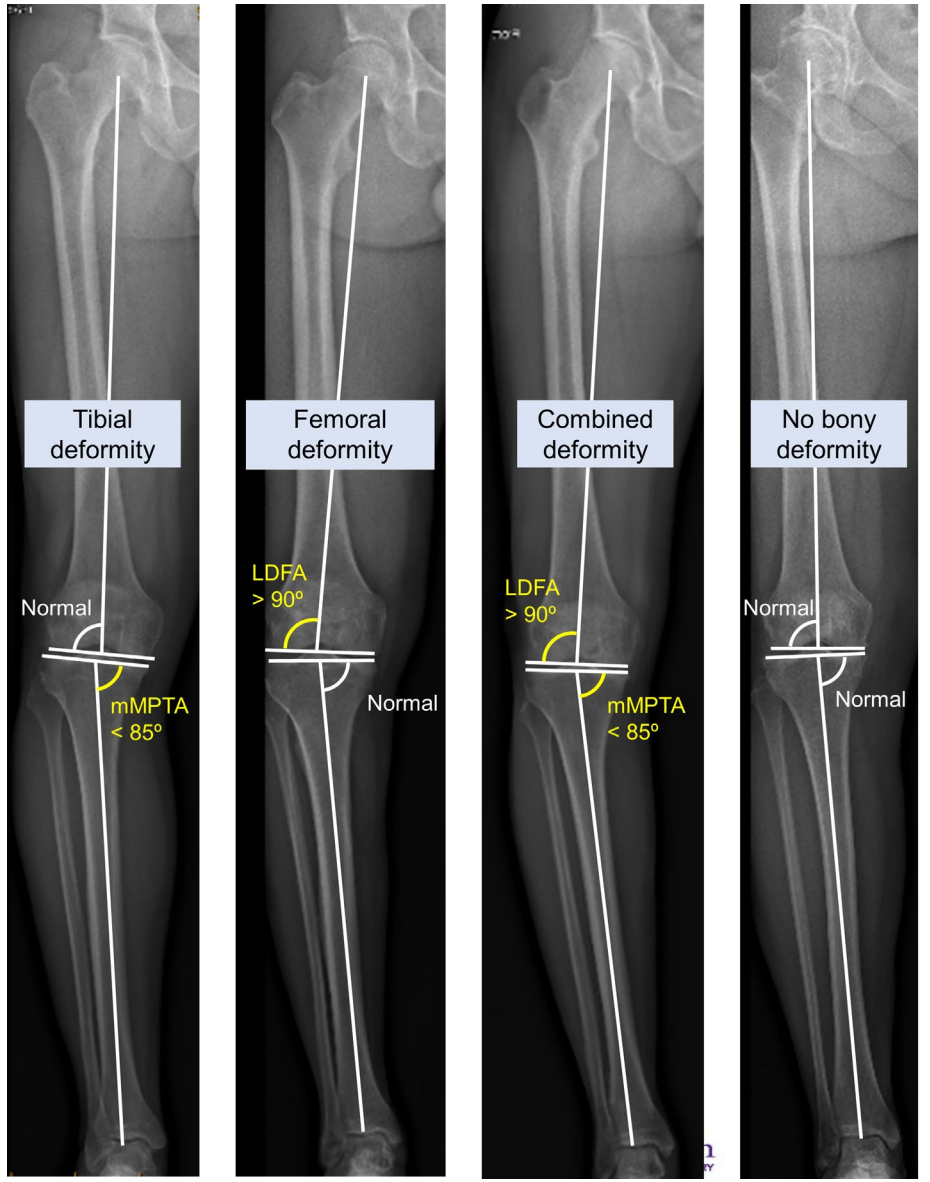
- HKA angle
- mMPTA (< 85° = tibial varus)
- mLDFA (> 90° = femoral varus)

Deformity location:

- Tibial deformity
- Femoral deformity
- Combined deformity (tibial + femoral)
- No bony deformity

