



# Factors of Patella Height in the Open Wedge High Tibial Osteotomy Patients

**TMDU**

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## **Disclosure of Conflict of Interest**

**Name of first author : Takashi Hoshino**

I have no COI  
with regard to our presentation.

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# Introduction

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- High tibial osteotomy (HTO) has been popularized with the development of firm fixators, such as locked plates, as well as simplified surgical techniques.

Kim KI, , et al. Am J Sports Med. 2017

- HTO changes not only coronal but also sagittal and axial alignment, which affects the femorotibial and patellofemoral joints.

Kesmezacar H , et al. Knee Surg Sports Traumatol Arthrosc. 2005

- In the sagittal plane, patella height and posterior tibial slope are the important structural factors strongly associated with normal joint function.

Ozalay M, et al. Knee Surg Sports Traumatol Arthrosc. 2008

- It is known that open wedge HTO (OWHTO) has a higher risk of postoperative patella baja than closed wedge HTO (CWHTO).

El-Azab H, et al. Am J Sports Med. 2010

- Patella baja is associated with decreased range of motion, a decreased lever arm, extensor lag, anterior knee pain, and increased energy expenditure.

Backstein D, et al. J Knee Surg. 2003



- However, risk factors for patella baja after OWHTO have yet to be clarified.

# Purpose

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- ① To investigate the usefulness of the measurement method by measuring the patella height preoperatively and at 1-year follow-up by three different measurement methods.
- ② To investigate the factors that influence patella height after OWHTO.

# Hypothesis

- The amount of change in the preoperative-postoperative tibial posterior slope is a factor that affects the postoperative patella height.

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# Material and Methods

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- Single center study
- Ninety-eight patients (43 males and 55 females, 101 knees) who underwent OWHTO with arthroscopy between September 2017 - May 2019.
- The patients were followed up for 1 year.





# Surgical procedure



- All patients received an arthroscopic examination.
- Arthroscopic procedures included medial meniscus procedure such as repair, partial resection or centralization.
- The weight – bearing line was designed to pass through at 57% after correction.
- Fixe with a locking plate (Tris Medial HTO Plate System; OLYMPUS)
- The gap created by the OWHTO was filled  $\beta$ -tricalcium phosphate (OLYMPUS)

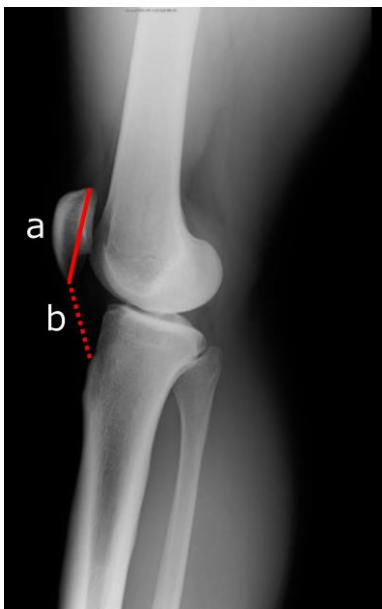
# Evaluations

## ① Comparison between preoperative and at 1 year follow-up

Three different measurement methods for patella height

Insall-Salvati Index(ISI)

b/a



Caton de Chams Index(CDI)

d/c



Blackburne Peel Index (BPI)

e/c



# Evaluations

## ② The factors that influence patella height after OWHTO

### ➤ Multiple regression

#### The dependent variable

amount of change in CDI before and after OWHTO ( $\Delta$ CDI)

#### The independent variables

age, gender, BMI, preoperative CDI,  
preoperative % mechanical axis (% MA), height of opening wedge,  
amount of change in tibial posterior slope before and after OWHTO  
( $\Delta$ PS)

