BMI and Medial Opening Wedge High Tibial Osteotomy – How Heavy Can You Go?

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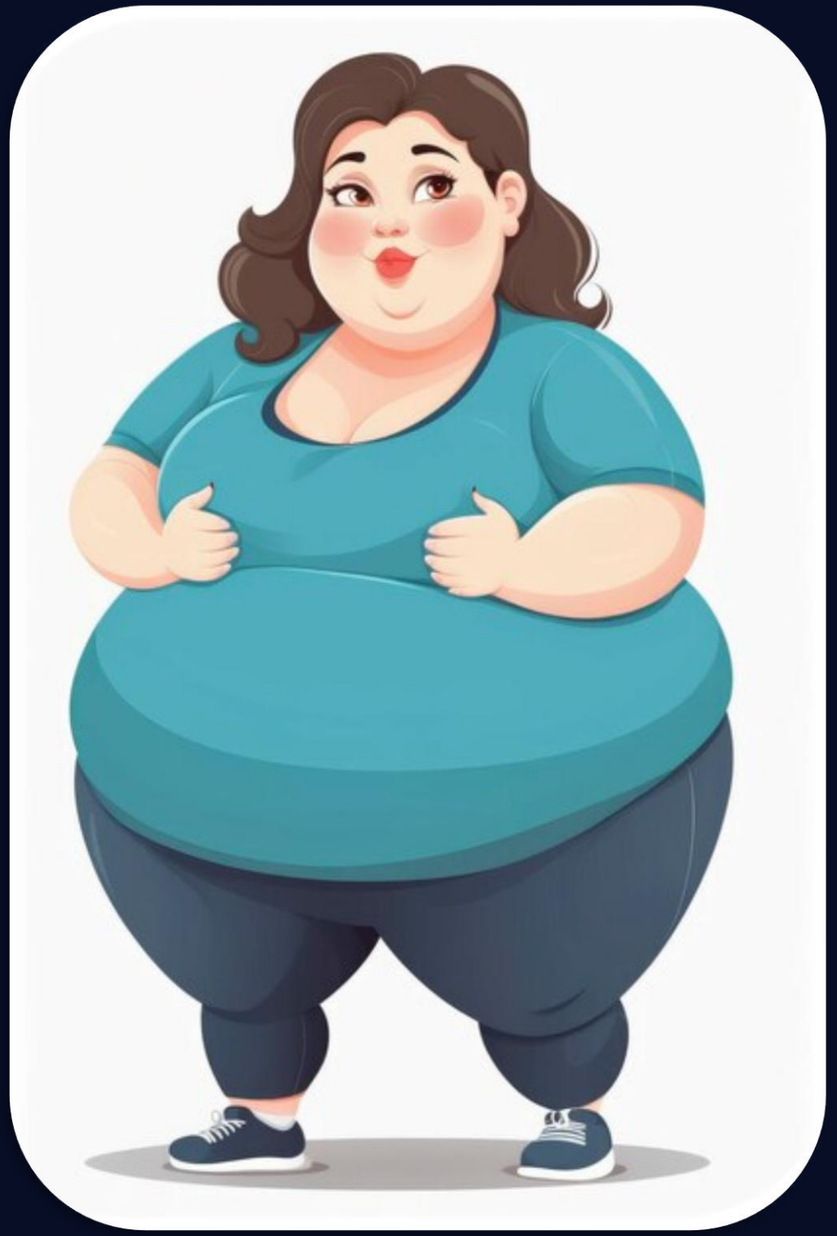


This presentation examines the relationship between body mass index and outcomes in medial opening wedge high tibial osteotomy, challenging conventional assumptions about weight limitations in orthopaedic knee procedures.

Disclosures

Ahmed Mabrouk and Sam Yasen have no disclosures.

Michael Risebury is a BodyCad Consultant.

Introduction and Background

MOWHTO Background

Medial opening wedge high tibial osteotomy is the workhorse in knee osteotomies with proven clinical outcomes and high 10-year survivorship.

BMI Controversies

Some studies show comparable outcomes regardless of BMI, whilst others report poorer outcomes and up to 10-fold higher complications in patients with BMI > 30 kg/m².

Study Purpose

This research examines BMI effects on radiological corrections, patient-reported outcomes, complication rates, conversion to arthroplasty, and 10-year survivorship.

