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Hybrid-closed wedge high tibial osteotomy
Return to play after H-CWHTO (Hybrid closed wedge high tibial osteotomy)

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Faculty Disclosure Information

- **Conflict of Interest**
- **Disclosure:** We have nothing to declare for this study.

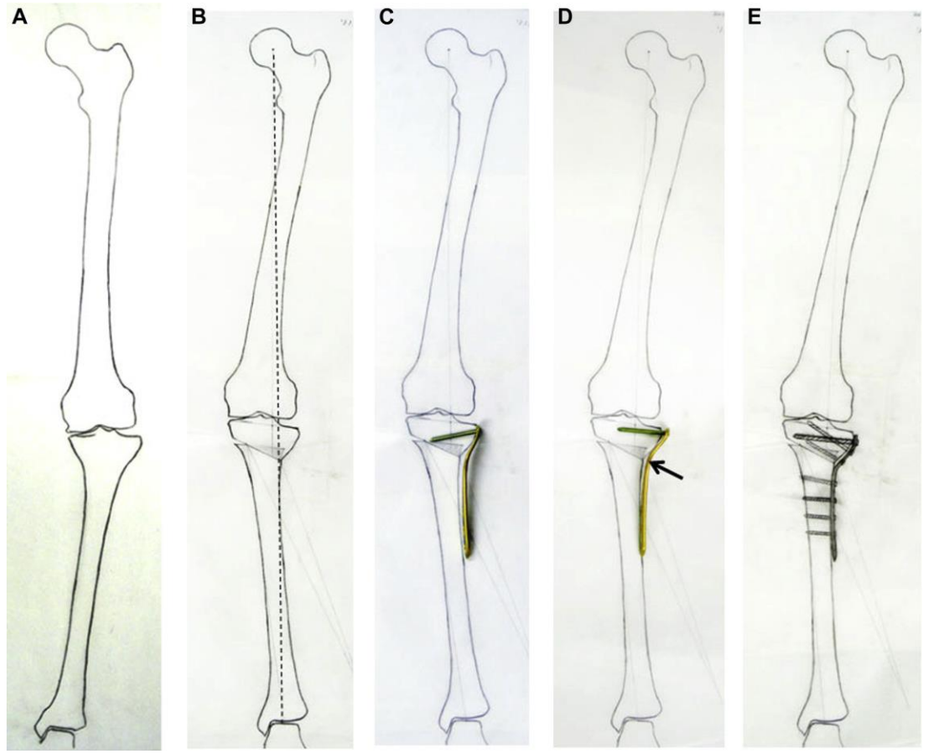
Introduction

- High tibial valgus osteotomy (HTO) is an established treatment for medial-compartment osteoarthritis of the knee. Takeuchi R. reported that combined medial open and lateral closed-wedge HTO (hybrid closed-wedge HTO) was used to overcome the limitations of traditional closed-wedge HTO because of following reasons [1].

1. Bone block removed is smaller in size
2. Procedure yields optimal geometric characteristics for bone healing
3. No step-off at the lateral osteotomy site
4. Lateral cortex of the proximal and distal fragments is attached firmly by the oblique osteotomy
5. Early full weight-bearing walking is possible.

What is H-CWHTO?

- An osteotomy was performed from the lateral to the medial side, with the hinge point set at a 2:1 ratio. A wedge-shaped bone resection was made toward the hinge according to the preoperatively measured correction angle. Closing the lateral side opens the medial side around the hinge point, resulting in a lateral closed, medial open wedge osteotomy technique [6].



What is H-CWHTO?

- H-CWHTO is indicated for more advanced medial and patellofemoral (PF) osteoarthritis. It has shown good clinical outcomes for these compartments [2]. This surgical technique is widely performed in Japan.

- Many studies have reported return-to-sport outcomes after high tibial osteotomy (HTO), especially **open-wedge HTO (OWHTO)**, showing high return-to-sport rates.

- However, there are **no previous reports regarding return-to-sport rates after H-CWHTO**.

Purpose

- To report the rate of return to sport at two years following H-CWHTO.

Methods

- Retrospective cohort study including patients who underwent H-CWHTO between 2017 and 2023 at multiple institutions.
- Radiographic evaluations were conducted preoperatively and postoperatively.
- Patients were followed at 2 years post-op.

Surgical Indications

- Varus alignment: HKA < 0°, WBL ratio < 50%, mMPTA < 90°
- Flexion contracture < 10°, Mild lateral compartment OA
- One or more of the following: smoker, correction angle > 12°, PF-OA

Inclusion criteria

- Follow-up of at least 2 years
- Partial meniscectomy
- Preoperative participation in sports (prior to the onset of pain)

Exclusion criteria

- Previous ligament reconstruction or meniscal repair
- Simultaneous femoral osteotomy or ACL reconstruction at time of surgery

Results

125 knees from 95 patients registered from 2017 to 2023

15 knees from 12 patients were excluded because of combined surgery and history of knee surgery

4 knees from two patients were lost to follow up

67 knees from 50 patients were excluded because not to participate sports

Consequences were determined in **39** knees from **31** patients

	Total (n=31)	Return to sports (n=22)	No Return to sports (n=9)	p-value*
Preoperative				
Median age (IQR, years)	63.1 (55-69)	60 (57-64)	60 (58-69.5)	0.29
Competitive level, n (%)	12 (38.7%)	7 (31.8%)	5 (55.6%)	0.23
Median Tegner activity score (IQR)	3.9(3-4)	3 (3-4)	3 (3-6)	0.72
Median frequency (IQR, days/month)	8 (4-13.5)	10 (4-15)	4 (4-8)	0.09
K-L grade (IQR)	2.6 (2-4)	3 (2-3)	2 (1-4)	0.34
Postoperative				
Correction angle (IQR, degree)	11 (9-12)	11 (9-13)	11 (10-11)	0.83

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*Categorical variables were evaluated using Fisher's exact test and continuous variables were evaluated using Wilcoxon's rank-sum test.

Discussion

Tegner activity score and Age

- **This study:** Tegner 3.9; age 63.1
- **OWHTO studies[3,5] :** Tegner 4.1–5.3; age 50–56
- Compared to OWHTO, H-CWHTO is typically performed in **older patients with more advanced OA**, and fewer participate in high-impact sports.

Return-to-Sport Rates

- **This study (H-CWHTO):** 71.0% **OWHTO studies[3,5] :** 75.3–82%
  The lower return rate may reflect the different indications and older patient population in H-CWHTO cases.

Key Predictors of Return to Sport

- Preoperative **sports participation frequency** is associated with higher return-to-sport rates.

- *Hoorntje et al.* reported higher return rates in patients who were active in sports within one year prior to OWHTO [4].
  This suggests **preoperative motivation** is a key factor influencing postoperative return to sports.

Conclusion

- Despite being indicated for patients with more advanced degenerative changes, H-CWHTO still offers a high likelihood of return to sport postoperatively.
- With appropriate indications and patient motivation, **return to athletic activities is achievable** after H-CWHTO.

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