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# **Return to Sports after Inverted V-Shaped High Tibial Osteotomy for Medial Knee Osteoarthritis - Comparison with Medial Opening Wedge High Tibial Osteotomy -**

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# ISAKOS Congress 2025

Presenter:      ©Taku Ebata

I have nothing to disclosure.



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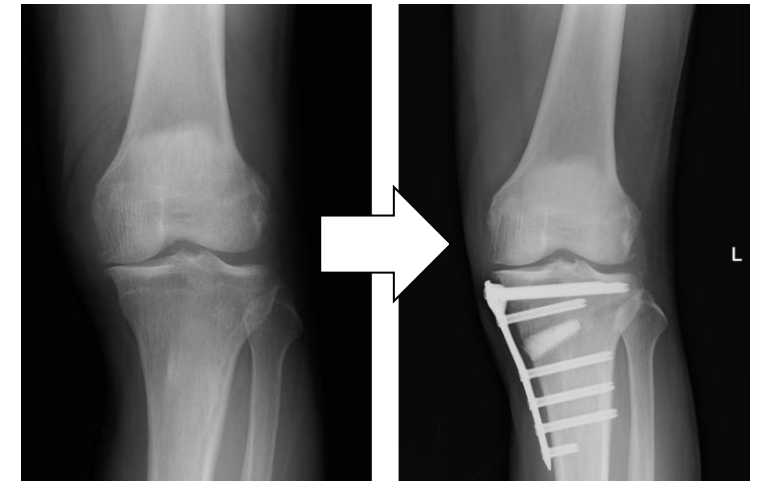


HOKKAIDO UNIVERSITY  
GRADUATE SCHOOL OF MEDICINE

DEPARTMENT of ORTHOPEDIC SURGERY

## Sports activity for middle aged patients with osteoarthritis (OA)

- ❑ With rising lifetime expectancy, the number of middle aged and older people with knee OA who wish to participate in sport activities has been increasing.
- ❑ High tibial osteotomy (HTO) is increasingly performed in physically active patients with medial knee OA, who have high expectations for return to sports (RTS).
  - ✓ Several studies have reported on RTS following medial opening wedge HTO (OW-HTO)
    - Favorable clinical outcomes
    - RTS rate: 80-90 %<sup>1-3</sup>



There is limited evidence regarding RTS after closing or neutral wedge HTO

## Inverted V-shaped HTO (IV-HTO): Neutral wedge osteotomy

### □ IV-HTO: Neutral wedge osteotomy

- ✓ hemi-closing and hemi-opening wedge osteotomy techniques <sup>4, 5</sup>

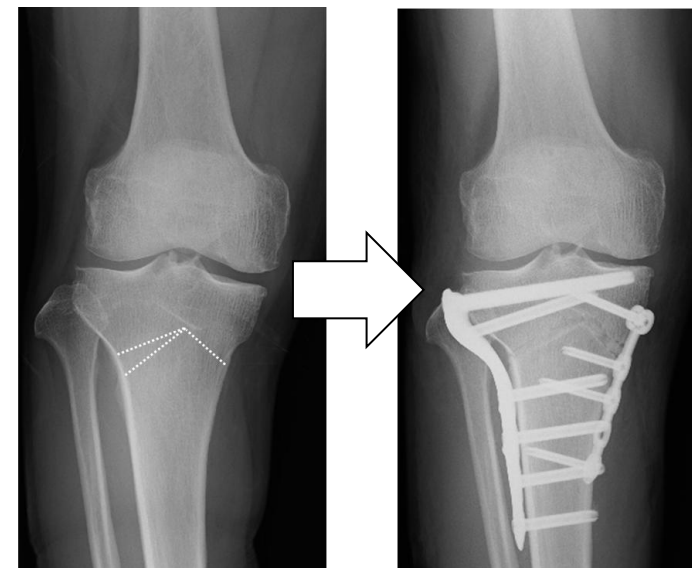
### □ Indication

- ✓ A correction of more than  $10^\circ$  to shift the mechanical axis to 65%
- ✓ With patellofemoral OA (PF-OA) of stage 3 or higher

