



Lower Extremity Injuries and Prevention

Tom Spears, DO, FAAOS
Orthopaedic Sports and Shoulder Surgery
Ortho Montana

Disclosure and Use of Artificial Intelligence

- I have no relevant financial relationships with an ineligible companies to disclose
- Artificial Intelligence (AI) tools were used to support the development of this educational content. No patient or learner data were entered into or processed by AI systems. Final content decisions were made by human contributors.



ACL Injuries – Why Do We Care?

- 6-7 ACL injuries per 100k exposures
- 1/90 female soccer players per season
- 9 – 12 months out
- \$25-30k/athlete
- 7x more likely in competition



Who Gets
Injured

#1 Girls' Soccer

#2 Girls'
Basketball

#3 Boys' football

#4 Girls' Lacrosse



Neuromuscular Training

- Strength: Lower-extremity and trunk control
- Plyometrics: Jumping, landing, deceleration
- Balance/proprioception: Single-leg stability
- Agility and cutting: Technique under sport-like demands
- Feedback: Knee alignment, trunk position, soft landings



Does It Work?

- Huang 2020 – does prevention work?
- Walden 2012 – Can teams deliver it?
- Petushek 2019 – What works best?

Meta-analysis: prevention works

HUANG ET AL. • AJSM 2020

53%

Lower ACL injury rate across 8 randomized /
cluster-randomized trials

Incidence rate ratio 0.47

95% CI 0.30–0.73

$P < .001$

Interpretation: strong pooled evidence for meaningful risk reduction, with heterogeneity in program content and delivery.

Randomized field trial

WALDÉN ET AL. • BMJ 2012

4,564

Female soccer players, ages 12–17

15 min

Warm-up twice weekly

64%

Lower ACL injury rate

7 ACL injuries in intervention vs 14 in controls; rate ratio 0.36 (95% CI 0.15–0.85).

Why the Waldén trial is useful

IMPLEMENTATION IS FEASIBLE

- 230 Swedish soccer clubs randomized by club over one season.
- Warm-up emphasized core stability, balance, and knee alignment.
- A brief team-based intervention can fit into routine practice.
- Caution: relatively few ACL events; findings were in adolescent female soccer players.

Best-practice synthesis

PETUSHEK ET AL. • AJSM 2019

- Systematic review/meta-analysis focused on young female athletes.
- Examined which neuromuscular program characteristics relate to ACL risk reduction.
- Supports purposeful programming rather than generic warm-ups.
- Use as a framework; optimal single exercise prescription is not definitively established.

A practical 15–20 minute warm-up

ILLUSTRATIVE CLINICAL TEMPLATE

- 3 min — dynamic running, skips, lateral movement
- 4 min — strength: squats, lunges, single-leg control
- 4 min — plyometrics: hop-and-stick, jump landing
- 4 min — cutting / deceleration with technique feedback
- 2–5 min — progressive sport-specific movement

Adapt load, complexity, and exercise selection to athlete age, ability, and sport.





Lower Extremity Survival Guide

To Ship Or Not To Ship



General Rules:

If you-

- See bone
- Can't feel pulse
- Can't make bleeding stop
- Have a crooked joint

Ship it.



Thigh

- Tomorrow
 - Hamstring injury
 - Quadriceps muscular injury
- Ship it
 - Femur fracture



Knee

- Tomorrow

- Patella dislocation?
- ACL
- MCL
- Meniscus



- Ship it

- Patella dislocation?
- No pulse
- Multi-lig/dislocation





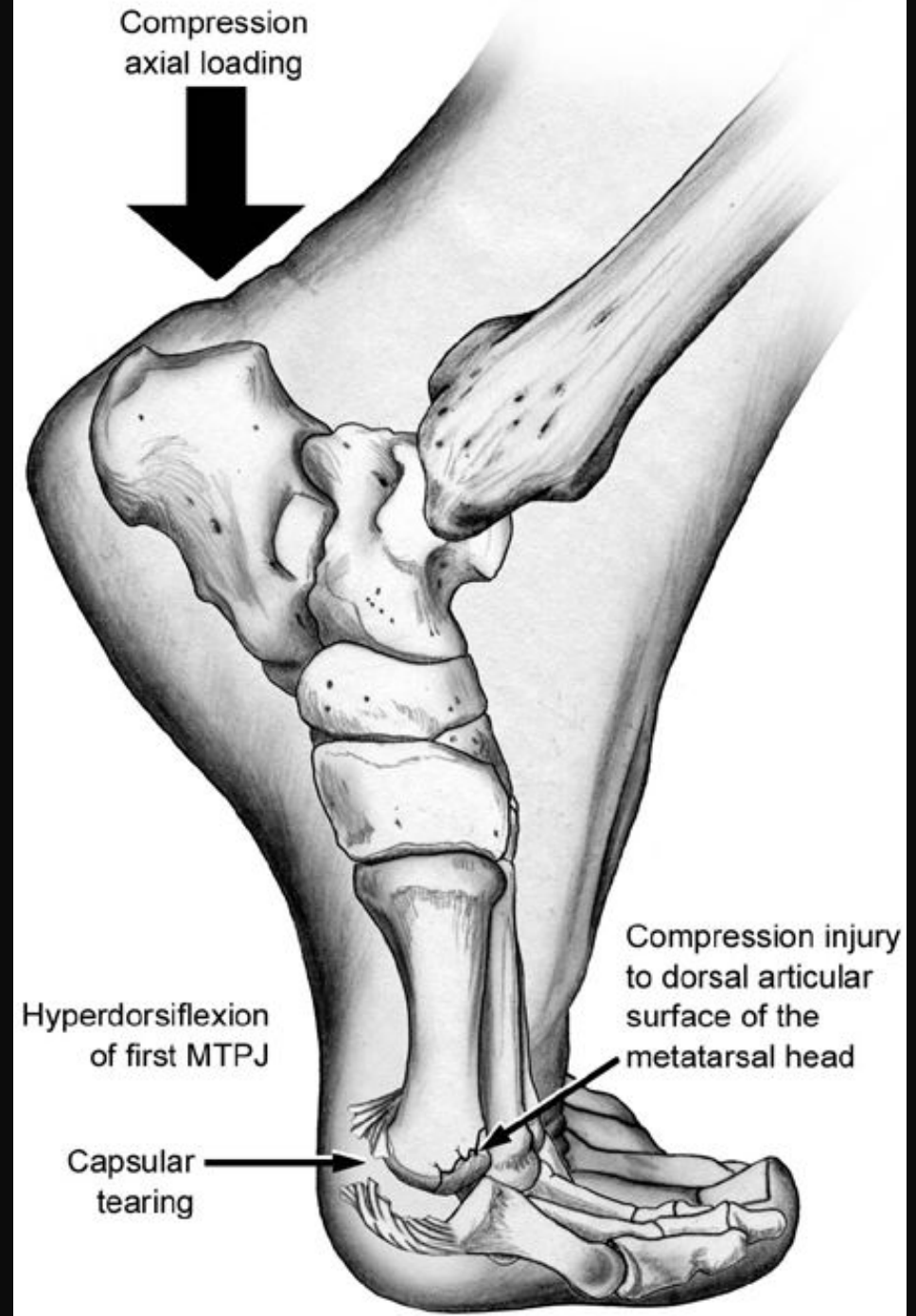
Ankle

- Tomorrow
 - Swollen
 - Ship It
 - Deformity
-



Turf Toe

- Axial load
 - Pain at the base of the big toe
 - Abnormal push off
-





Questions?

- **Tom Spears, DO, FAAOS**
- (406)426-6557
- *Nos Pugna Pro Vita*