

When is it Critical to Fix the Posterior Malleolus?

Prism Schneider MD, PhD, FRCSC Division of Orthopaedic Trauma Professor, Departments of Surgery and Community Health Sciences University of Calgary

19th Annual International San Francisco Orthopaedic Trauma Course April 24 - 26, 2025

Disclosures



- Scientific Advisory Committee
 - Osteoporosis Canada
- Institutional Research Funding
 - Smith & Nephew
 - Johnson & Johnson
- Educational Engagements
 - Stryker
- Associate Editor
 - Canadian Journal of Surgery



- Does the posterior malleolus (PM) fracture size matter?
- When is it critical to fix a PM fracture?

Objectives

- Does surgical fixation of the PM improve outcomes?
- Decision-making for PM fracture management is still highly debated







- 31 year old female
- Fall mountain biking
- Healthy
- Physiotherapist

Decision-making is traditionally based on fracture size on radiographs



Significance of Posterior Malleolus



- Posterior malleolus (PM) provides bony and ligamentous stability
 - PM fractures can be bony avulsions of the posterior inferior tibiofibular ligament (PITFL)
- PM fractures occur in up to **44%** of ankle fractures
- Xray measurement of size is highly inaccurate and has poor reliability
- 143 classification systems described for PM fractures



Does Size of the PM Fracture Matter?

Archives of Orthopaedic and Trauma Surgery (2023) 143:4181–4220 https://doi.org/10.1007/s00402-022-04643-7

TRAUMA SURGERY

Classifications of posterior malleolar fractures: a systematic literature review

Julia Terstegen¹ · Hanneke Weel² · Karl-Heinz Frosch^{1,3} · Tim Rolvien¹ · Carsten Schlickewei¹ · Elena Mueller¹

- Variable cut-offs used for surgical fixation indication
 - Ranging from 20% to 35%
 - 1/3 of the joint surface
- 9 studies reported a better outcome with open reduction and internal fixation (ORIF) of small PM fractures
 - 7 studies reported no difference





Does Morphology Matter?





- Haraguchi et al developed the first CT-based classification (2006)
- 3 types described:
 - Type I posterolateral oblique
 - Type II transverse with extension to medial malleolus
 - Type III shell-type

Good inter- and intraobserver reliability

Several modifications by other authors

Does Morphology Matter?





- Bartoníček/Rammelt classification (2016)
- Type 1 fractures have better outcome vs. Type 2
- Type 4 fractures had significantly improved clinical outcomes when surgically fixed

Good to excellent inter- and intraobserver reliability

Evidence of Instability

- PM fractures can be bony avulsions of PITFL
 - Syndesmotic instability
 - Additional ligamentous injuries
- ORIF of the PM:
 - Reconstructs the bony anatomy of the tibiotalar and tibiofibular joints
 - Reduces the fibula in the incisura
 - Restores the ligamentous stability of the PITFL





_

Incarcerated Fragments

• 2/3 of incarcerated fragments are associated with Haraguchi Type I patterns







Articular Incongruity

- Disruption of mechanical forces
 - Increased point loading
- Altered load transfer
- Increased risk for post-traumatic osteoarthritis (OA)
 - Up to 75% of ankle post-traumatic OA are associated with a prior ankle fracture







Open Reduction and Internal Fixation of the Posterior Malleolus Fragment in Ankle Fractures Improves the Patient-Rated Outcome: A Systematic Review

- Significantly better American
 Orthopaedic Foot & Ankle Society
 (AOFAS) scores for ORIF vs. Closed
 Reduction and Internal fixation (CRIF)
 - 90.9 vs. 83.4; p < 0.001

Mean Difference IV, Fixed, 95% CI

Foot & Ankle International 2023, Vol. 44(8) 727–737



Does Fixation Improve Outcomes?

Does Fixation Improve Outcomes?



Open Reduction and Internal Fixation of the Posterior Malleolus Fragment in Ankle Fractures Improves the Patient-Rated Outcome: A Systematic Review

- Significantly better AOFAS scores for ORIF vs. non-operative treatment
 - 92.0 vs. 82.5; p < 0.001



Foot & Ankle International®

2023, Vol. 44(8) 727-737

Does Fixation Improve Outcomes?



 Quan et al.
 Journal of Orthopaedic Surgery and Research
 (2023) 18:10

 https://doi.org/10.1186/s13018-022-03488-5
 (2023) 18:10

Journal of Orthopaedic Surgery and Research

Posterior malleolus fracture: a mid-term follow-up

Yuan Quan^{1†}, Hao Lu^{1†}, Peng Qi², Songyao Tian³, Jiantao Liu⁴, Chunlong Zhang¹, Boyu Zhang¹ and Hailin Xu^{1*}

- 79 patients, CT-based classification of PM fractures
- Minimum 5-year follow-up
- Those treated surgically had improved functional scores
 - (OMAS, EQ-5D, and AOFAS)



- 31 year old female
- Fall mountain biking
- Healthy
- Physiotherapist





- 31 year old female
- Fall mountain biking
- Healthy
- Physiotherapist

Radiographic Signs of Instability Joint Incongruity





- 31 year old female
- Fall mountain biking
- Healthy
- Physiotherapist

Radiographic Signs of Instability Joint Incongruity





- 31 year old female
- Fall mountain biking
- Healthy
- Physiotherapist

Best available evidence suggests improved short- and medium-term outcomes with ORIF





- 6 month follow-up
- Healed PM and ATFL avulsion
- Full return to activities



FOOTHILLS MEDICAL CENTRE OTS FOOTHILLS MEDICAL CENTRE

- 52 year old female
- Slip down stairs
- Elevated BMI
- Non-smoker
- Teaching Assistant





- 52 year old female
- Slip down stairs
- Elevated BMI
- Non-smoker
- Teaching Assistant







- 52 year old female
- Well leg x-rays
- Posteromedial approach
- Reduce and reconstruct medial and posterior apex



- 52 year old female
- Slip down stairs

- Restored bony stability
- Restored articular congruity





Objectives



- Does the posterior malleolus fracture size matter?
 - Morphology is more important
- When is it critical to fix a PM fracture?
 - Instability, incarcerated fragment, joint incongruity
 - Remember to assess syndesmotic stability
- Does surgical fixation of the PM improve outcomes?
 - Best available evidence suggests improvement in PROMs for short- and medium term





When is it Critical to Fix the Posterior Malleolus?

Prism Schneider MD, PhD, FRCSC Division of Orthopaedic Trauma Professor, Departments of Surgery and Community Health Sciences University of Calgary

19th Annual International San Francisco Orthopaedic Trauma Course April 24 - 26, 2025