### □ This procedure offers several advantages

- I. A large correction with minimal bone resection
- II. A minimal change in patellar height while restoring PF joint congruence
- III. Limited effects on posterior tibial slope and the length of lower leg
  - The favorable clinical outcomes following IV-HTO for severe medial knee OA

**There are no reports on the details of RTS following IV-HTO**



The objective of this study is to compare RTS following IV-HTO with those after OW-HTO

# Study design

- ❑ A total of 59 knees who underwent HTO for a medial OA or a varus knee with spontaneous osteonecrosis of the knee (SONK) from 2015 to 2022 were enrolled retrospectively
  - ✓ All patients participated in sports activity before surgery
    - IV group: 32 patients who underwent IV-HTO
    - OW group: 27 patients who underwent OW-HTO
- ❑ Evaluation:
  - ✓ RTS
    - Tegner activity score
    - Sports activity level according to the previous report<sup>6</sup>
  - ✓ Clinical outcomes: JOA score、Lysholm score
  - ✓ Radiological assessment
    - A-P view: HKA angle, %MA, MPTA
    - Lateral view: PTS, Caton-Deschamps (CD) ratio
    - Axial view: Tilting angle
- ❑ Statistical analysis: Mann-Whitney U test and paired t-tests (significance set at  $p = 0.05$ )

Level of impact on joints	Sports Examples
Low	Stationary cycling, Golf, Stationary skiing, Swimming, Walking
Potentially low	Isokinetic Weight lifting, Speed walking, hiking Cross-country skiing, Table tennins, Jazz dancing
Intermediate	Ice skating, Rock climbing,Doubles tennis, Downhill skiing
High	Baseball, Basketball, Football, Racketball, Running, Soccer, Singles tennis, Karate, Water skiing

# Patients Demographics

Data were reported as mean (SD)

	IV group (n=32)	OW group (n=27)	P value
age (years)	54.5 (10.8)	58.7 (11.9)	0.10
Male / Female (patients)	14 / 16	16/11	0.43
Operation side (Rt. : Lt.)	14 / 16	9/18	0.59
Height (cm)	161.3 (10.7)	163.8 (11.9)	0.38
Body weight (kg)	71.4 (16.4)	70.8 (17.8)	0.79
Body mass index (kg/m <sup>2</sup> )	27.5 (4.6)	26.2 (5.1)	0.28
Diagnosis (patients)	OA: 26 SONK:6	OA: 20 SONK:4 Others:3	0.17
K-L Grade 0/1/2/3/4			
FT joint	0/0/2/17/13	0/0/7/17/3	0.02
PF joint	2/4/14/11/1	8/14/5/0/0	<0.01

The IV group had more severe preoperative OA grade than the OW group.

## Return to sports after HTO surgery

Data were reported as mean (SD)

	IV (n=32)	OW (n=27)	p value
RTS rate (%)	86.7 (28 / 32)	88.9 (24 / 27)	>0.99
Time of RTS (months)	8.7 (2.9)	7.8 (2.8)	0.19
Tegner activity score (pts)			
Pre-symptomatic	4.8 (1.1)	5.0 (0.8)	0.54
Preoperative	2.3 (1.1)	2.9 (0.7)	<b>0.02</b>
Postoperative	4.1 (1.0)	4.4 (1.1)	0.16
Sports activity level			
Pre / Post (No.)			
Low	9 / 12	6 / 8	
Potentially Low	6 / 6	4 / 5	
Intermediate	2 / 0	3 / 2	Pre / Post
High	15 / 10	13 / 9	0.88 / 0.41

The RTS rate after IV-HTO was comparable with that after OW-HTO.

