

WHEN IT'S NOT ABOUT THE FIT

a.k.a medical conditions often seen during the bike fit session



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thank you

Medicine *of* Cycling™

UCSF

University of California
San Francisco



disclosures

NONE



BRIAN ADAMS

(bio)

- Doctor of Physical Therapy – University of Michigan
- Exercises Physiologist – Michigan State University
- University of Michigan Sports Medicine Program
- 34yrs endurance athlete - multiple disciplines
- 25yrs racing international + domestic
- Bike shop mechanic
- USAC Cycling Coach
- Instructor / BikeFit Pro
- Adjunct Faculty – University of Michigan
- Private Practice Owner: Adams Sports Medicine



Agenda

- Upper Extremity
- Spine/Pelvis
- Lower Extremity
 - Diagnoses
 - Pathology/Presentation
 - Screening/Testing
- Other
 - General considerations (as time allows)



Agenda

- No Lab component
- No Treatment Planning
- Not comprehensive
- Adjunct to other lectures
- Food for Thought



Learning Objectives

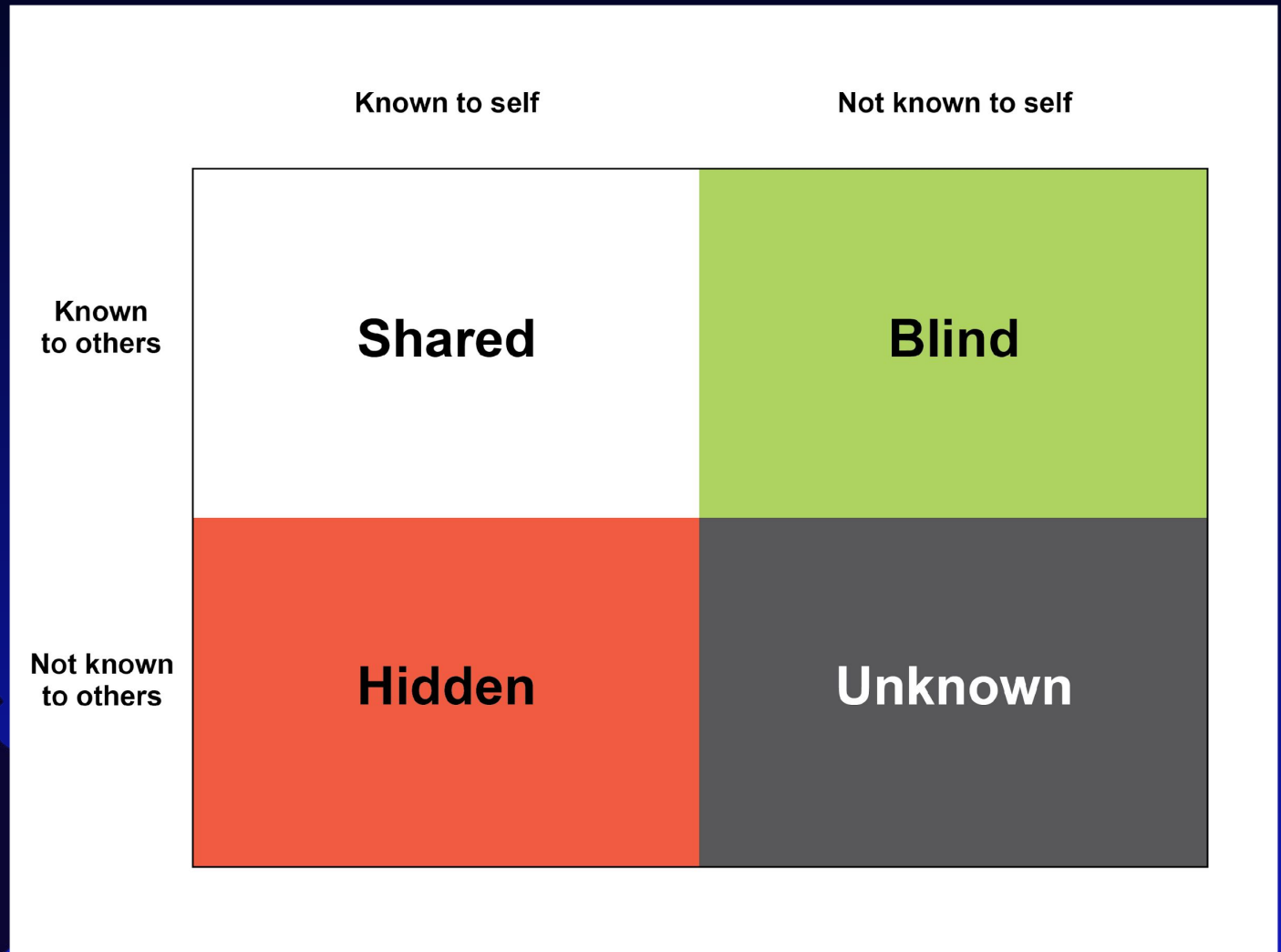
1. Understand the role of the professional fitter regarding medical screening in the clinic and fitting studio.
2. Identify common diagnoses seen in the recreational and competitive cyclist as it pertains to bike fitting.
3. Identify and discuss key research supporting current trends in the bike fitting process.
4. Illustrate a better understanding of the common diagnoses/maladies affecting the cyclist during the bike fit process, and the resources available to the bike fit professional.




Four Stages of Knowledge



johari window



A cyclist is shown from the waist down, wearing a black cycling jersey and shorts, riding a stationary bike. A red laser line is projected vertically down the cyclist's right leg, likely for alignment or posture analysis. The bike is white and black, and the cyclist is wearing white cycling shoes with red accents. The background is a plain, light-colored wall.

“Clinicians need a basic understanding of bicycle fitting and how anatomic factors and training errors contribute to repetitive stress injuries.”

-Asplund *Phys Sportsmed.* 2004



USA CYCLING

NO
PARKING
EXCEPT
FOR
VEHICLES
IN SERVICE



Breaking News

LIVE Chuck Norris takes up cycling

TVN
EXCLUSIVE

screening basics

- night pain
- non-retractable pain
- neuro symptoms
- shortness of breath
- deep calf or UE pain
- cardiovascular signs



differential diagnosis

bike fit causing...?

or just fanning the flames?

optimal vs. adaptive/accommodated fit

KEEP or REFER (or BOTH)

