

# Surgical Indications of Tibial Derotational Osteotomy for Idiopathic Tibial Torsion: A Systematic Review

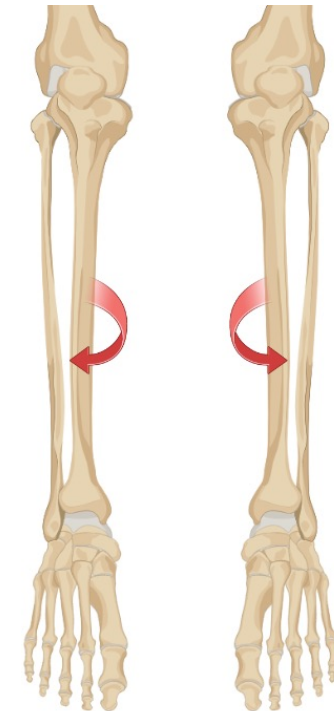
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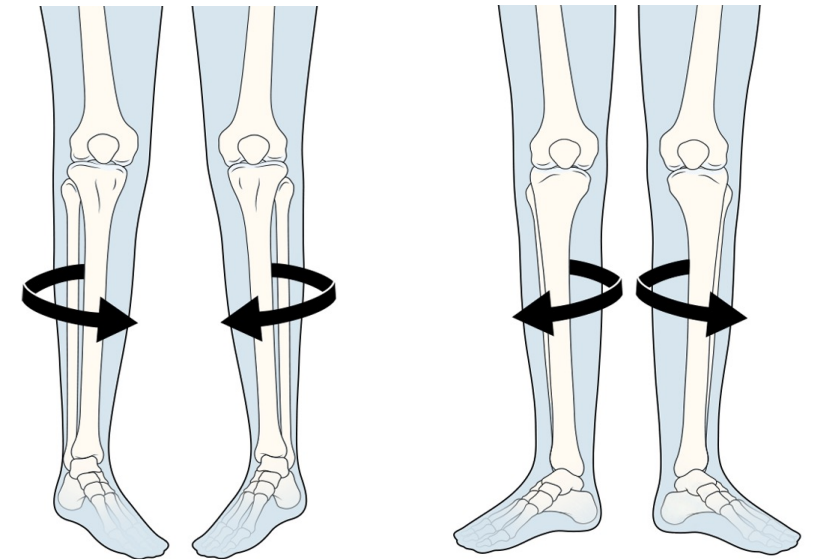
# DISCLOSURES

- None of the authors have any disclosures to report



# INTRODUCTION

- Tibial torsion (TT) is a common rotational abnormality in children with an etiology is often idiopathic
- Most cases spontaneously correct by age 4, but a small percentage of cases persist into adulthood
- TT can be associated with anterior knee pain, patellofemoral instability, and osteoarthritis
- Idiopathic tibial torsion is best corrected by tibial derotational osteotomy (TDO), but indications for this surgery remain unclear
- Accurate diagnosis of TT prior to initiating treatment is essential, however, there remains no consensus on threshold angles using common TT assessment tools



Internal  
tibial torsion

External  
tibial torsion

*Image Source: Boston Children's Hospital*



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# OBJECTIVES

- **Primary**
  - To identify common surgical indications of tibial derotational osteotomy in patients with idiopathic tibial torsion
- **Secondary**
  - To identify diagnostic thresholds among common measurement methods for patients with idiopathic tibial torsion treated with TDO



# METHODS

## **Inclusion Criteria**

- Therapeutic clinical studies reporting clinical indications, degree of correction, and outcomes in patients who underwent TDO
- Idiopathic tibial torsion in otherwise healthy patients
- Articles describing >1 technique were permitted if TDO was performed with other procedures

## **Exclusion Criteria**

- Tibial torsion due to trauma, neuromuscular disease, or other non-idiopathic cause
- No information on surgical indications
- Exclusively non-surgical interventions
- Cadaveric or animal studies, review or technique articles, or case reports