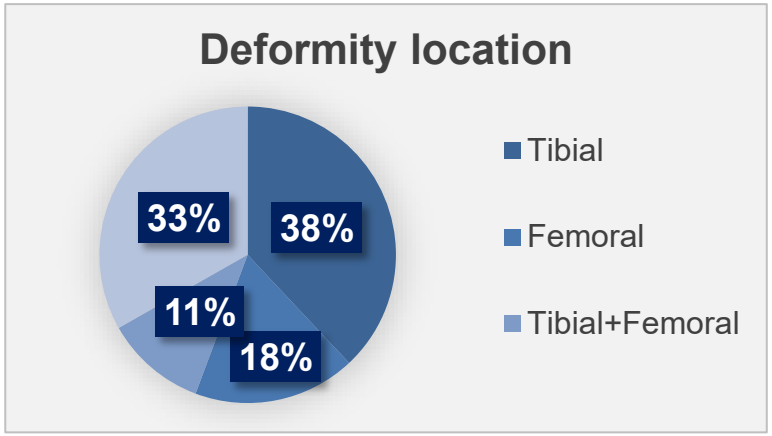
Statistical analysis:

- TKA conversion rate (Chi-square test)
- TKA-free survival (Kaplan-Meier, Log-rank test)



Result: deformity location in North American patients

Deformity location in North America



- Tibial deformity most common (38%)
- Two–thirds had bony deformity
- One–third had no bony deformity

Patient demographics

	Deformity location				P value
	Tibial	Femoral	Combined (tibial + femoral)	No bony deformity	
Indications for osteotomy (OA/joint preservation)	92/11	42/6	26/4	77/13	0.887
Age	52.6 ± 8.3	49.4 ± 9.8	52.2 ± 7.6	50.3 ± 8.9	0.111
Preoperative K-L grade (1/2/3/4)	4/53/32/14	3/20/20/5	0/15/13/2	4/52/29/5	0.452
Preoperative HKA angle (º)	**172.6 ± 2.5**	**172.9 ± 2.4**	**168.9 ± 2.5**	**174.8 ± 2.4**	**< 0.05[a]**

Note: Values are presented as mean ± standard deviation.
[a] Statistically significant ($p < 0.05$) in all comparisons except between the tibial and femoral groups.

- No significant differences in age or K–L grade
- Preoperative HKA angle significantly differed ($p < 0.05$)

Result: TKA conversion rates after MOWHTO

TKA conversion rates and time to conversion by deformity location

Deformity center	Number of cases (n)	Conversion to TKA (n)	Conversion rate (%)	Time to conversion (years)
Tibial	103	3	3	2.2 ± 0.4
Femoral	48	0	0	Not applicable
Combined (tibial + femoral)	30	2	7	3.0 ± 0.3
No bony deformity	90	8	9	3.2 ± 0.9

Note: Values are presented as mean ± standard deviation unless otherwise indicated.

No significant difference (p = 0.080)