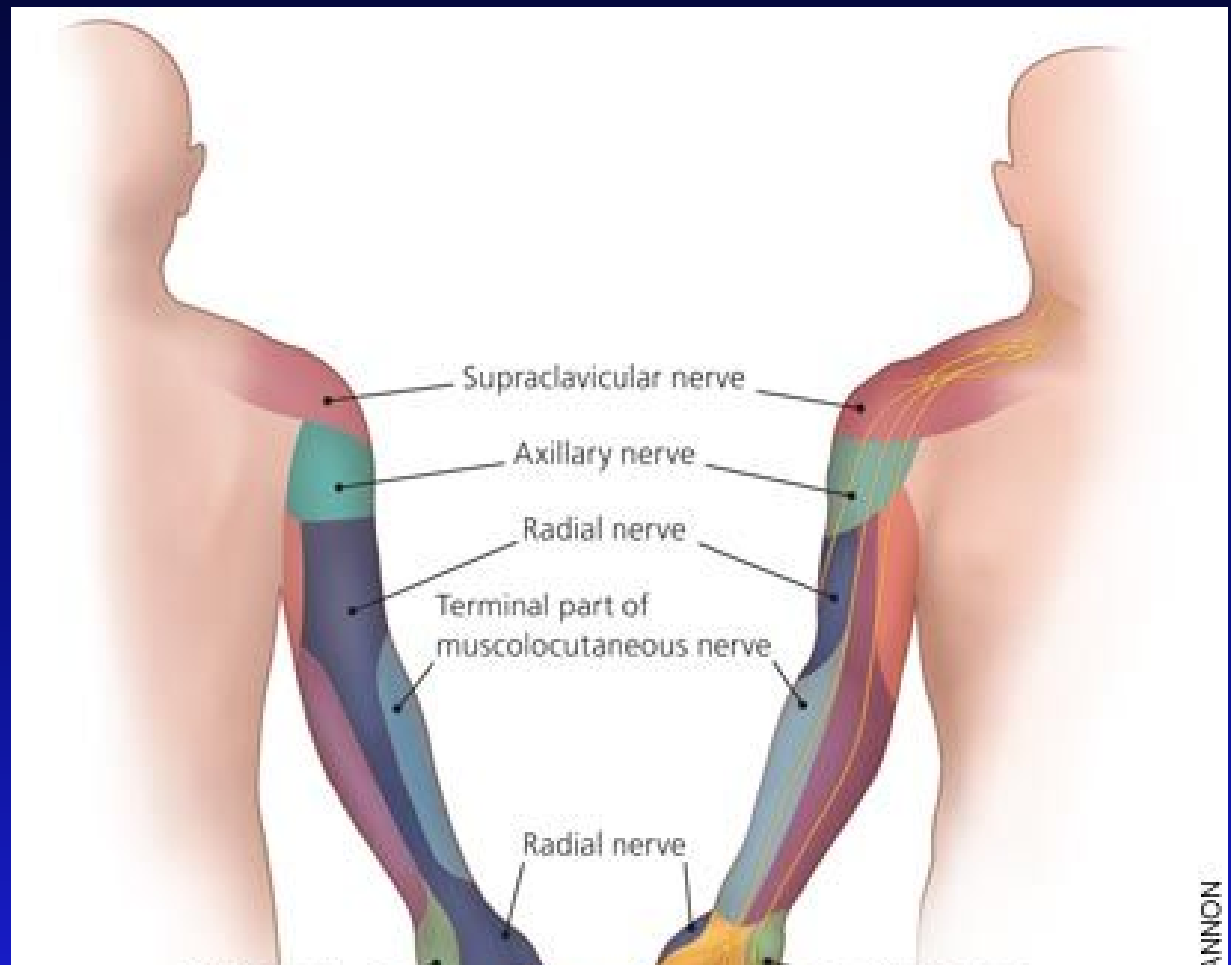


top to bottom



upper extremity

common issues?



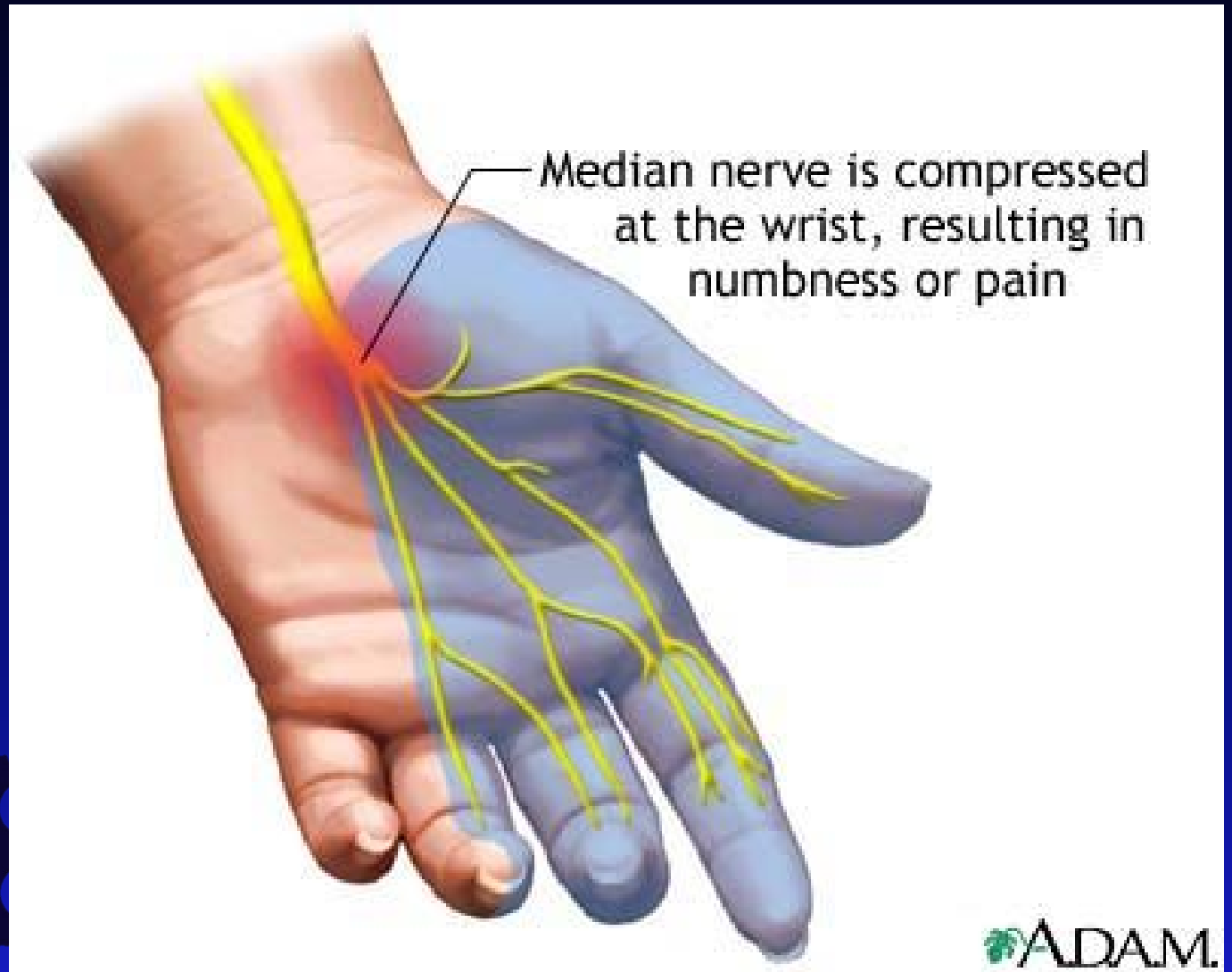
shoulder/elbow/wrist/hand

common complaints:

