ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

The effect of alignment correction and limb length discrepancy after total knee arthroplasty on contralateral lower extremity alignment and knee condition

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Disclosures:

The authors have no conflicts of interest to declare.

Introduction

- ❖ Total knee arthroplasty (TKA)
  - ➢ Alignment correction → leg length change\

- ❖ Single limb TKA can change contralateral knee condition
  - ➢ ***Splinting effect:*** single limb TKA improve mechanical axis on contralateral knee
  - ➢ Significant changes in knee's stance phase, joint angle, and movement analysis profile of the contralateral knee

- ❖ Leg length Discrepancy (LLD) can affect contralateral alignment
  - ➢ TKA can induce leg length change → LLD change
  - ➢ LLD is associated with knee condition

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Purpose & Hypothesis

❖ **Purpose**

➢ **To determine the effect of alignment correction & postoperative LLD in unilateral TKA on the contralateral lower extremity alignment & knee pain**

❖ **Hypothesis**

➢ **Alignment correction or postoperative LLD in unilateral TKA would induce alignment changes in the contralateral lower extremity, resulting in knee pain.**

Methods

❖Retrospective study

❖*Inclusion criteria*

➢Single limb TKA patient (2019.3~2022.2) by single surgeon

➢TKA patient base on mechanical axis

❖*Exclusion criteria*

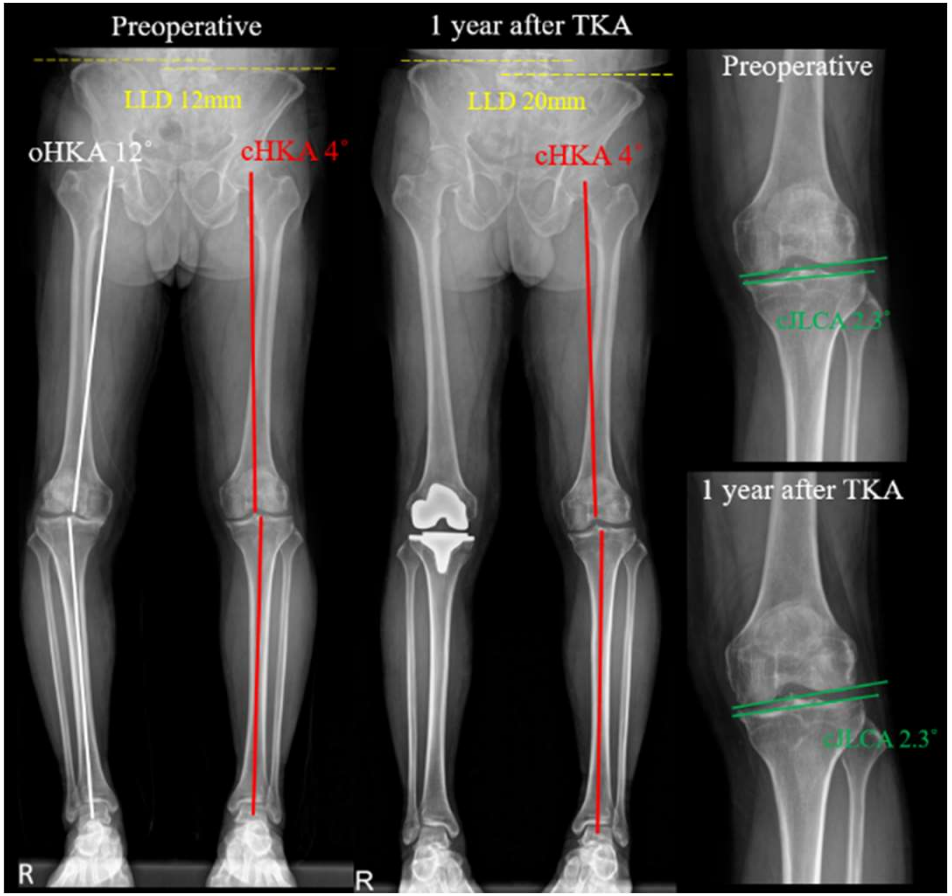
➢Previous lower extremity operation (fracture, osteotomy)