TKA conversion rates and times after MOWHTO: bony vs. no bony deformity

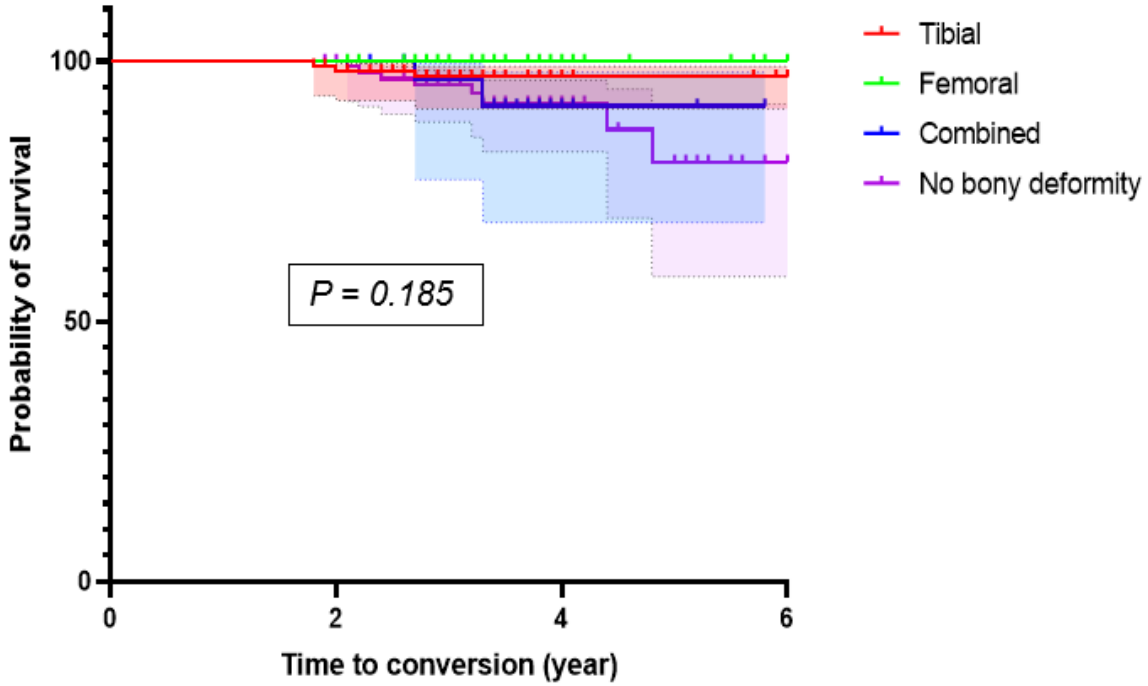
Deformity location	Number of cases (n)	Conversion to TKA (n)	Conversion rate (%)	Time to conversion (years)
Bony deformity	181	5	3	2.5 ± 0.5
No bony deformity	90	8	9	3.2 ± 0.9

Note: Values are presented as mean ± standard deviation unless otherwise indicated.

No significant difference (p = 0.068)

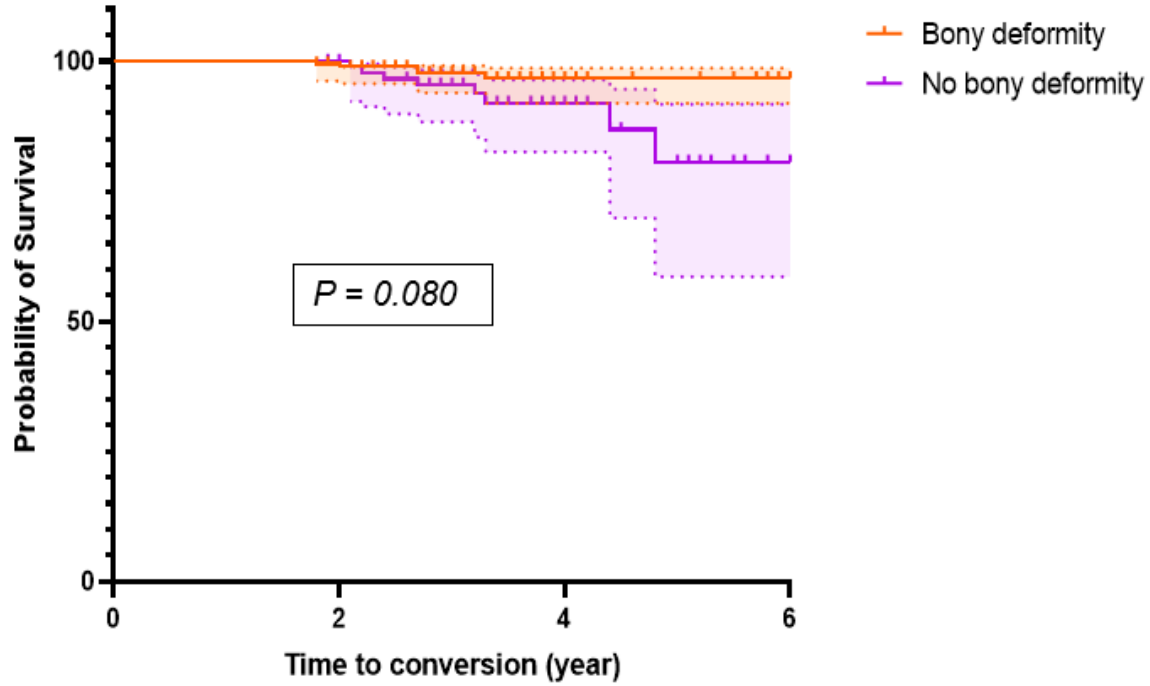
Result: TKA-free survival

TKA-free survival by deformity location



No significant difference in TKA-free survival (p = 0.185)