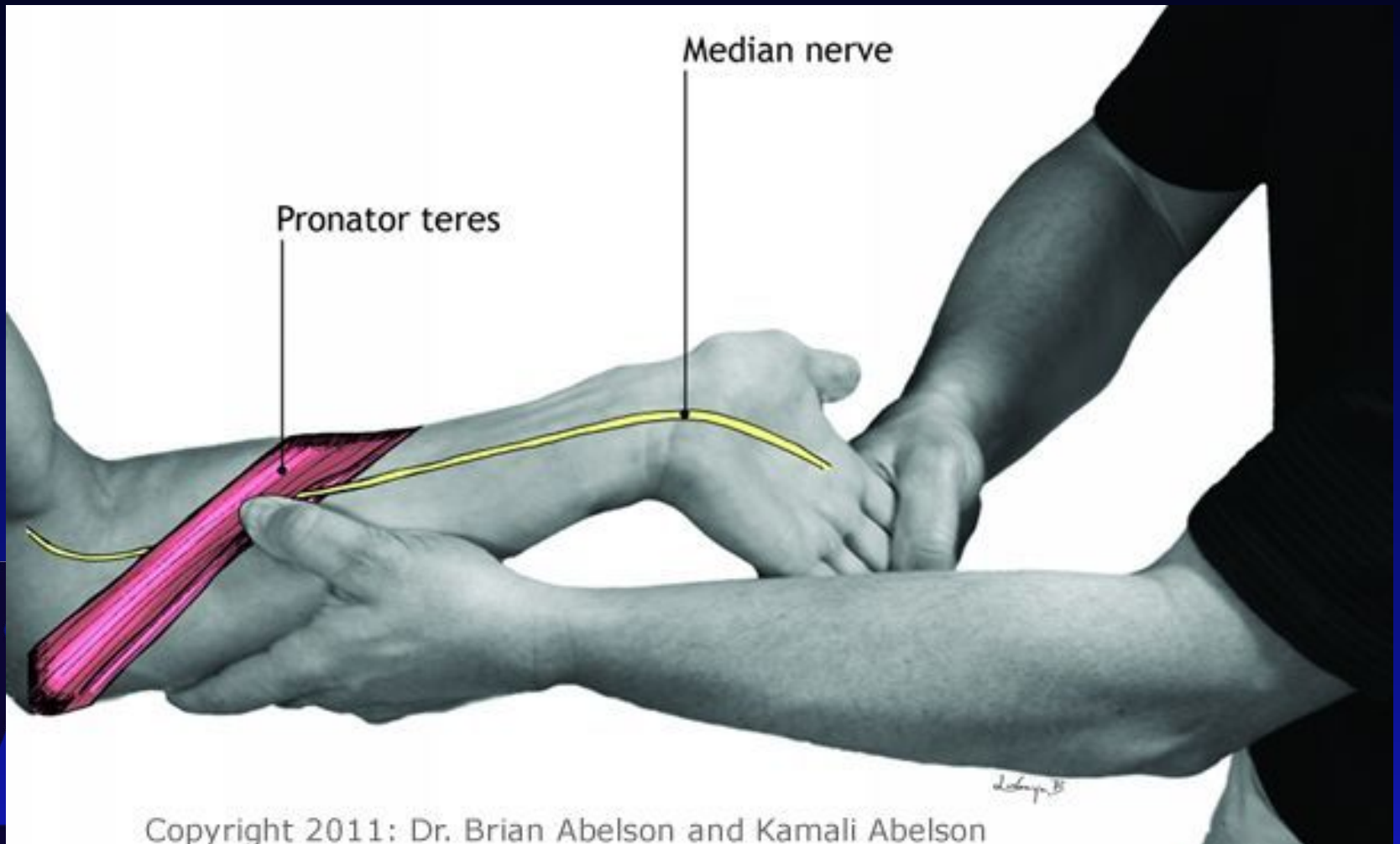
- neck pain
- hand pain/numbness
- ache in forearms
- wrist pain



carpal tunnel syndrome



pronator teres syndrome



ulnar nerve tension



hand/wrist

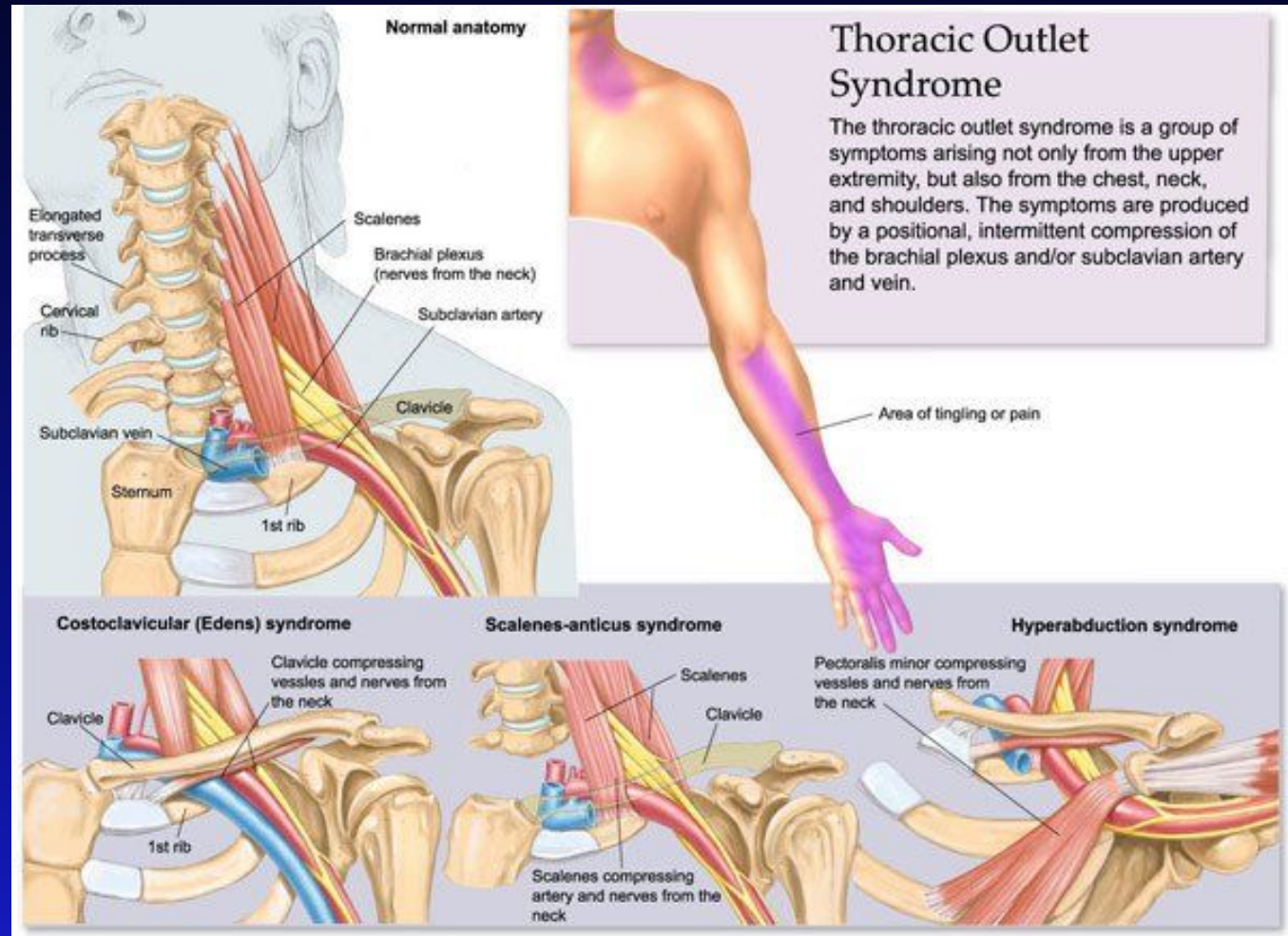
- Bair M, Gross M. Differential Diagnosis and Intervention of Proximal Median Nerve Entrapment: A Resident's Case Problem