➢Disease that can affect alignment (LCP, RA)

Measurement

- Age, Height, Weight, both knee KL grade
- Preop & Postop (1Y) both side Hip-Knee-Ankle (HKA) angle: oHKA & cHKA
- Postop LLD
- Preop & Postop (1Y) contralateral knee VAS score
- Preop & Post op (1Y) joint line convergence angle (JLCA) on contralateral knee: cJLCA

Radiologic Measurement



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Measurement

- ❖Preoperative HKA (≥ 10° or <10°)
  - ➢Effect due to alignment change

- ❖Preoperative HKA difference (≥ 5° or <5°)
  - ➢Effect due to alignment difference change

- ❖Postoperative LLD (+ or -)
  - ➢Effect due to + LLD or - LLD

Result

❖Patients demographics (127 patients)

	Preoperative oHKA			Preoperative HKA difference between op & contralateral side			Postoperative LLD		
	< 10˚ (N = 85)	≥ 10˚ (N = 42)	P value	< 5˚ (N = 74)	≥ 5˚ (N = 53)	P value	op > contralateral (N = 103)	op ≤ contralateral (N = 24)	P value
Demographic data									
Age (year)	72.9 ± 5.9	73.3 ± 4.6	0.698	72.8 ± 6.0	73.3 ± 4.7	0.615	73.1 ± 5.6	72.7 ± 5.0	0.780
Gender (male/female)	50/35	20/22	0.232	42/32	28/25	0.661	56/47	14/10	0.725
Height (cm)	159.2 ± 7.5	156.4 ± 9.6	0.097	159.1 ± 7.8	157.2 ± 9.0	0.216	158.3 ± 8.9	158.3 ± 5.0	0.959
Weight (kg)	66.6 ± 9.5	64.6 ± 12.3	0.327	66.3 ± 10.0	65.4 ± 11.3	0.637	65.5 ± 10.7	67.7 ± 9.7	0.371
BMI (kg/m2)	26.2 ± 2.7	26.4 ± 4.5	0.785	26.1 ± 2.8	26.4 ± 4.1	0.598	26.1 ± 3.4	27.0 ± 3.5	0.264
Laterality(Rt/Lt)	40/45	15/27	0.225	35/39	20/33	0.284	37/66	18/6	0.001
cKL grade(I/II/III/IV)	29/35/19/2	11/15/10/6	0.067	21/27/22/4	19/23/7/4	0.184	33/38/25/7	7/12/4/1	0.658
Alignment									
Preoperative oHKA(˚)	4.3 ± 4.2	14.2 ± 3.5	<0.001	5.3 ± 4.1	9.5 ± 8.8	0.002	7.0 ± 6.9	7.3 ± 6.6	0.879
Postoperatieve oHKA(˚)	0 ± 2.0	0.7 ± 1.8	0.041	0.2 ± 2.0	0.2 ± 1.9	0.794	0.2 ± 1.8	0.2 ± 2.6	0.952
Preoperative cHKA(˚)	2.6 ± 3.4	6.1 ± 3.7	<0.001	3.6 ± 4.2	3.6 ± 3.6	0.653	3.8 ± 4.0	3.7 ± 3.2	0.903
Preoeprative cJLCA(˚)	1.6 ± 2.4	2.9 ± 2.1	0.004	2.1 ± 2.6	2.0 ± 2.1	0.768	2.1 ± 2.4	1.8 ± 2.3	0.502
Preoperative LLD(mm)	-2.1 ± 6.7	-3.9 ± 8.2	0.192	-3.0 ± 6.8	-2.4 ± 7.9	0.625	-1.3 ± 6.7	-9.0 ± 6.4	<0.001

Result (Alignment change)

