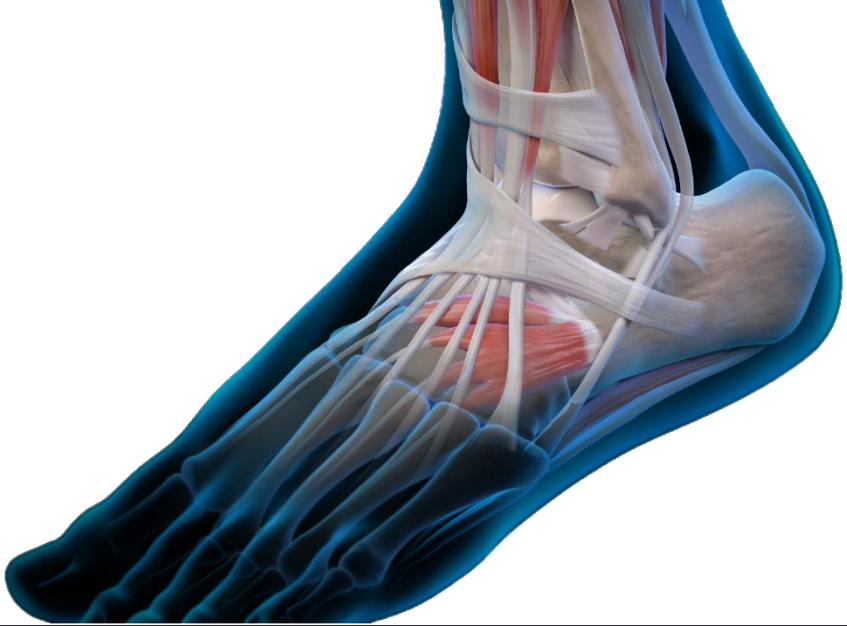

The role of the deltoid and syndesmotic ligaments on the rotational ankle (in)stability – a diagnostic and therapeutic study.

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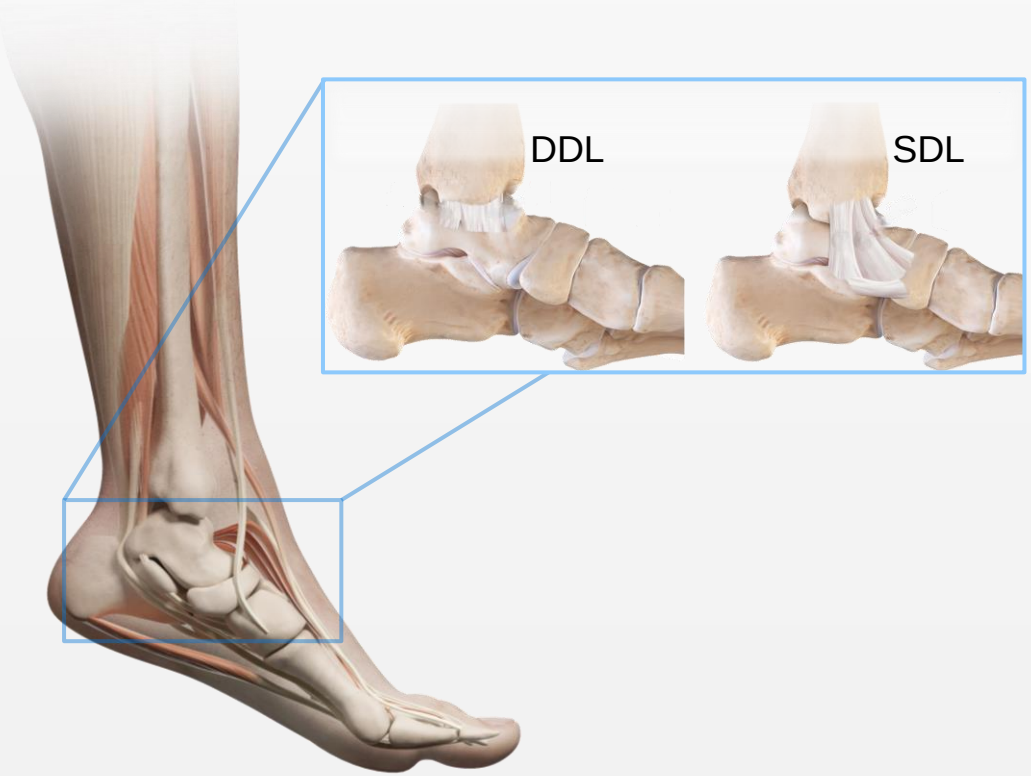
Faculty Disclosure Information