thoracic outlet syndrome

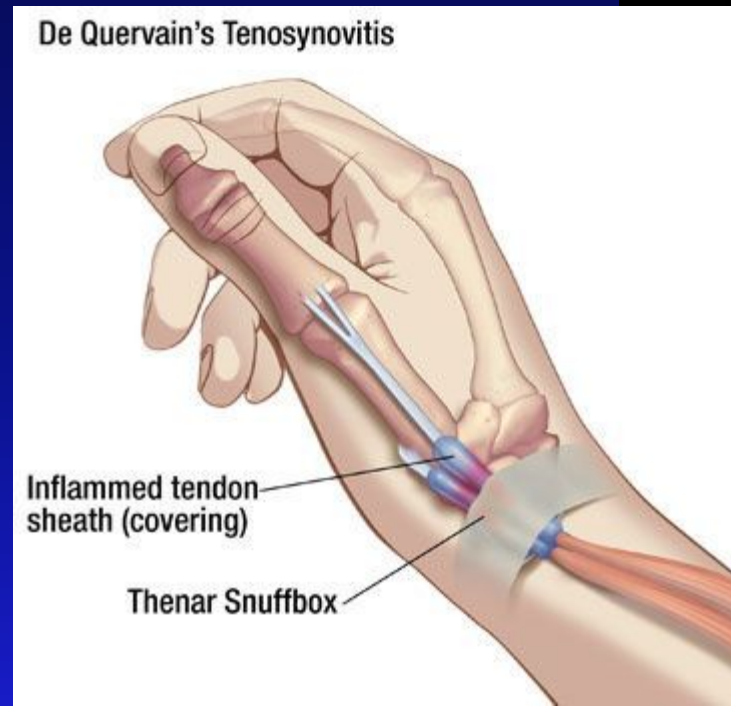
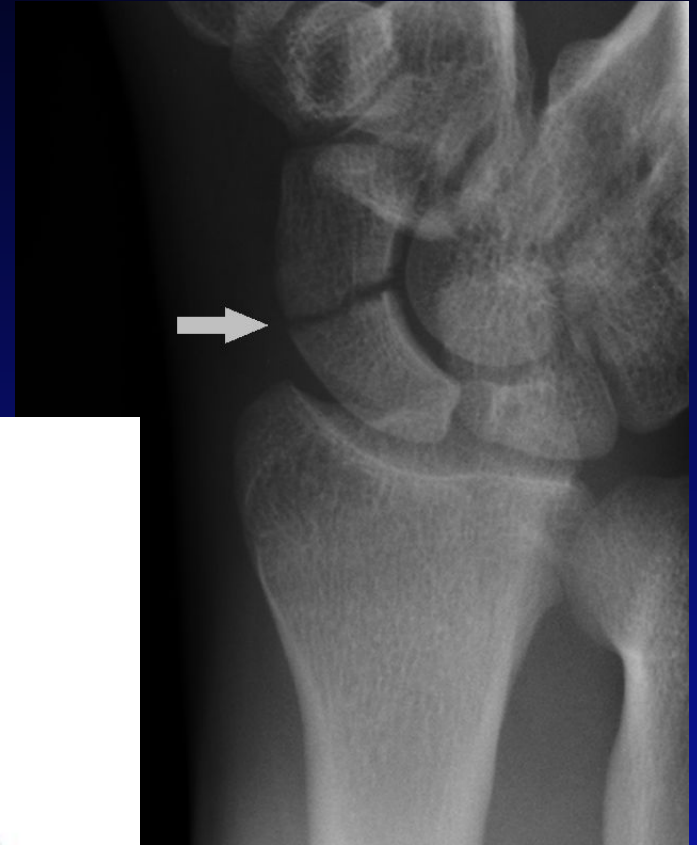
Tests:

- Roos
- Adson
- Allen



wrist/thumb

- dif. dx:
 - scaphoid
 - tenosynovitis





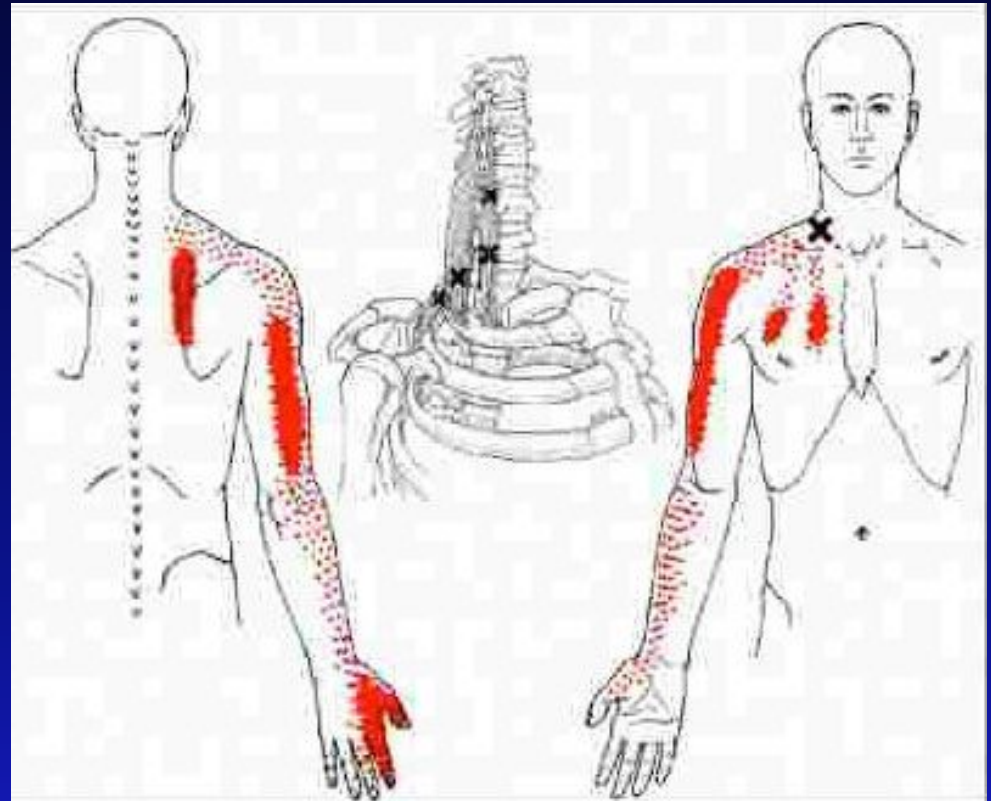
cervical spine

- hyper-lordosis
- facet compression
- muscle fatigue/spasms
- trigger points
- posture off-bike



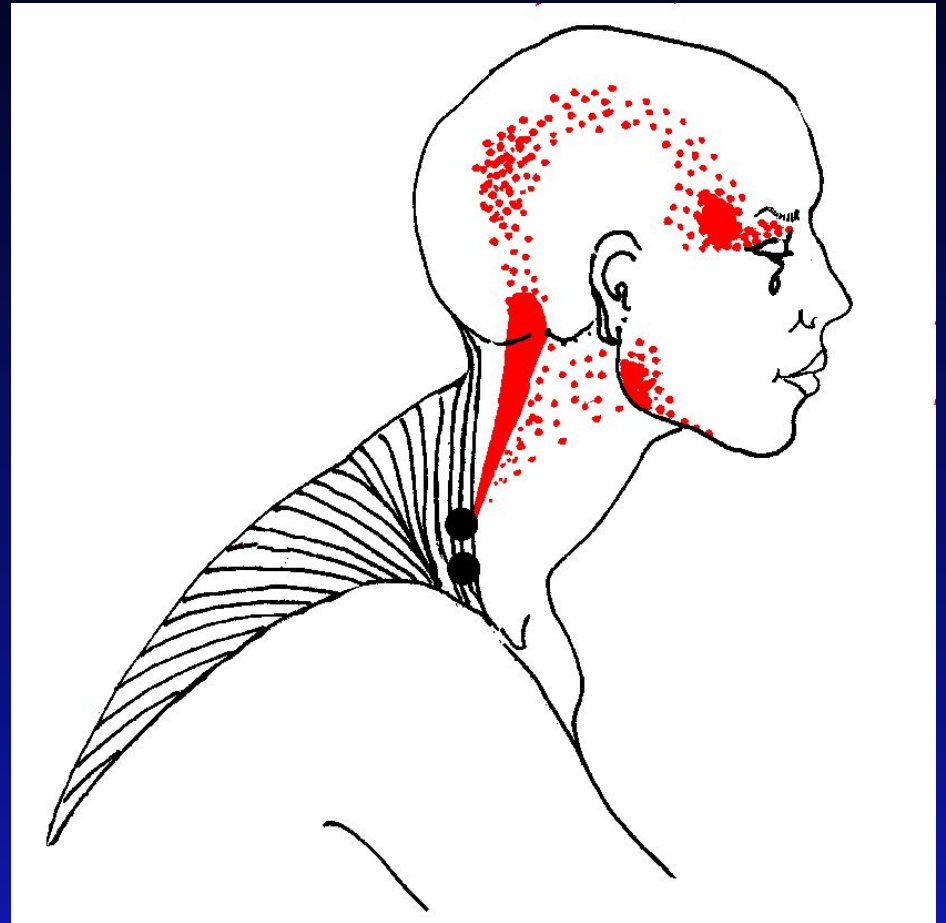
trigger points

referral patterns



trigger points

referral patterns



thoracic spine

hypomobility contributes to c-spine

- loss of kyphosis
- hyper kyphosis




lumbar spine

dif. dx

- discogenic
- facet syndrome
- trigger point

correlate with other signs/symptoms
combined with clinical testing



lumbar spine

- Urban L, MacNeil B. Diagnostic Accuracy of the Slump Test for Identifying Neuropathic Pain in the Lower Limb



lower extremity

- low back pain
- hip pain
- ITB/knee pain
- Achilles tendinopathy
- foot pain/numbness
- leg length