Study Hypothesis

MOWHTO in patients with high BMI would result in inferior outcomes, higher complications and significantly lower survivorship, based on existing literature.

Methodology and Patient Demographics

Study Design

Retrospective analysis of 574 MOWHTO cases with recorded BMI

Patient Stratification

Three BMI categories following NICE classification system

BMI Distribution

HW group (n=96): 23±1.5 kg/m², OW group (n=233): 27.4±1.4 kg/m², OB group (n=245): 34.4±3.8 kg/m²

The study population demonstrated a statistically significant intergroup difference in BMI distribution ($p<0.001$). All patients underwent the same surgical technique with consistent preoperative planning and postoperative rehabilitation protocols to ensure standardisation of treatment.

Patient Classification and Selection

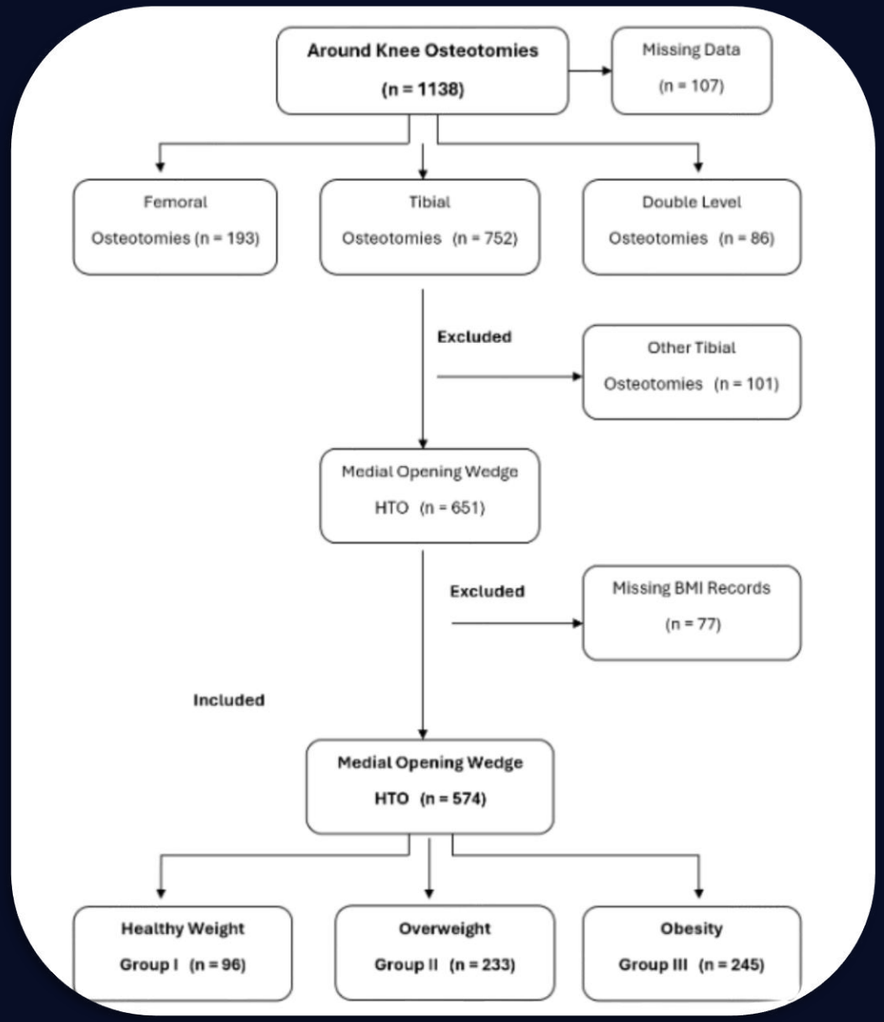


Figure 1: Patient Flow Chart showing the distribution of cases across BMI categories.

BMI Classification (NICE Guidelines)

- Healthy Weight (HW): BMI 18.5–24.9 kg/m² (n=96)
- Overweight (OW): BMI 25–29.9 kg/m² (n=233)
- Obesity (OB): BMI ≥30 kg/m² (n=245)

The largest proportion of patients fell into the obese category (42.7%), followed by overweight patients (40.6%), whilst healthy weight patients represented the smallest group (16.7%).

This distribution reflects the common clinical scenario where knee osteoarthritis often coincides with elevated BMI, making this study particularly relevant to everyday orthopaedic practice.