TKA-free survival: bony vs. no bony deformity



No significant difference in TKA-free survival (p = 0.080)

Discussion: impact of deformity location on MOWHTO outcomes

Key findings:

- Tibial deformity most common (38%) in North America
- Bony deformity in 67%, no bony deformity in 33%

TKA-free survival:

- No significant survival difference by deformity location (p = 0.185)
- Low TKA conversion rates across all groups

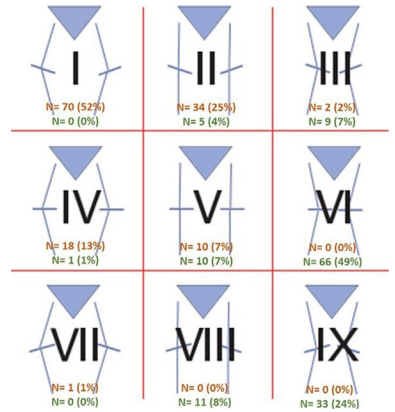
Clinical outcomes:

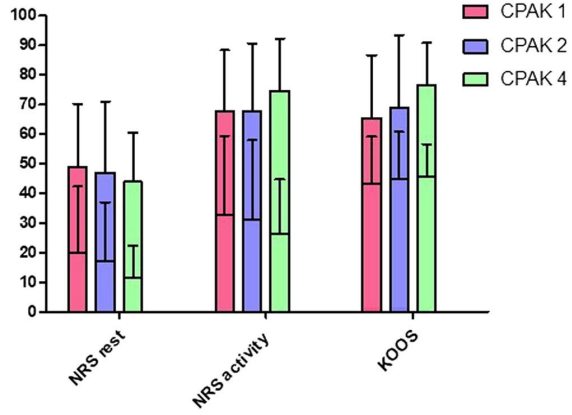
- No significant outcome differences across varus phenotypes
- MOWHTO improves femoral-driven and intra-articular varus knees

Van Genechten et al. KSSTA 2023

MOWHTO benefits are not limited to tibial deformity

CPAK Classification





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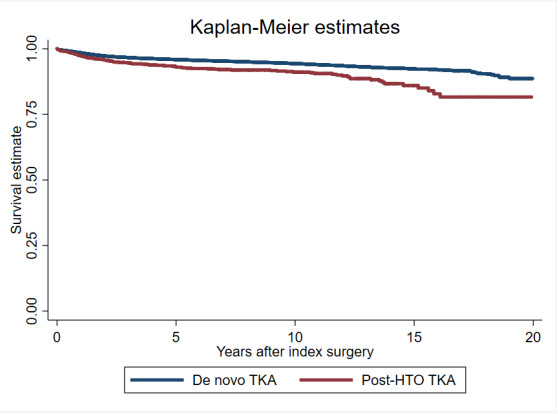
Discussion: MOWHTO in patients without bony deformity

Key findings:

- MOWHTO benefits in this subgroup remain uncertain
- No significant difference in TKA conversion (p = 0.068) or TKA–free survival (p = 0.080)
- Conversion rate: 9%

Higher TKA conversion without bony deformity:

- Excessive JLO/mMPTA may lead to worse outcomes Akamatsu et al. Arthroscopy 2018
- Arthroplasty outcomes following HTO are comparable to primary TKA without a preceding osteotomy El-Galaly A et al. J Arthroplasty 2018



MOWHTO remains a viable option despite a higher TKA conversion risk

Conclusion

- **Tibial deformity** was the most common (38%) in this **North American cohort**
- **Two-thirds** had bony deformity, **one-third** had no bony deformity
- MOWHTO remains beneficial **even in non-tibial deformities**
- Deformity location does **not significantly impact TKA-free survival**

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