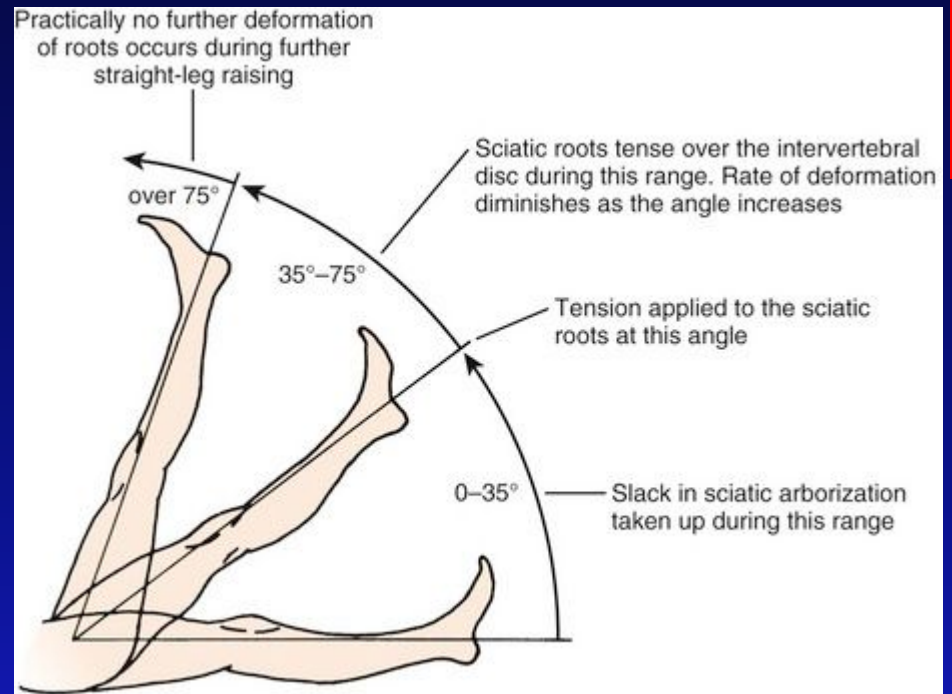
low back pain

facet
discogenic
muscle spasms



lumbar tests

root cause for distal signs/symptoms

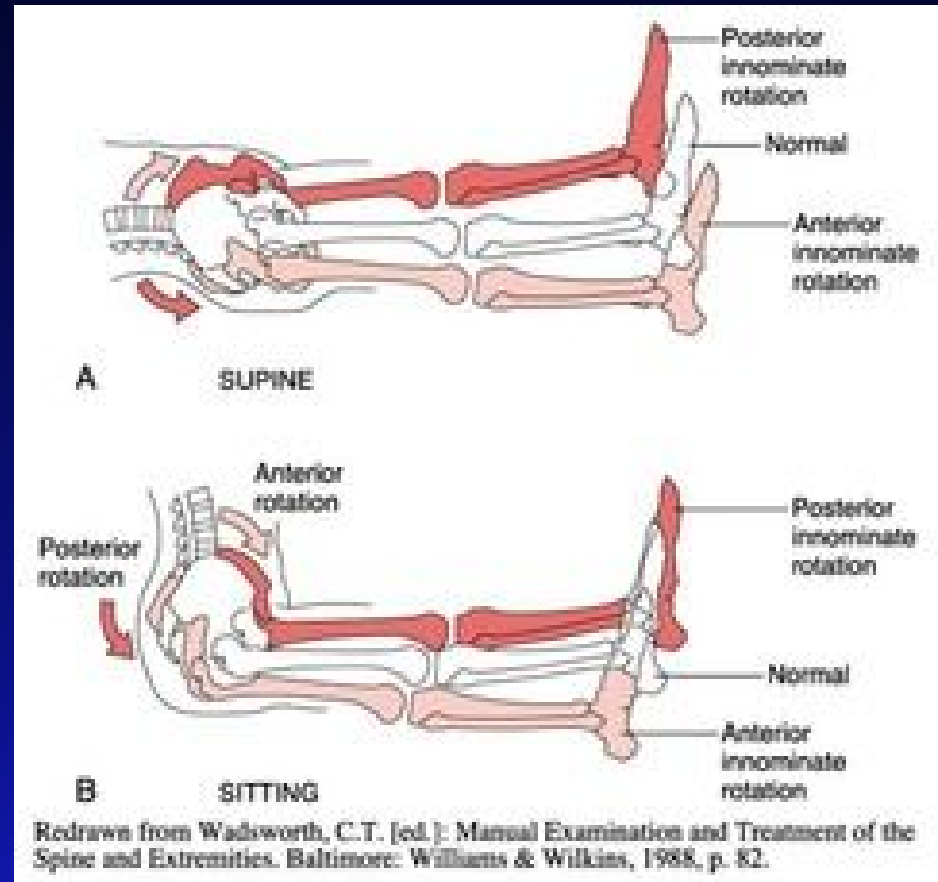


leg length difference

supine-to-sit

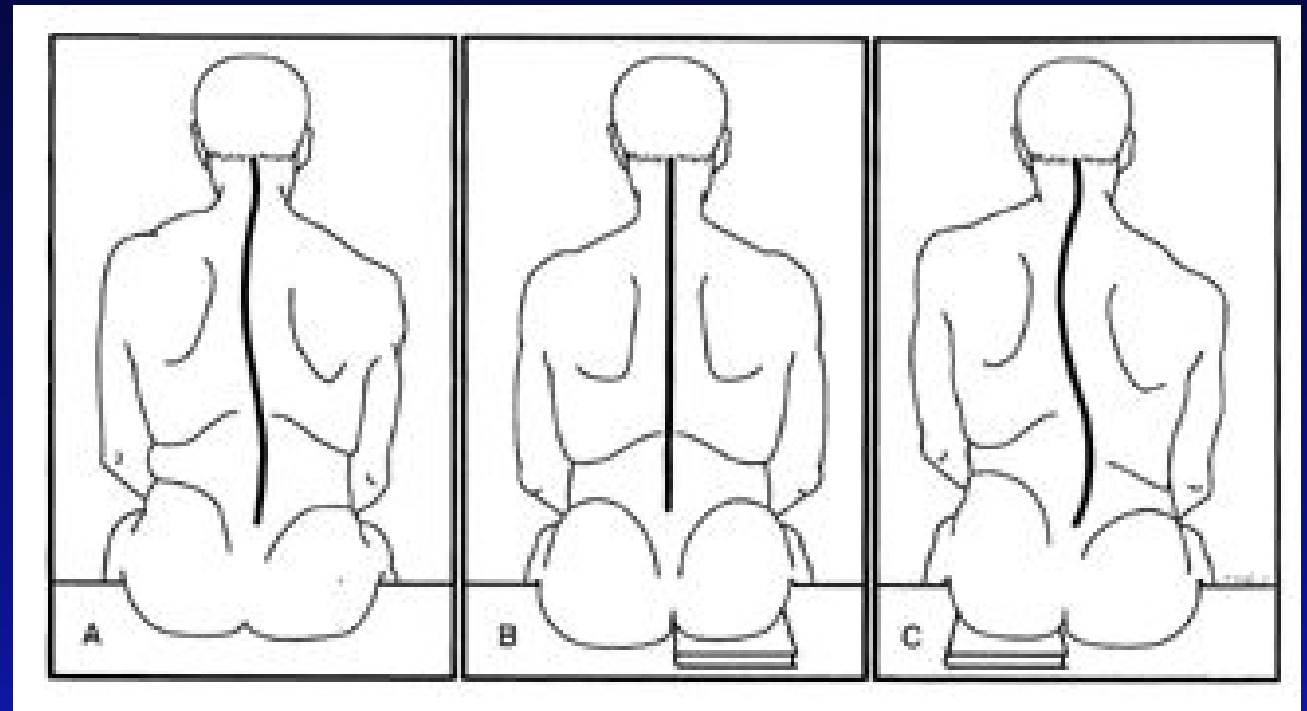
fix vs. compensate

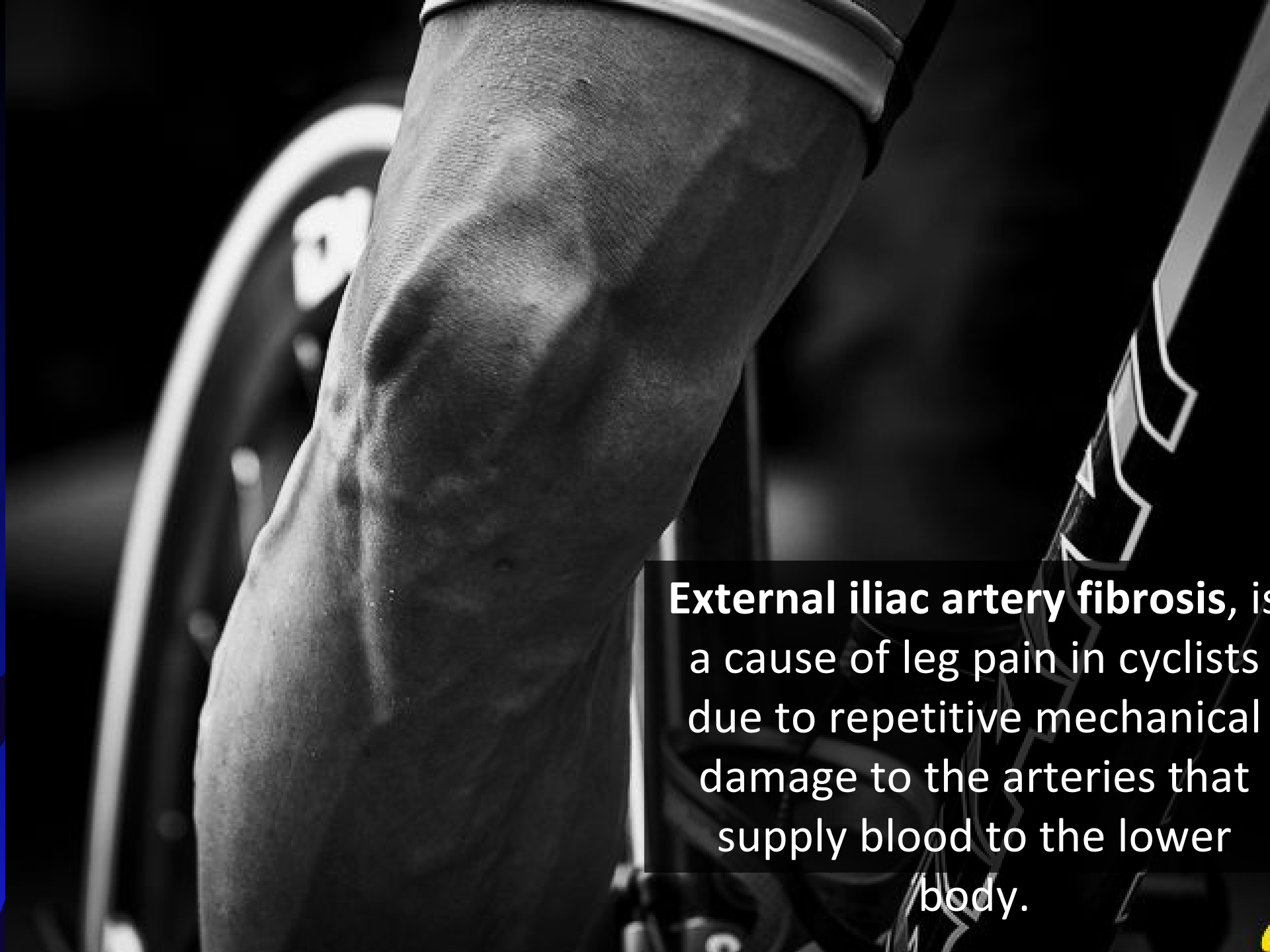
“ALPS”