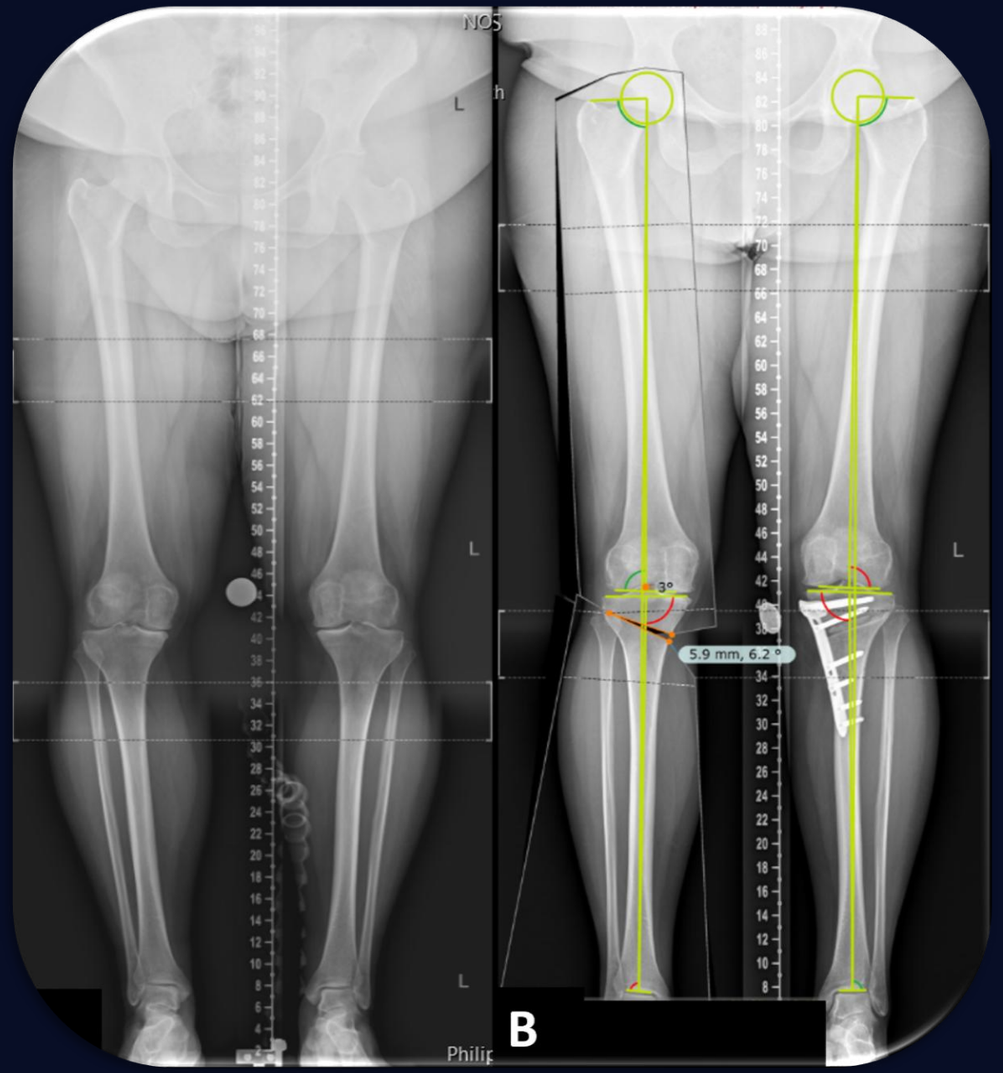
Surgical Technique and Radiographic Assessment

Free-hand Biplanar Technique

All procedures utilised a standardised free-hand biplanar medial opening wedge osteotomy technique, ensuring consistency of the surgical approach across all BMI groups.

Mikulicz Point Targeting

All corrections were targeted to a Mikulicz point of 50-65% according to the OA grade, optimising biomechanical load distribution across the knee joint.



Radiographic Assessment

Standing radiographs were used to assess pre- and post-operative alignment, allowing precise measurement of correction parameters regardless of patient BMI.

Radiological Outcomes and Patient-Reported Measures

Alignment Parameters

No significant differences in pre- or post-operative alignment parameters between BMI groups

KOOS and Oxford Knee Scores

Significant improvement in all scores postoperatively, continuing up to 5 years ($p<0.001$)

Intergroup Comparison

No intergroup differences in functional outcomes or pain scores ($p>0.05$)

The radiological parameters showed consistent correction across all BMI groups, with no statistically significant differences in mechanical axis deviation, medial proximal tibial angle, or joint line convergence angle. Similarly, patient-reported outcome measures improved significantly in all groups, regardless of BMI classification.