Employee at Arthrex, GmbH

Introduction



- Deltoid ligament (DL) complex, consisting of superficial and deep layers (SDL and DDL, respectively) plays a crucial role in **stabilizing the medial ankle** joint.

- SDL and DDL are involved in 58% of all ankle fractures[1]

→ **NO CONSENSUS** on treatment strategy of deltoid ligament ruptures[2]

Objectives

01

Diagnostic Study

Evaluation of external rotation ankle **instability** causes by variable combinations of deltoid dissections in a syndesmotic injury model.

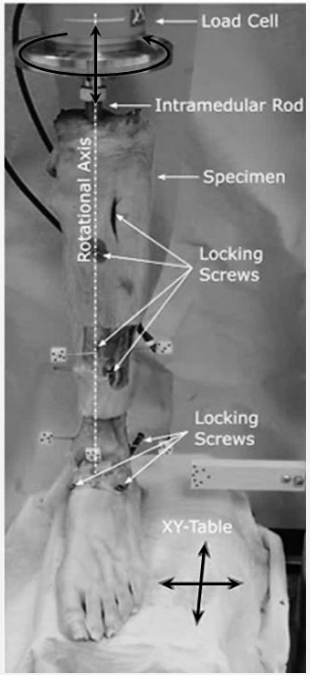
02

Therapeutic Study

Determine the ability of different surgical interventions for the syndesmotic and deltoid ligament complex to restore native external rotation **stability**.