## **Search Strategy**

- With a strategy reflecting the concepts of idiopathic tibial torsion, derotational osteotomies, and surgical indications, we searched across 9 databases with March 2022 as the search end date

**Titles/Abstracts Screened**  
(n=1630)

**Full-Text Articles Screened**  
(n=53)

**Full-Text Articles Included**  
(n=20)

## **Analysis**

- Quality of evidence from each study was assessed using the modified Coleman methodology score (MCMS)
- Descriptive statistics were employed to analyze the data



## RESULTS



Studies analyzed:

**20**



Tibias analyzed:

**593**



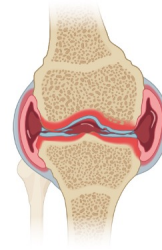
Patients analyzed:

**434**



Average age  
in years:

**21.6**



Patients with prior  
knee surgery:

**23%**



Patients who underwent  
isolated TDO:

**50%**



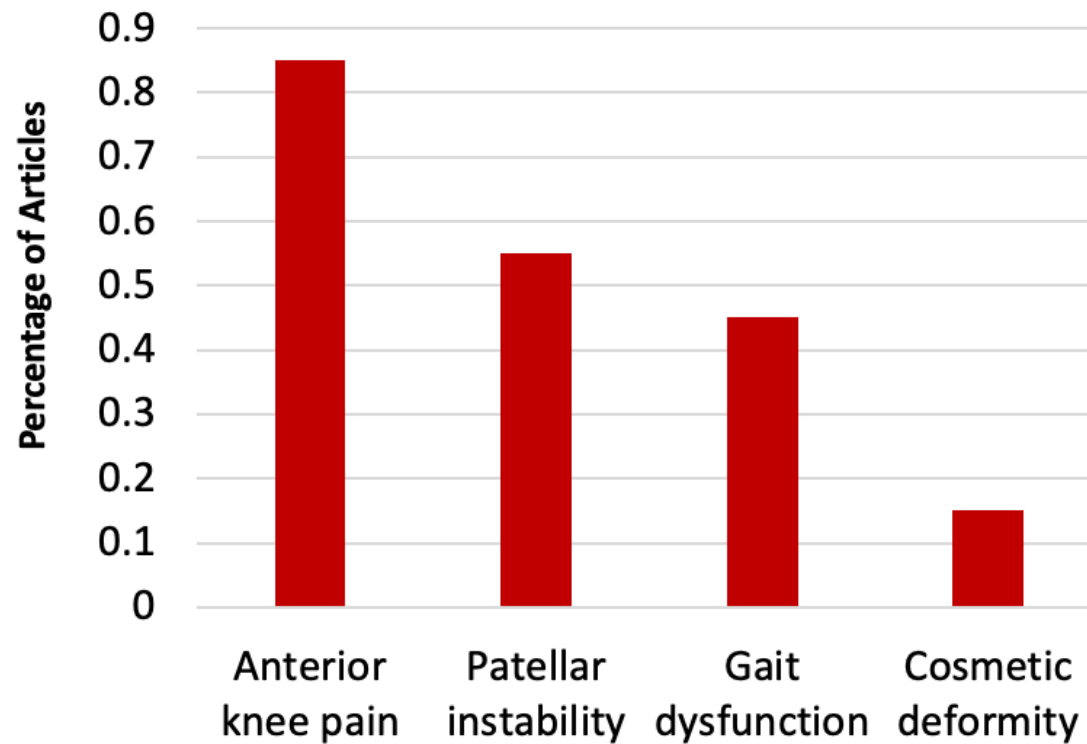
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TDO = tibial derotational osteotomy

## Anterior knee pain and patellar instability were the most common surgical indications

Most Common Indications for Surgery



| Indication(s) for surgery | Number of studies (%) |
|---------------------------|-----------------------|
| Anterior knee pain        | 3 (15%)               |
| Patellar instability      | 3 (15%)               |
| Gait dysfunction          | 0                     |
| Cosmesis                  | 0                     |
| Pain / Instability        | 5 (25%)               |
| Pain / Gait               | 2 (10%)               |
| Pain / Gait / Instability | 3 (15%)               |
| Pain / Gait / Cosmesis    | 4 (20%)               |

