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# Perioperative Changes of Hindfoot Alignment After Total Knee Arthroplasty in Rheumatoid Arthritis

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# **Conflict of Interest**

**Nothing to disclose**

# Introduction

- - Knee deformity induces compensatory hindfoot alignment

Varus knee → Valgus hindfoot;

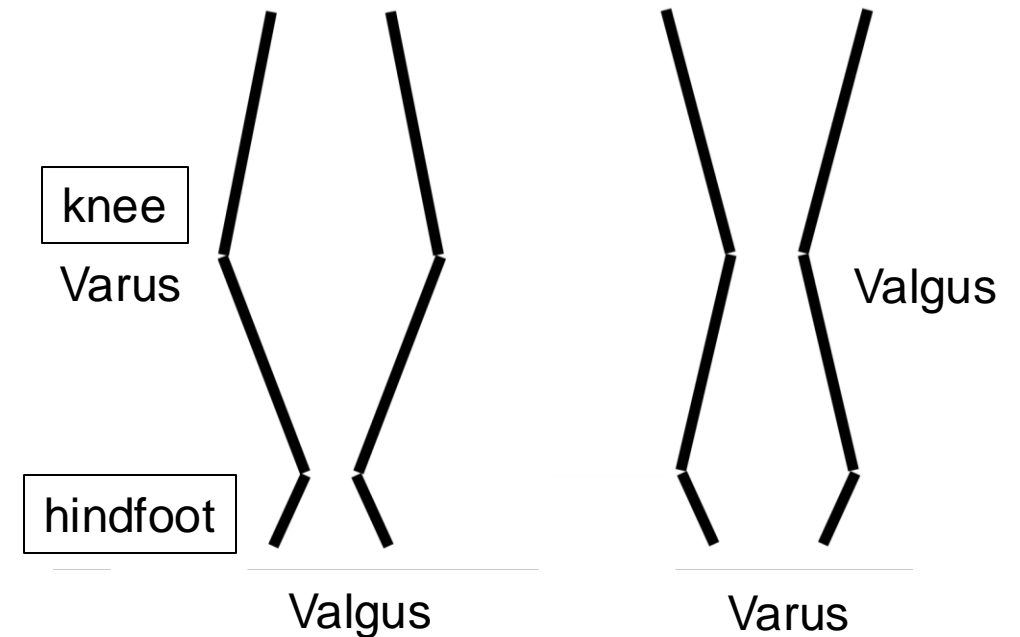
Valgus knee → Varus hindfoot

- each  $1^\circ$  increase in knee varus shifts the hindfoot about  $0.5^\circ$  into valgus, each  $1^\circ$  of knee valgus shifts the hindfoot into varus by  $\sim 0.43^\circ$

*Research Article*

**Correlation in the Coronal Angle between Knee and Hindfoot Was Observed in Patients with Rheumatoid Arthritis Unless Talocrural Joint Was Destroyed**

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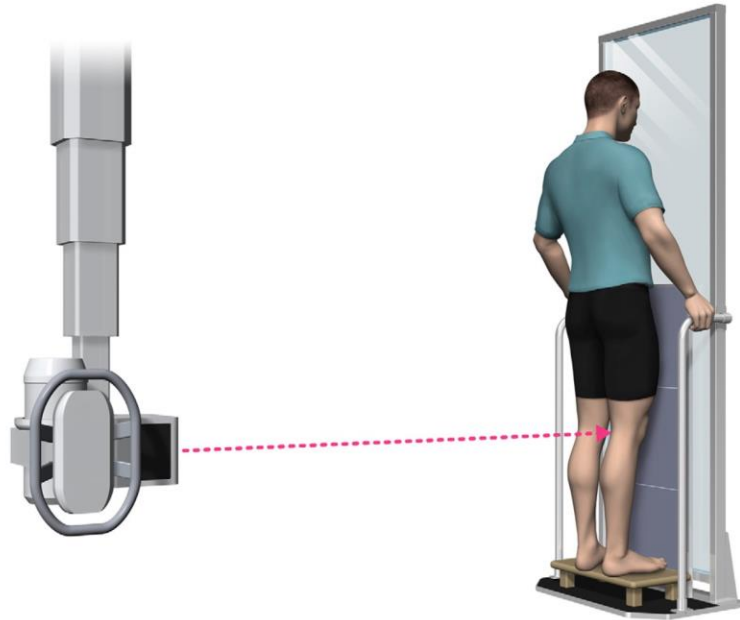


# Rheumatoid Arthritis

- RA patients may develop concomitant destruction of knee and hindfoot
- Often experience uncommon deformities, such as knee varus and hindfoot varus, knee valgus and hindfoot valgus, potentially worsening hindfoot alignment post-TKA
- This study aimed to evaluate changes in hindfoot alignment after TKA in RA patients.