p values < 0.05 were considered significant

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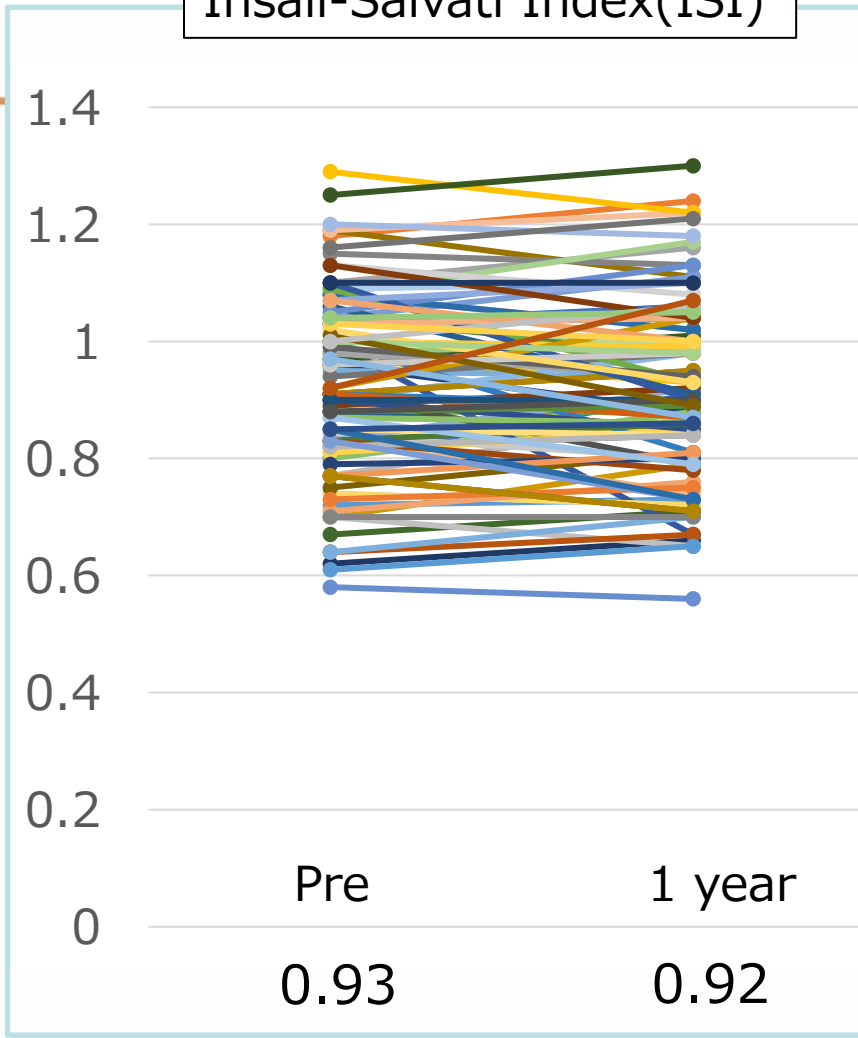
# Results

# Patient demographic data

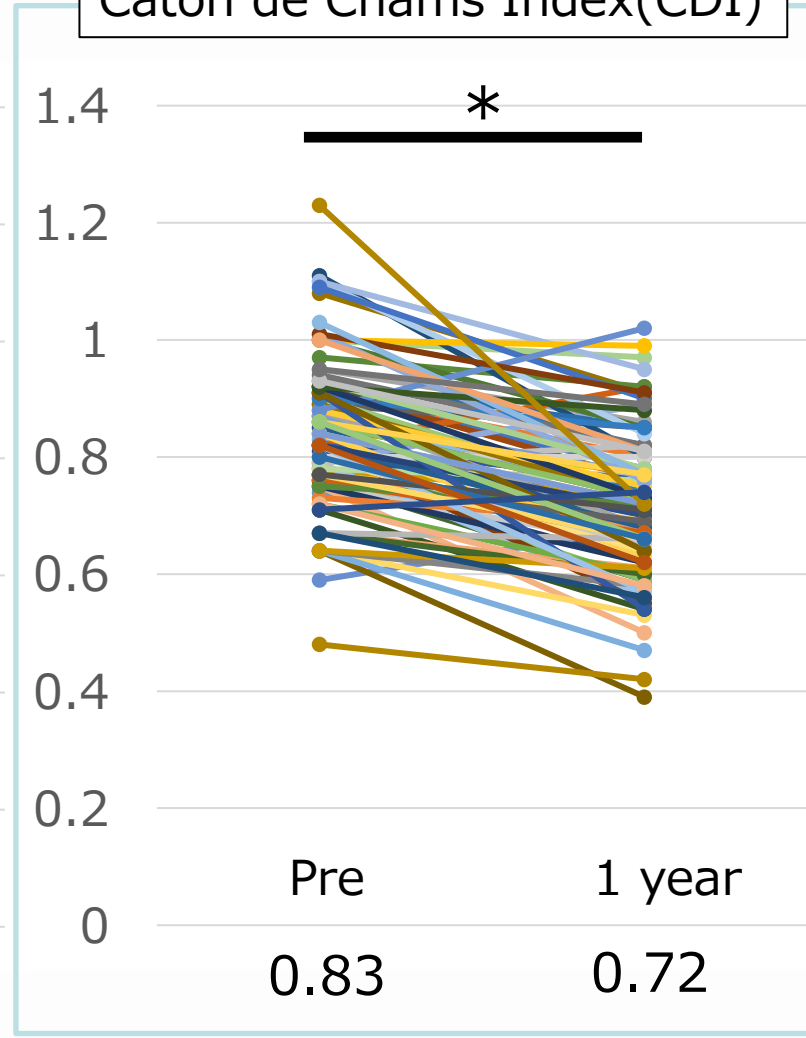
	<b>OWHTO n=98 (101 knees)</b>
Age, years, mean (range)	62 (34-37)
Sex, male/female	55/43
Height, cm, mean (range)	160.8 (143.1-179.0)
Weight, kg, mean (range)	64.3 (39.2-95.4)
BMI, mean (range)	24.9 (18.1-33.9)
KL grade (2/3/4)	45/53/3
Height of opening wedge, mm, mean (range)	10.0 (3.5-17)