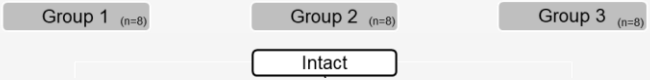
Materials & Methods

Test setup

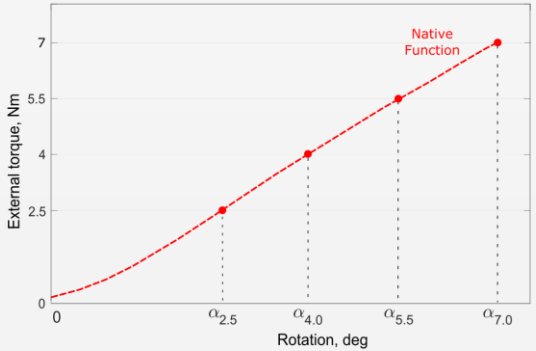


Test protocol

24 human distal tibia amputee specimens

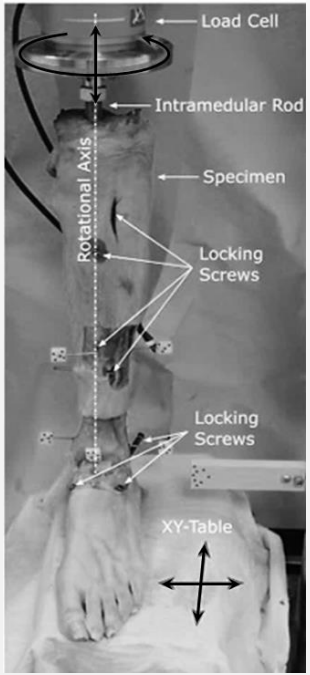


- Time-zero rotational stability test



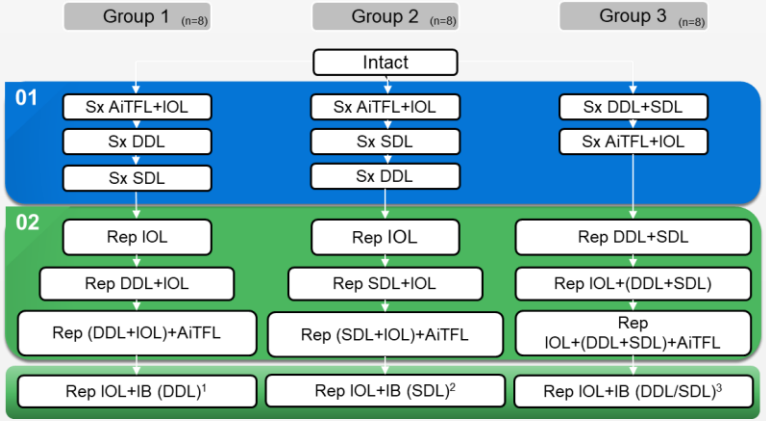
Materials & Methods

Test setup



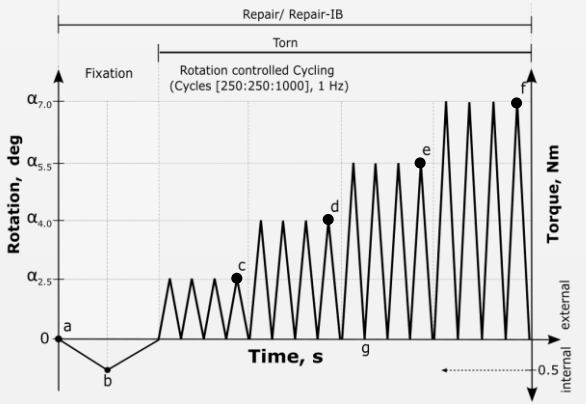
Test protocol

24 human distal tibia amputee specimens



AiTFL: anterior inferior tibiofibular ligament
IOL: interosseous ligament
IB: suture augmentation (InternalBrace®)

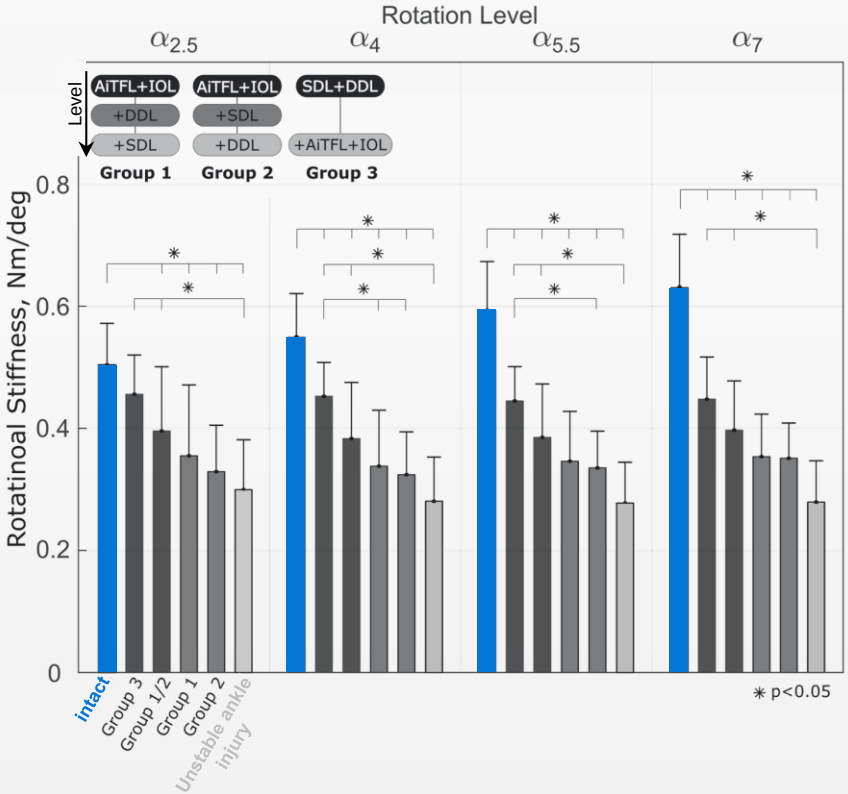
- External rotation laxity test after each dissection and repair step



01 Main Findings - Diagnostic Study

- **Each dissection step led to a decrease in rotational stiffness**: from intact ankles showing the highest values of torsional stiffness towards a completely loose state with the lowest resistance to rotational loading in the unstable ankle injury.