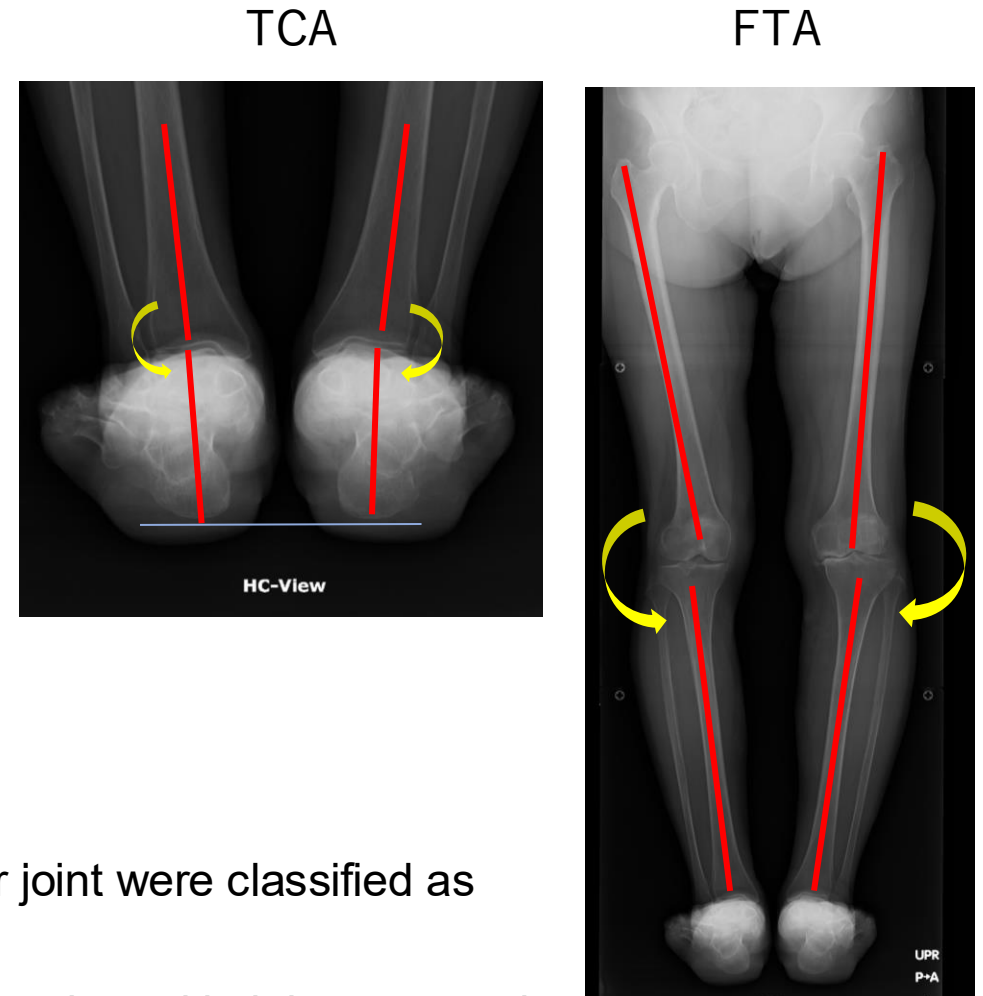
# Methods

- Prospective study: consecutive RA pts undergoing TKA in 2013-2018
- Hip-to-Calcaneus view (Haraguchi N, et al. JBJS 2015)
  - Pre-op & 6 months after TKA



# Methods

- Femorotibial angle (FTA)
- Tibiocalcaneal angle (TCA)
  - Normal (-2.1~4.5)
  - Valgus (>4.5)
  - Varus(<-2.1) *Nishitani K, et al. Biomed Res Int 2020*
- Ankle and subtalar joints were evaluated using Larsen grade
- Hindfoot classification based on Larsen grade
  - Cases with Larsen grade  $\geq 3$  in either the ankle or subtalar joint were classified as hindfoot Larsen grade  $\geq 3$
  - In all such cases, the subtalar joint was also grade  $\geq 3$  when the ankle joint was grade  $\geq 3$



# Results

- 69 RA patients (Varus knee: 37, Valgus knee: 32, mean age: 66.2 years)
- Mean FTA improved significantly

FTA and TCA before and after TKA					
	n		Pre-op	Post-op	P Value
Varus knee	37	FTA	179.4 ± 5.8	173.1 ± 3.2	<0.001
		TCA	3.4 ± 4.7	1.9 ± 3.5	0.005
Valgus knee	32	FTA	165.9 ± 6.5	173.3 ± 3.0	<0.001
		TCA	-0.8 ± 5.7	2.2 ± 5.4	<0.001

# Results

- In both the Varus-Varus and Valgus-Varus groups, in which the knee deformity is considered to be compensated by the hindfoot, TCA improved significantly and was within the normal range after TKA.
- In the Varus-Normal and Valgus-Normal groups, TCA did not change significantly after TKA.
- In Varus–Varus and Valgus-Varus, where no hindfoot compensation was at work, the TCA did not improve after TKA.