① Comparison between preoperative and at 1 year follow-up

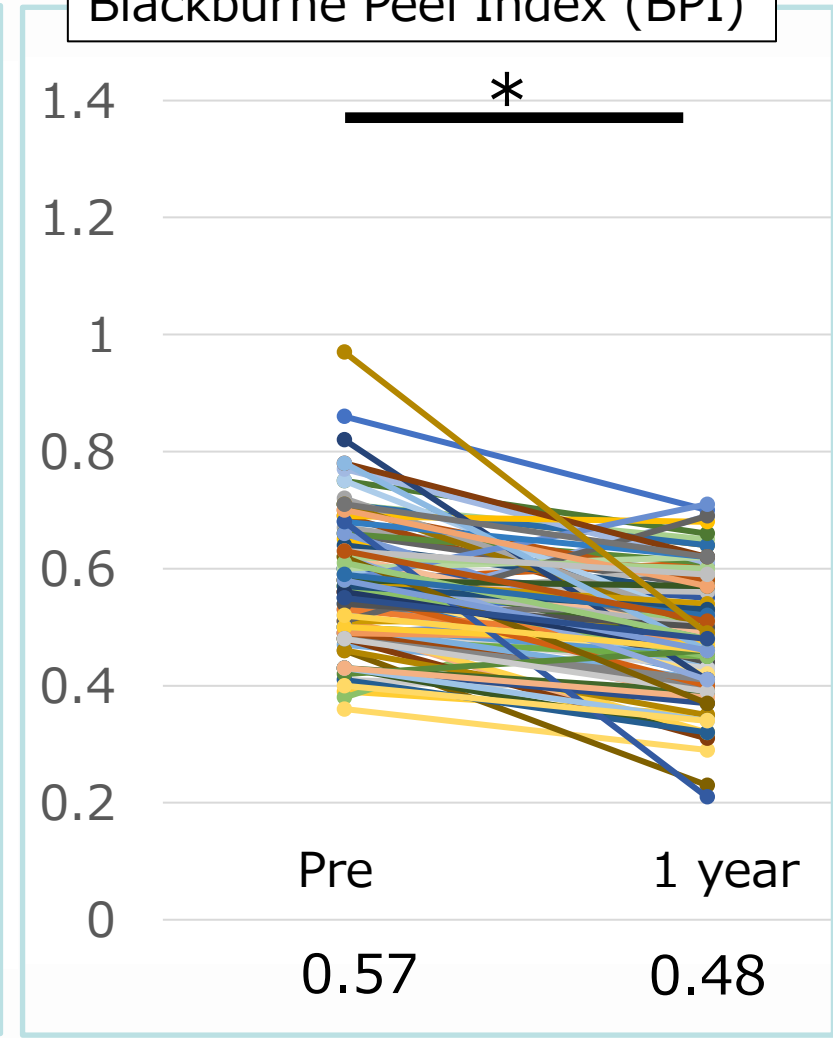
Insall-Salvati Index (ISI)



Caton de Chams Index (CDI)



Blackburne Peel Index (BPI)



CDI and BPI decreased significantly at 1-year follow-up

## ② The factors that influence patella height after OWHTO

	$\beta$ (standardized regression coefficients)	P value
Age	0.029	NS
BMI	0.009	NS
Sex	-0.02	NS
Opening wedge of height	-0.056	NS
$\Delta$ PS	-0.273	0.01>
Preoperative CDI	-0.442	0.01>

Preoperative CDI and the amount of change in tibial posterior slope were factors that affected the amount of change in CDI.

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# Discussions



# Three different measurement methods for patella height

- The most reliable method to measure patella height is the ISI on conventional radiographs.

F. Verhulst, et al. Knee Surg Sports Traumatol Arthrosc. 2020

- A multicenter study measuring the patella heights after HTO reported that the CDI is more reproducible than the ISI.

Amzallag J, et al. Knee Surg Sports Traumatol Arthrosc. 2013

## The current study

- CDI and BPI decreased significantly at 1-year follow-up, whereas there was no significant difference in ISI.
- CDI and BPI may be useful for measuring patella height after OWHTO.

# The factors that influence patella height after OWHTO

- In the OWHTO group, patella height decrease and posterior tibial slope increase between pre and post surgery. According to CDI and BPI, these correlations were weak, whereas according to ISI, there was no correlation.

El-Azab H, et al. Am J Sports Med. 2010

- OWHTO can induce patella baja, and a 1.7% decrease in the CDI was shown with 1°-correlation angle.

Otsuki S, et al. J Orthop Surg 2018

## The current study

- Small preoperative CDI and decrease in tibial posterior slope may affect the postoperative patella height.
- These factors should be considered as a risk factor for patella baja after OWHTO.

# Limitation

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- We didn't evaluate the association between patella height changes and the clinical outcomes.
- We evaluated only x-ray factors, and other factors related to the knee extension mechanism were not be considered in this study.

# Conclusion

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- CDI and BPI may be useful for measuring patella height after OWHTO.
- Small preoperative CDI and the amount of change in tibial posterior slope were risk factors for patella baja after OWHTO.