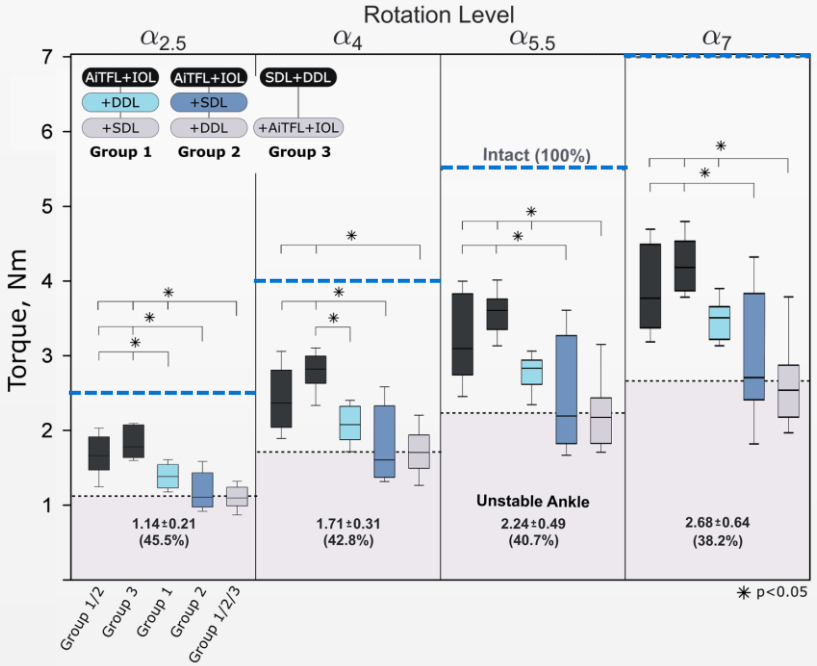
- A **two-ligament syndesmotic injury** (AiTFL+IOL, Level 1 Group 1/2) or a **complete rupture of the deltoid** (SDL+DDL, Level 1 Group 3) had the **most significant impact to rotational stability** of the ankle joint.



01 Main Findings - Diagnostic Study

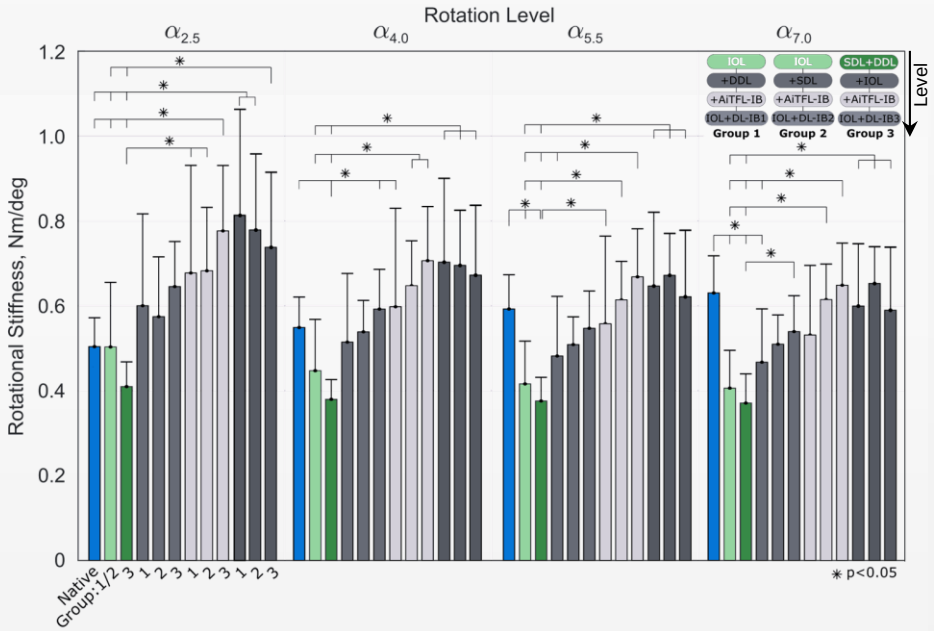
- Individual DL with combined syndesmotic dissection demonstrated a **higher contribution of SDL to ankle instability than DDL**.