Preoperative	Healthy	Overweight	Obesity
mTFA (°)	-5.9 ±2.8 [-6.5, -5.3]	-5.5 ±3.1 [-5.9, -5.1]	-5.5 ±2.8 [-5.9, -5.2]
mLDFA (°)	88.8 ±1.9 [88.4, 89.2]	88.6 ±1.7 [88.4, 88.8]	88.7 ±1.7 [88.5, 89]
MPTA (°)	85.5 ±3 [84.9, 86.1]	85.5 ±2.6 [85.2, 85.9]	85.9 ±2.4 [85.6, 86.2]
JLCA (°)	2.4 ±1.6 [2, 2.7]	2.3 ±1.6 [2.1, 2.6]	2.7 ±1.9 [2.5, 3]
LL (mm)	822.3 ±63.6 [809.4, 835.2]	839.6 ±54.5 [832.5, 846.7]	833.5 ±59.6 [825.9, 841]
Mikulicz (%)	20.3 ±13.1 [17.7, 23]	23.1 ±13.4 [21.3, 24.8]	22.7 ±12.2 [21.9, 25]

Postoperative	Healthy	Overweight	Obesity
mTFA (°)	1.2 ±2 [0.7, 1.6]	1.1 ±2.6 [0.8, 1.5]	1.6 ±2.4 [1.3, 1.9]
mLDFA (°)	88.4 ±2.2 [88,88.9]	88.2 ±1.9 [88, 88.5]	88.7 ±1.9 [88.4, 88.9]
MPTA (°)	91.2 ±2.6 [90.7, 91.8]	91.4 ±2.4 [91, 91.7]	92 ±2.8 [91.6, 92.4]
JLCA (°)	2.1 ±1.5 [1.8, 2.4]	2.2 ±1.6 [1.9, 2.4]	2.3 ±1.7 [2, 2.5]
LL (mm)	827.9 ±61 [815.1, 840.7]	844.6 ±58.7 [836.9, 852.3]	833.4 ±60.2 [825.6, 841.2]
Mikulicz (%)	53.8 ±9.8 [51.8, 55.9]	54.3 ±10.7 [52.9, 55.7]	55.4±11 [54,56.8]

Survivorship Analysis

Follow-up Period

Patients were followed for up to 10 years post-surgery to assess long-term outcomes and survivorship.

Analysis Method

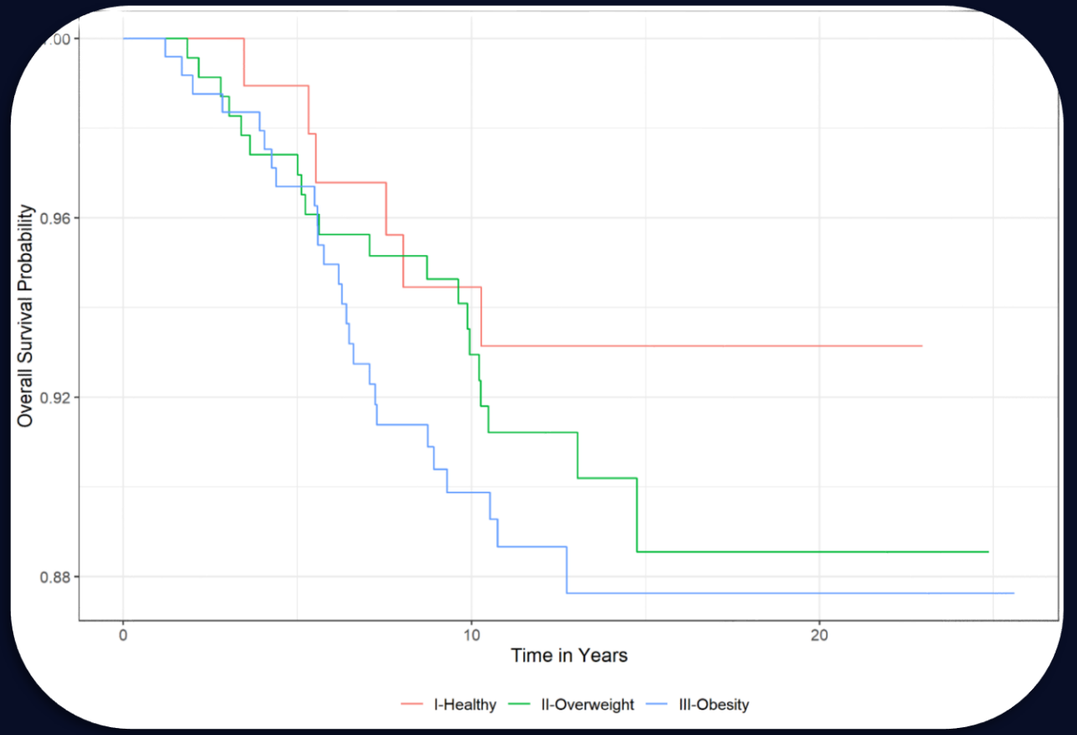
Kaplan-Meier survival analysis was conducted to compare survivorship between BMI groups.