TCA before and after TKA				
Knee-Hindfoot	n	Pre-op	Post-op	P Value
Varus-Valgus	13	8.0 ± 2.2	4.3 ± 3.7	0.003
Varus-Normal	18	2.3 ± 1.4	1.6 ± 1.8	0.154
Varus-Varus	6	-3.3 ± 0.9	-2.5 ± 1.5	0.324
Valgus-Varus	11	-7.4 ± 3.6	-0.6 ± 5.1	<0.001
Valgus-Normal	16	1.2 ± 1.3	2.1 ± 3.6	0.355
Valgus-Valgus	5	7.2 ± 2.2	8.9 ± 4.7	0.337



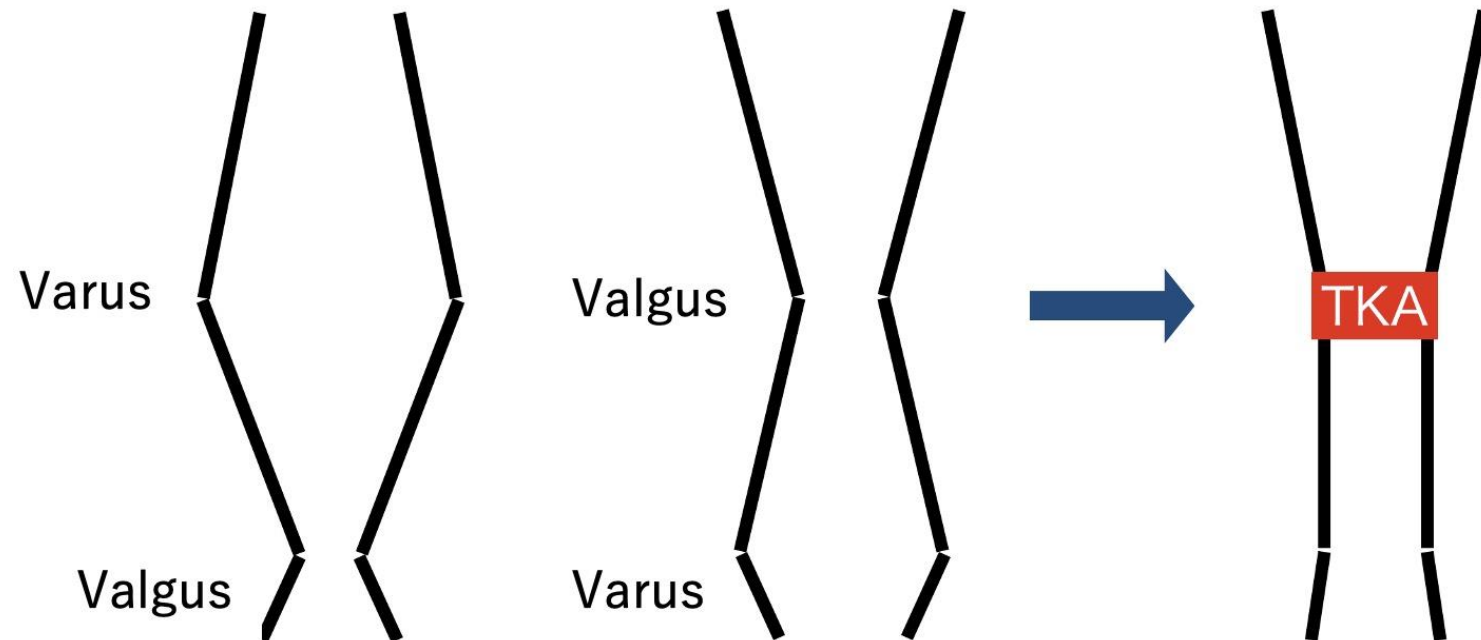
# TCA Changes by Larsen Grade and Hindfoot Alignment Pattern

- In the Varus-Valgus and Valgus-Varus groups:
  - No significant improvement in TCA at Larsen grade  $\geq 3$
  - Significant improvement at Larsen grade  $\leq 2$
- In the Varus-Varus and Valgus-Valgus groups:
  - No significant change in TCA regardless of Larsen grade