## Clinical outcomes

Data were reported as mean (SD)

	Preoperative	Postoperative	p value
JOA score (points)			
IV	63.4 (13.2)	86.1 (15.7)	<0.01
OW	69.8 (14.1)	88.4 (11.0)	<0.01
Lysholm score (points)			
IV	57.7 (14.2)	84.9 (14.6)	<0.01
OW	60.0 (18.5)	88.8 (9.7)	<0.01
KOOS (points)			
Total			
IV	62.2 (14.8)	81.8 (11.3)	<0.01
OW	53.8 (18.4)	83.2 (12.7)	<0.01
Sports			
IV	40.7 (22.0)	64.8 (24.0)	<0.01
OW	31.7 (22.8)	65.6 (27.4)	<0.01

Clinical outcomes significantly improved after both HTO surgery



## Radiological assessment

	Pre	Post	p value
HKA (° )			
IV	-8.2 (3.8)	4.1 (2.8)	<b>&lt;0.01</b>
OW	-5.7 (2.8)*	4.4 (1.6)	<b>&lt;0.01</b>
%MA (%)			
IV	11.4 (17.4)	64.6 (9.9)	<b>&lt;0.01</b>
OW	24.3 (9.1)*	65.2 (5.2)	<b>&lt;0.01</b>
MPTA (° )			
IV	82.0 (3.2)	93.4 (1.5)	<b>&lt;0.01</b>
OW	84.0 (1.8)*	92.6 (1.2)	<b>&lt;0.01</b>
PTS (° )			
IV	9.6 (3.1)	8.7 (3.4)	0.33
OW	10.2 (1.6)	11.2 (2.1)*	<b>0.048</b>

	Pre	Post	p value
CD ratio			
IV	0.98 (0.13)	0.96 (0.13)	0.09
OW	0.97 (0.14)	0.82 (0.14)*	<b>&lt;0.01</b>
Tilting angle (° )			
IV	8.0 (4.4)	5.5 (2.7)	<b>&lt;0.01</b>
OW	4.3 (3.4)*	4.8 (3.8)	0.13

Data were reported as mean (SD)

\*: Significant difference between IV group and OW group.

The IV group had more severe varus knee preoperatively than the OW group  
The IV group did not change PTS and CD ratio postoperatively

## To sum up our results ...

- ❑ 87.5% of the patients who underwent IV-HTO for severe medial OA returned to sports after surgery, with an average time to return of 8.7 months.
  - ✓ This result was comparable with that following OW-HTO
- ❑ Clinical outcomes significantly improved after both HTO surgery, with no significant differences between the groups.
- ❑ Radiological evaluation revealed that ...
  - ✓ Preoperatively, the IV group had more severe varus and OA grade than the OW group
  - ✓ The postoperative PTS was significantly increased compared with the preoperative value in the OW group, while there were no significant differences in the IV group
    - The postoperative PTS was significantly higher in the OW group than in the IV group.
  - ✓ While the CD ratio significantly decreased in the OW group postoperatively, there were no significant differences between the pre- and postoperative values in IV group

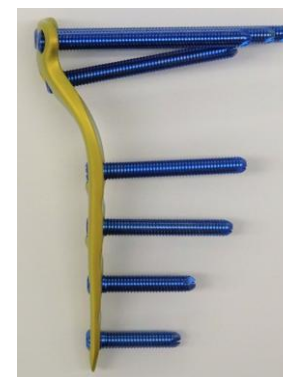
## RTS after IV-HTO for severe medial knee OA patients

### □ Our study:

- ✓ The preoperative degrees of varus knee, FT and PF-OA were more severe in the IV group
- ✓ Clinical outcomes and RTS rates of the patients who underwent IV-HTO were comparable than those who underwent OW-HTO

### □ The advancements in surgical techniques have improved clinical outcomes by facilitating early bone union with an average of three months after this surgery

- ✓ The locking compression plate system<sup>5</sup>
- ✓ Acute oblique fibula osteotomy and suture ligation technique<sup>7</sup>



These findings might indicate that the IV-HTO was one of the surgical options for patients with severe varus knee combined PF and FT OA who wish to RTS

## Conclusion

- ❑ We compared the clinical outcomes including RTS after IV-HTO with that after OW-HTO
- ❑ In this study, 87.5% of the patients who underwent IV-HTO for severe medial OA returned to sports after surgery, with an average time to return of 8.7 months
- ✓ Although the FT and PF-OA were more severe in the IV group than the OW group, RTS rates of the patients who underwent IV-HTO were comparable than those who underwent OW-HTO.
- Therefore, an inverted V-shaped HTO procedure may be one of the surgical options for the patients with severe varus knee combined PF and FT-OA who wish to RTS.

## References

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