Key Finding

No statistically significant differences in survivorship were observed between healthy weight, overweight and obese patients.

Clinical Implication

BMI alone does not appear to predict MOWHTO failure or conversion to arthroplasty.



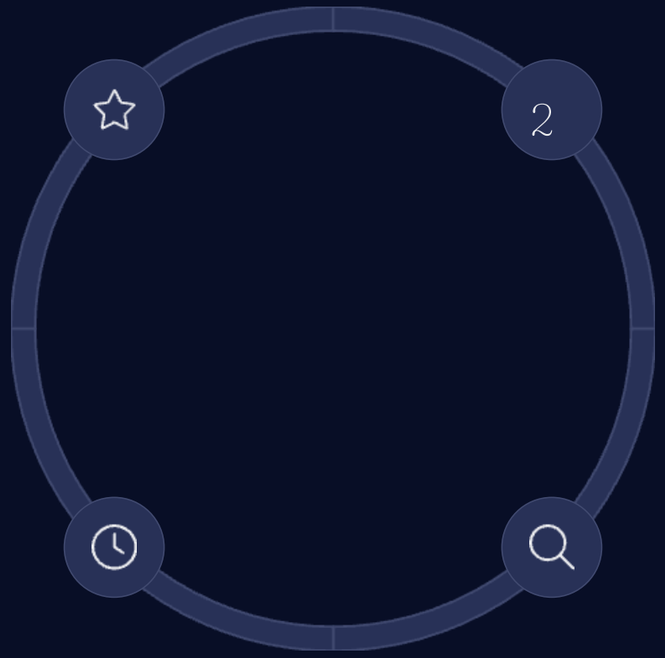
Conclusions and Clinical Implications

Radiological Outcomes

No significant differences in correction parameters between BMI groups

Survivorship

Comparable mid-term survivorship regardless of BMI



Functional Outcomes

Similar improvement in KOOS and Oxford scores across all BMI categories

Complications

No significant difference in complication rates between BMI groups

Body mass index has no significant effect on radiological corrections, clinical outcomes, complications, or survivorship of MOWHTO at short to medium term follow-up. No specific cut-off point for BMI can be recommended as a contraindication to MOWHTO based on these findings.

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Introduction

Medial opening wedge high tibial osteotomy (MOWHTO) is the workhorse in osteotomies around the knee, with proven clinical outcomes and high 10-year survivorship[8, 17, 22]. Optimizing the indications and patient selection is a key for continued success with the lowest possible complications[5, 6, 18, 19, 24].

Body mass index (BMI) has often been a concern when considering a variety of knee surgeries [2, 7, 9, 13, 27]. On the short and midterm, comparable patient reported outcome measures have been reported. [1, 2, 21]. Conversely, some studies reported poorer outcomes and up to a 10-fold higher complications in patients with BMI of > 30 kg/m2. [3, 8, 23]. Moreover, poorer survival at 5 and 10 years was reported in cases with BMI > 25 kg/m2.[4]

This study reports the effect of the BMI on the early to midterm results of MOWHTO. Radiological corrections, patient reported functional outcomes, the complication rate, conversion to arthroplasty rate , 10-year survivorship are reported based on the BMI class. It was hypothesized that MOWHTO in patients with high BMI would result in inferior radiological and clinical outcomes, higher complication rate and significantly low survivorship, based on existing literature.