small hemipelvis

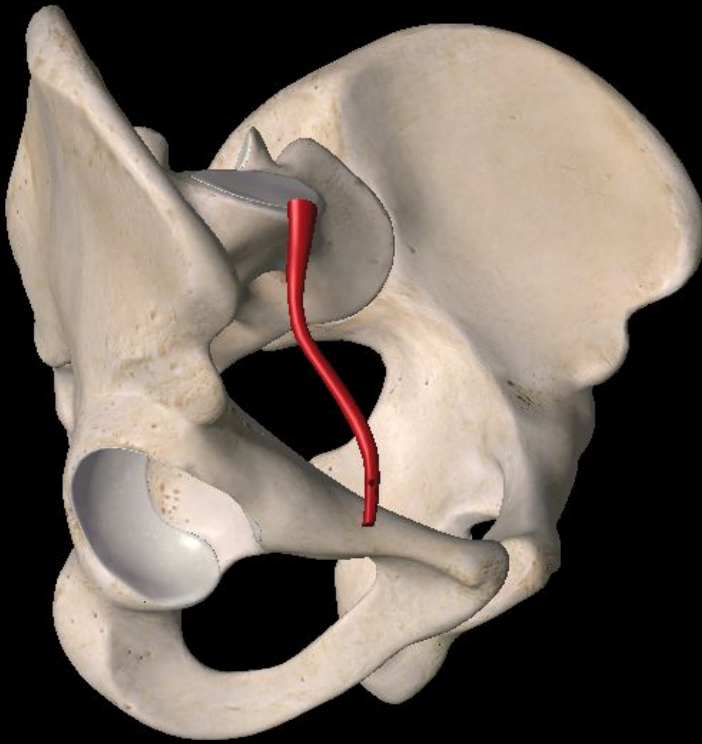
congenital malformation



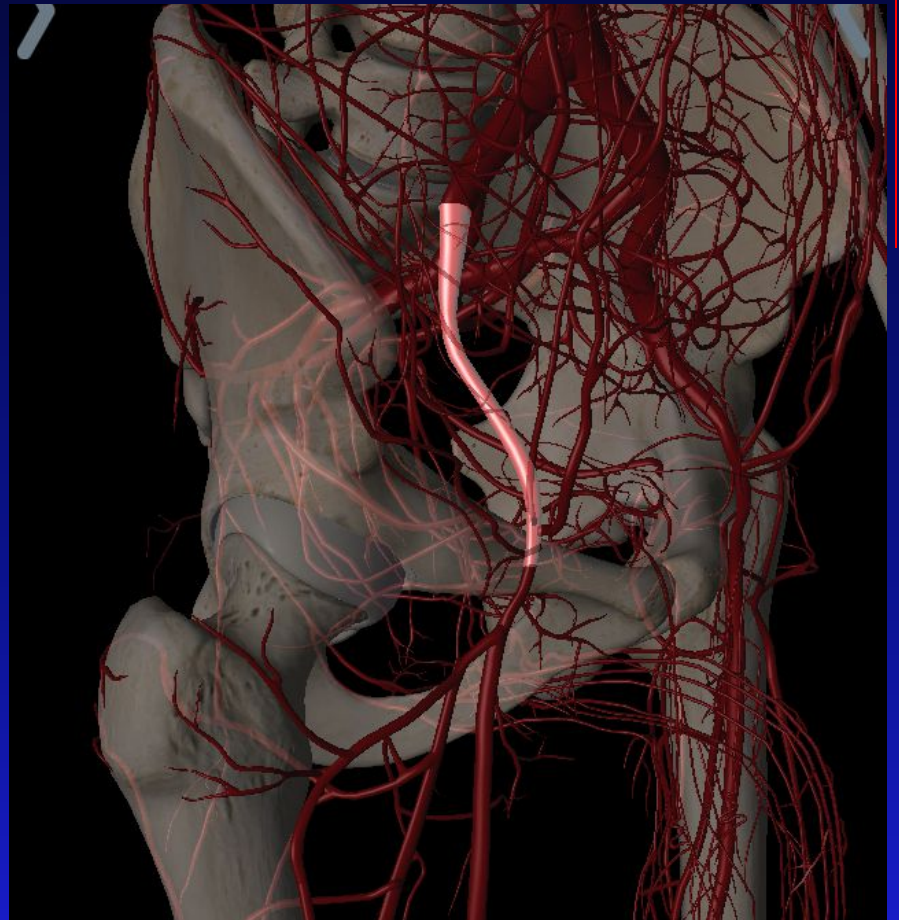


External iliac artery fibrosis, is a cause of leg pain in cyclists due to repetitive mechanical damage to the arteries that supply blood to the lower body.

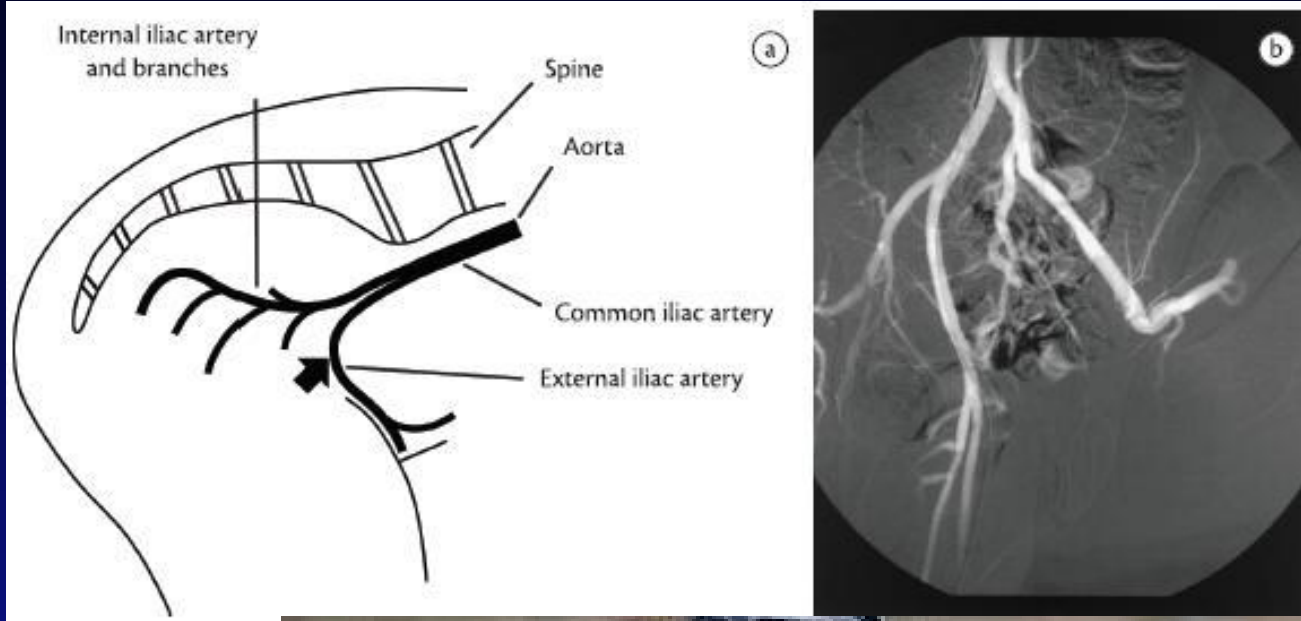
external iliac artery fibrosis



mechanical, not
chemical



external iliac artery fibrosis



external iliac artery fibrosis

- correlate clinical presentation and symptoms
- intermittent claudication
- refer out for possible ultrasound angio studies