TCA before and after TKA according to Larsen grade					
Knee-Hindfoot	Larsen grade in hindfoot	n	Pre-op	Post-op	P Value
Varus-Valgus	$\geq 3$	4	7.8	5.8	0.45
	$\leq 2$	9	8.1	3.6	0.009
Varus-Varus	$\geq 3$	2	-3.5	-3.3	0.921
	$\leq 2$	4	-3.3	-2.2	0.308
Valgus-Varus	$\geq 3$	5	-6.5	-0.8	0.065
	$\leq 2$	6	-8.2	-0.4	0.005
Valgus-Valgus	$\geq 3$	5	7.2	8.9	0.337
	$\leq 2$	0	-	-	-

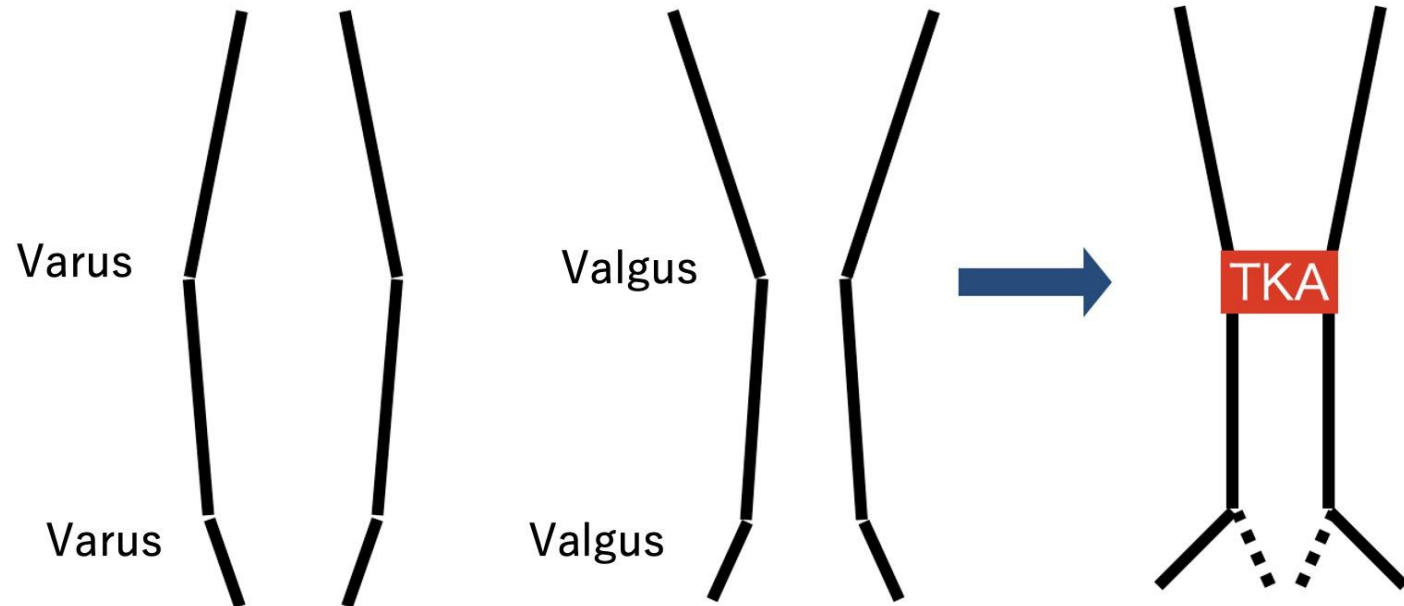
# Discussion

- In cases with compensatory hindfoot alignment  
⇒ hindfoot alignment improved after TKA



# Discussion

- Cases without compensatory mechanism  $\Rightarrow$  Poor hindfoot alignment correction
    - Larsen grade  $\geq 3$  in the hindfoot
    - Knee varus + hindfoot varus
    - Knee valgus + hindfoot valgus
- $\Rightarrow$  Hindfoot alignment tends to remain unchanged after TKA



# Conclusion

- In RA patients, hindfoot alignment improves after TKA in Varus-Valgus and Valgus-Varus positions, where the hindfoot compensatory mechanism may be active.
- However, if the Larsen grade of the hindfoot is 3 or higher, the hindfoot alignment may not improve after TKA.
- In addition, hindfoot alignment may not improve after TKA in Varus–Varus and Valgus–Valgus, in which the hindfoot compensatory mechanism is thought to be inoperative.

# References

1. Haraguchi N, Ota K, Tsunoda N, Seike K, Kanetake Y, Tsutaya A. Weight-bearing-line analysis in supramalleolar osteotomy for varus-type osteoarthritis of the ankle. J Bone Joint Surg Am. 2015 Feb 18;97(4):333-9.
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