Patients and Methods

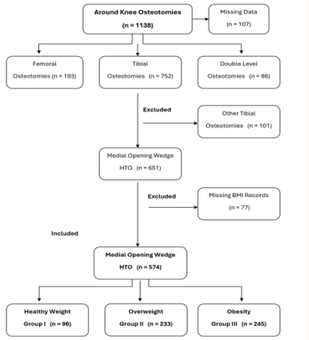

Figure 1: Patient Flow Chart

Patients were categorized into 3 groups according to their BMI as per the classification from the National Institute for Health and Care Excellence (NICE): The healthy weight (HW) group of patients with BMI of 18.5-24.9 kg/m^2, the overweight (OW) group of patients with BMI of 25-29.9 kg/m^2 , and the obesity (OB) group of patients with a BMI ≥ 30 kg/m^2

All corrections were targeted to a Mikulicz point of 50 – 65 % according to the OA grade. A free-hand biplanar medial opening wedge osteotomy technique was performed in all cases **Figure 2**.

Results

A total of 574 cases who underwent MOWHTO and had their BMI recorded, were included in the study. Patients were categorized based on their BMI class into 3 groups: the HW group (n =96), the OW group (n = 233), and the OB group (n = 245). The mean BMI in HW group was 23 ± 1.5 kg/m^2 , in OW group was 27.4 ± 1.4 kg/m^2 and in OB group was 34.4 ± 3.8 kg/m^2, with intergroup statistically significant difference (p < 0.001).

Preoperative	Healthy	Overweight	Obesity
mTFA (°)	-5.9 ±2.8 [-6.5, -5.3]	-5.5 ±3.1 [-5.9, -5.1]	-5.5 ±2.8 [-5.9, -5.2]
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Mikulicz (%)	20.3 ±13.1 [17.7, 23]	23.1 ±13.4 [21.3, 24.8]	22.7 ±12.2 [21.9, 25]

Table 1: Preoperative alignment parameters across the three groups categorized by BMI

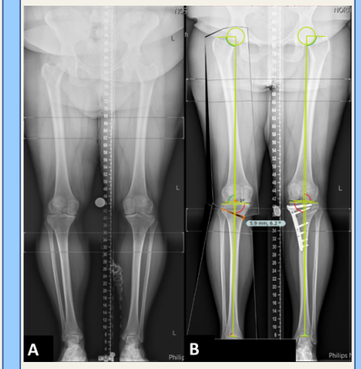

Figure 2: Long leg standing radiographs (A) Preoperative varus malalignment of the tibia and the medially deviated Mikulicz line B) Postoperative MOWHTO fixed with Tomofix® plate and the corrected alignment with Mikulicz line at 55%.

References

Medial opening wedge high tibial osteotomy performs similarly irrespective of body mass index. Mabrouk A, Risebury M, Yasen S. ***Knee Surg Sports Traumatol Arthrosc.*** *2024 June.*
DOI: *10.1002/ksa.12317*

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Table 2: Postoperative alignment parameters across the three groups categorized by BMI.

Patient Reported Outcome Measures (PROMs)

All KOOS scores , Oxford knee scores, VAS pain and health scores have significantly improved postoperative and continued to improve up to 5 years (All p < 0.001) , with no intergroup difference (P > 0.05).

Survivorship

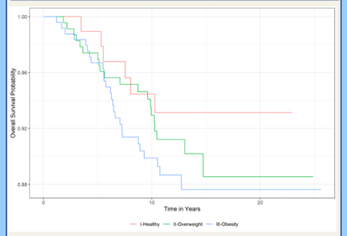

Figure 3: Kaplan Meier survival curve of medial opening wedge high tibial osteotomy based on the BMI class. Note the curve is magnified for overall survival probability between 0.88 and 1.00 for better visualization.

Conclusion

Body mass index has no significant effect on either the radiological corrections, clinical outcomes, complications, or survivorship of MOWHTO at short to medium term follow up. No specific cut off point for BMI can be recommended as a contraindication to MOWHTO.

References

Mabrouk A, Risebury M, Yasen S.	**Medial opening wedge high tibial osteotomy performs similarly irrespective of body mass index.**	**Knee Surg Sports Traumatol Arthrosc.** 2024 June.	DOI: 10.1002/ksa.12317

This study represents one of the largest cohorts examining BMI's impact on MOWHTO outcomes. Our findings challenge conventional assumptions about weight limitations in knee osteotomy procedures and provide evidence-based guidance for patient selection.