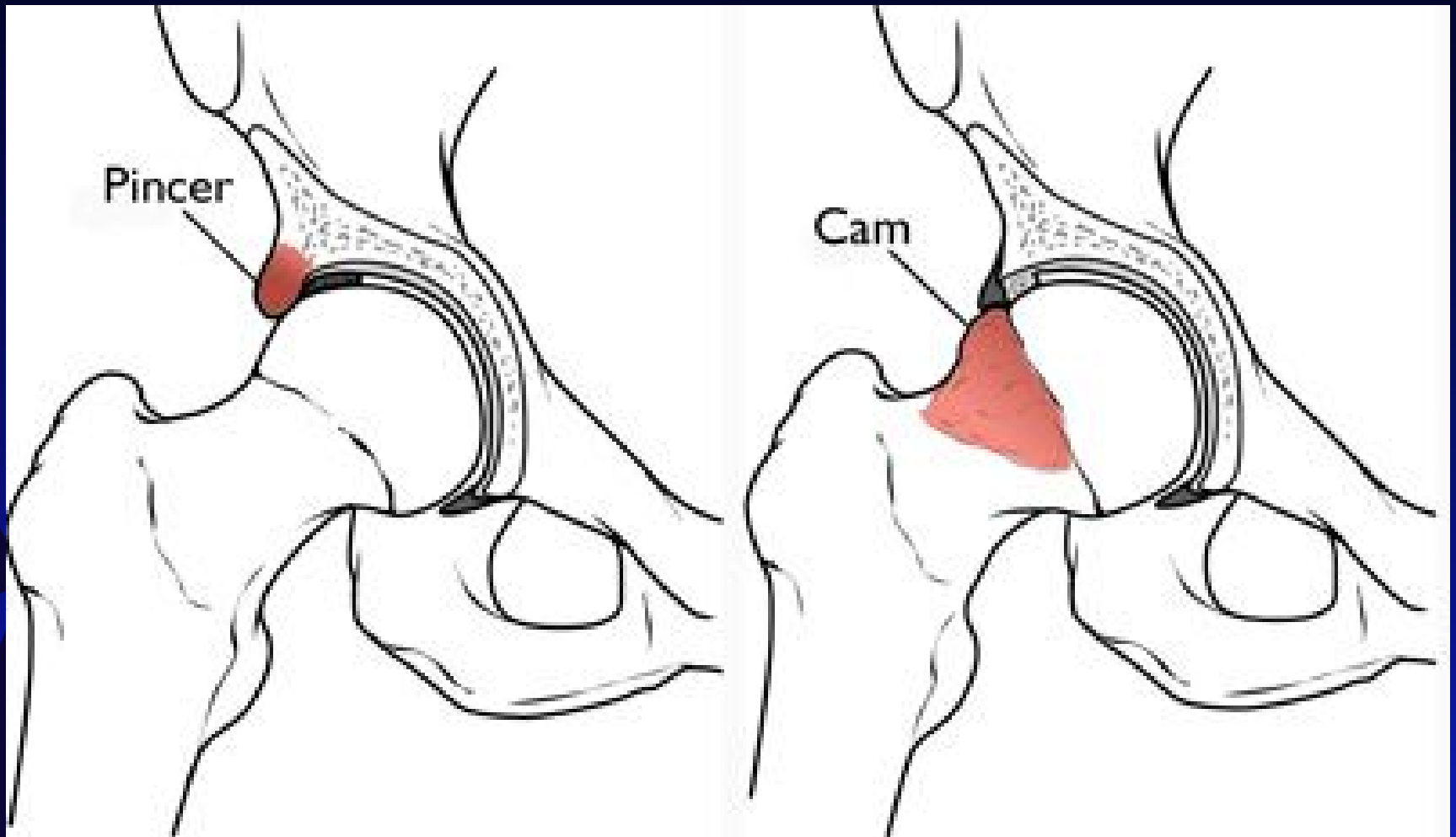


lower extremity vascular

- Abraham P1, Chevalier JM, Leftheriotis G, Saumet JL, Brunelle R, Baradaran N, Keeler S. Iliac artery endofibrosis: Case study of an elite triathlete. *Can Fam Physician*. 2016 Apr;62(4):318-20.
- Taylor AJ, George KP. Ankle to brachial pressure index in normal subjects and trained cyclists with exercise-induced leg pain. *Med Sci Sports Exerc*. 2001 Nov;33(11):1862-7.
- Taylor AJ1, George KP. Lower extremity arterial disease in sports. *Am J Sports Med*. 1997 Jul-Aug;25(4):581-4.