- In the "**Unstable Ankle**" (Level 3, Group 1/2/3) injury model with all ligaments cut, the residual joint stability ranged from 46% to 38% for 2.5 Nm to 7 Nm, respectively.



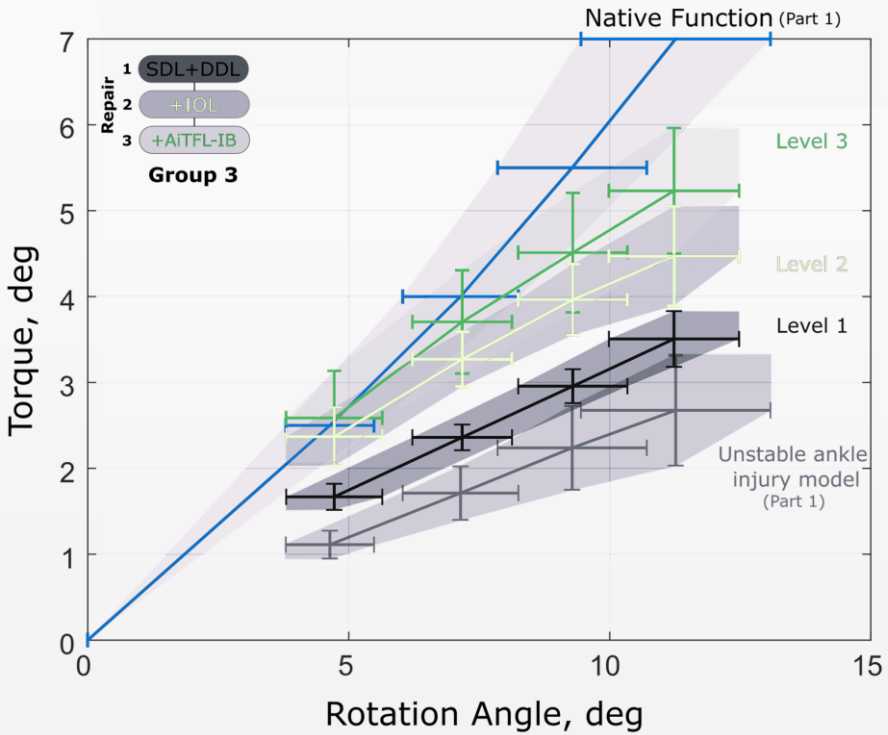
02 Therapeutic Study

- Either IOL (Level 1, Group 1/2) or complete deltoid ligament repair (**SDL+DDL**, Level 1, Group 3) **contributed most to restoring rotational ankle stability** but still showed the lowest resistance to external rotation, especially during higher rotational loading.



02 Therapeutic Study

- Only the final repair stage with **all ligaments addressed** (Level 2 Repair) or **IOL repair with** different **DL augmentation** (Level 3 Repair) provided near-native stability restoration.



Conculsion

01

Diagnostic Study

Knowledge of the individual and combined syndesmotic and deltoid ligament injury patterns to rotational ankle stability is crucial for appropriate surgical intervention in treating unstable ankle joints.

02

Therapeutic Study

Only complete ligament repair or augmenting the deltoid ligament complex in addition to syndesmotic refixation restores ankle stability and should therefore be considered in the treatment of unstable ankle joints.

References

1. Cooper MT. The Role of Deltoid Repair and Arthroscopy in Ankle Fractures. Clin Sports Med 39: 733 – 43, 2020.
2. Jiang, K, et al.. Comparison of Radiographic Stress Tests for Syndesmotic Instability of Supination – External Rotation Ankle Fractures: A Cadaveric Study. J Orthop Trauma 28(6): e123-e127, 2014.