❖Changes in cHKA & cJLCA according to preoperative oHKA & HKA difference

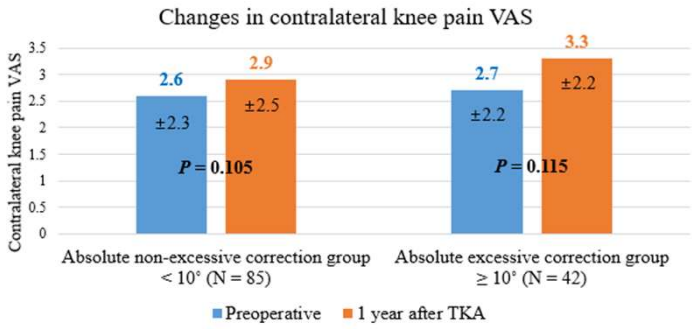
	cHKA			cJLCA		
	Preoperative	1 year after TKA	P value	Preoperative	1 year after TKA	P value
Preoperative oHKA (˚)						
< 10˚ (N = 85)	2.6 ± 3.4	2.6 ± 3.8	1	1.6 ± 2.4	1.7 ± 2.1	0.553
≥ 10˚ (N = 42)	6.1 ± 3.7	6.3 ± 3.9	0.478	2.9 ± 2.1	2.9 ± 2.0	0.762
Preoperative HKA difference						
< 5˚ (N = 74)	3.6 ± 4.2	3.8 ± 4.1	0.642	2.1 ± 2.6	2.1 ± 2.2	0.938
≥ 5˚ (N = 53)	3.6 ± 3.6	3.9 ± 4.3	0.193	2.0 ± 2.1	2.1 ± 2.0	0.269

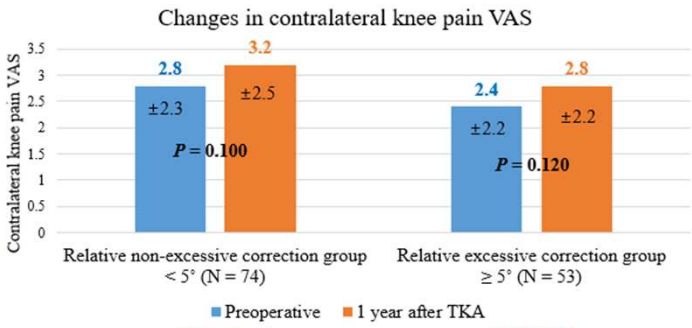
❖Changes in cHKA & cJLCA according to postoperative LLD

	cHKA			cJLCA		
	Preoperative	1 year after TKA	P value	Preoperative	1 year after TKA	P value
Postoperative LLD (mm)						
op side > contralateral side (N = 103)	3.8 ± 4.0	3.9 ± 4.3	0.668	2.1 ± 2.4	2.2 ± 2.0	0.844
op side ≤ contralateral side (N = 24)	3.7 ± 3.2	3.7 ± 3.8	0.904	1.8 ± 2.3	1.9 ± 2.5	0.338

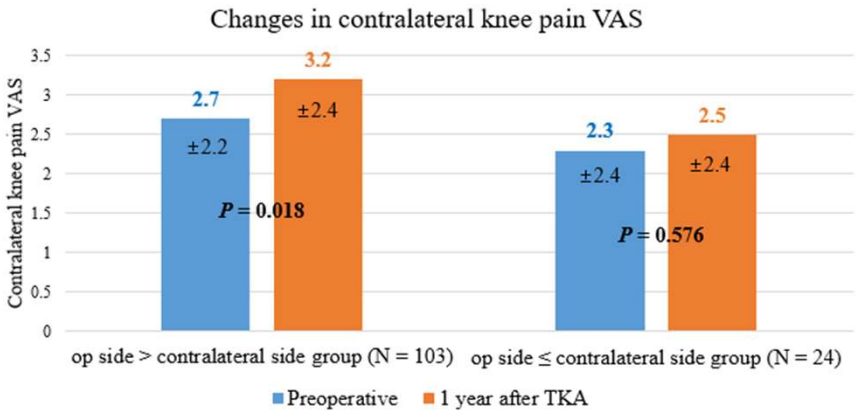
Result (Pain)

❖VAS change according to Alignment





• VAS change according to LLD



Limitation

- Short term follow up period (1Y)
- Only VAS score was analyzed
- Only consider JLCA on contralateral side

Conclusion

- Alignment correction & postoperative LLD in unilateral TKA might not change the contralateral lower extremity alignment & pain in 1-year follow-up

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