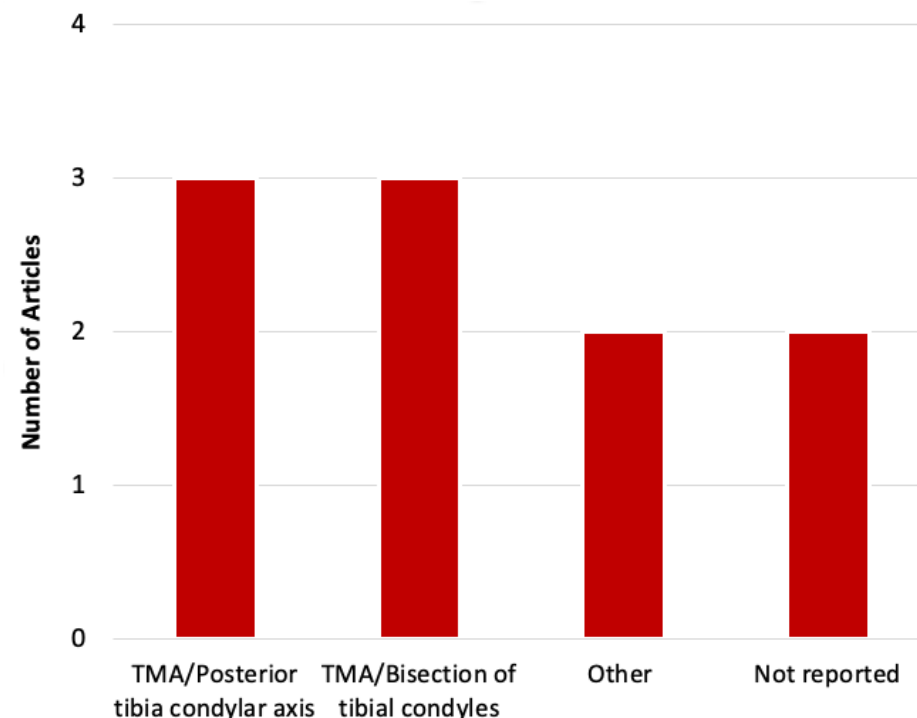


## Thigh-foot angle, transmalleolar axis, and CT scans were commonly used to assess TT

### Numerical Thresholds for Pathologic Tibial Torsion on Physical Exam

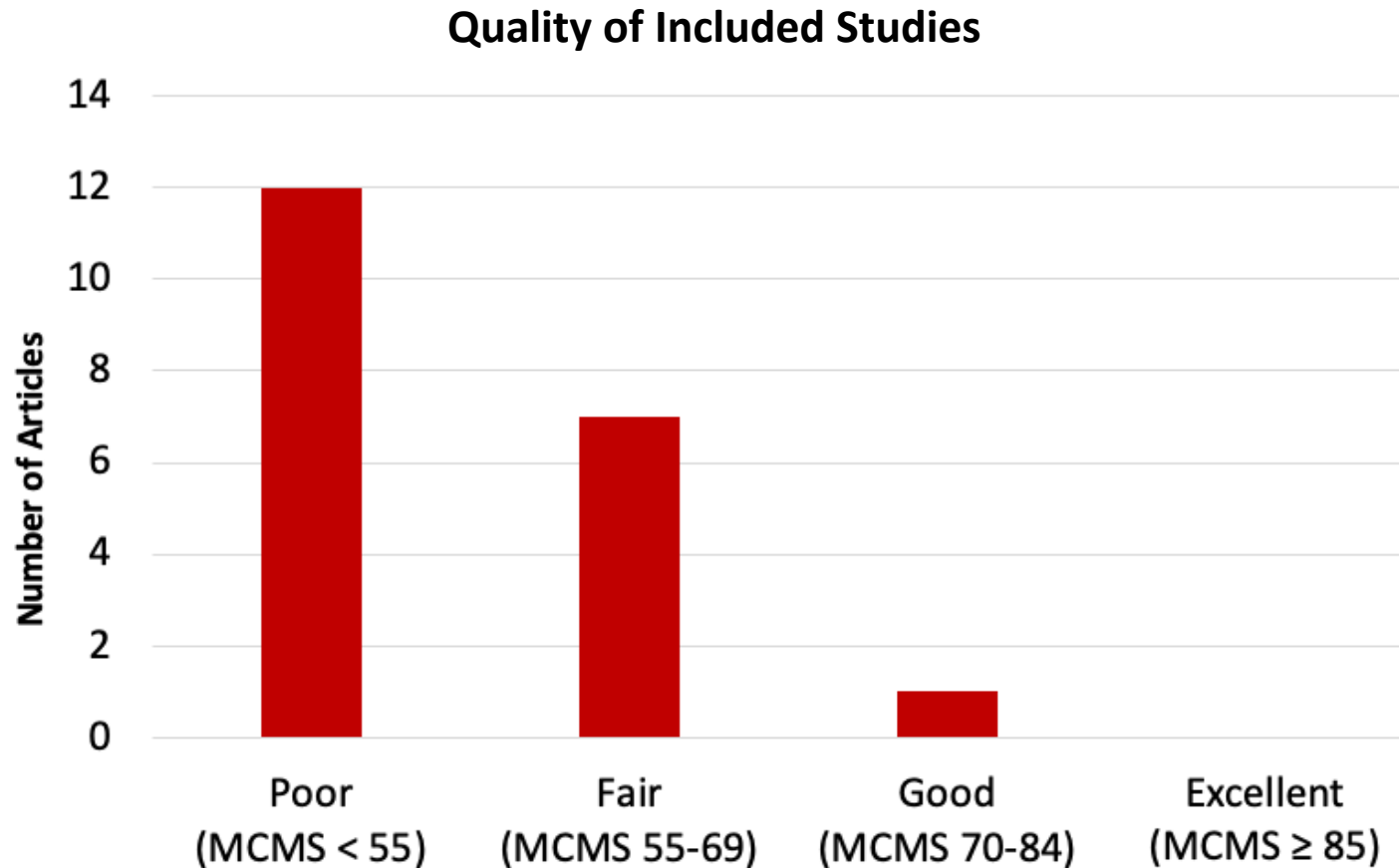
|  | Thigh foot angle (TFA)  | Transmalleolar axis (TMA)    |
|--|---|------------------------------|
| <b>Number of articles (%)</b>                  | 13 (65%)  | 6 (30%)                      |
| <b>External tibial torsion (# of articles)</b> | > 22° (1)   | > 24° with knee flexed (1)   |
|  | > 25° (1)   | > 30° with knee flexed (1)   |
|  | > 30° (6)   | > 30° with knee extended (1) |
|  | > 2 standard deviations from the mean for patient's age group (1) | > 35° with knee extended (1) |
|  | Unreported threshold (2)  | > 45° with knee extended (1) |
| <b>Internal tibial torsion (# of articles)</b> | < 0° (2)  | < 20° with knee extended (1) |
|  | < 2 standard deviations from the mean for patient's age group (1) |                              |

### CT Measurement Axes





## The majority of studies available on TDO to treat idiopathic TT were of lower quality



# CONCLUSION

## Summary

- Anterior knee pain and patellar instability are common indications for TDO to treat idiopathic tibial torsion that often present together
- Standardized thigh-foot-angle ( $<0^\circ$  or  $>30$ ) and CT measurements (transmalleolar axis and posterior tibia condylar axis or bisection of tibial condyles) may allow for more accurate diagnosis of pathologic tibial torsion

## Limitations

- The quality of studies were primarily “fair” or “poor” according to the MCMS scores
- The included studies primarily assessed tibial torsion in the United States, which may limit the generalizability of data to other populations