femoral acetabular impingement



femoral acetabular impingement

can contribute to:

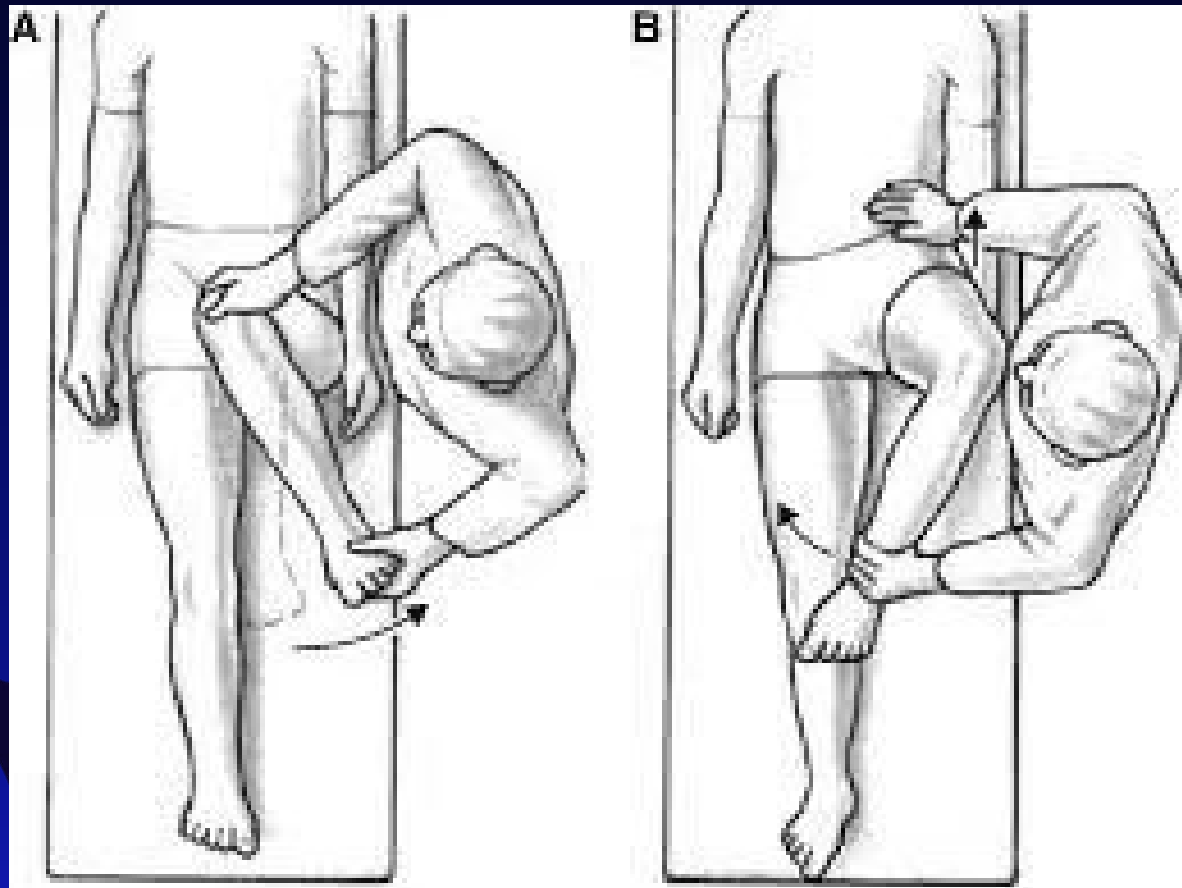
- knee flare
- hip rocking
- anterior hip pain

dif dx:

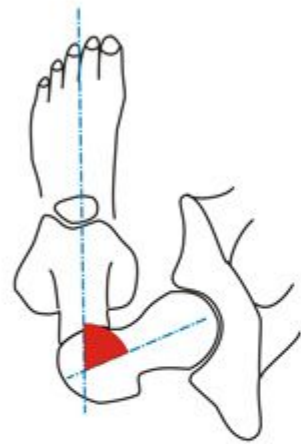
- capsular restriction
- ante/retroversion of femur



femoral acetabular impingement

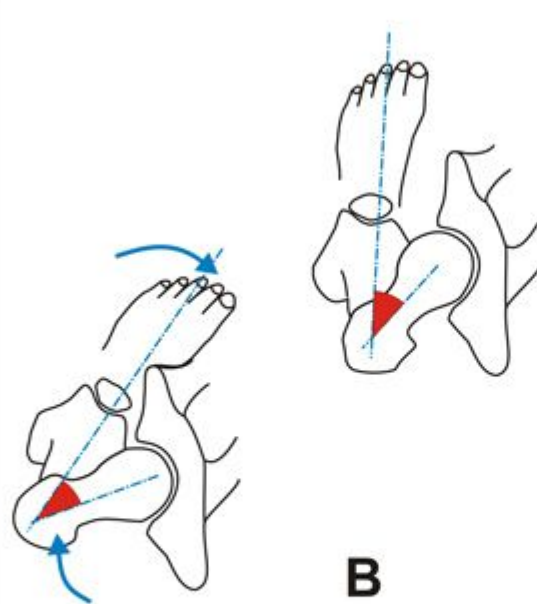


ante/retroversion



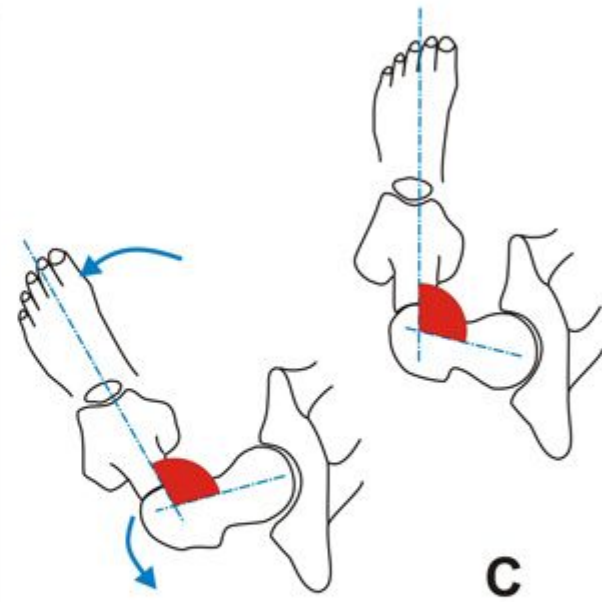
A

NORMAL HIP



B

FEMORAL ANTEVERSION



C

FEMORAL RETROVERSION

foot/ankle

- Hallux valgus/limitus/rigidus
- sesamoiditis
- tarsal tunnel syndrome
- achilles tendinitis
- forefoot varus vs. rearfoot varus vs. supinatus



callus formation

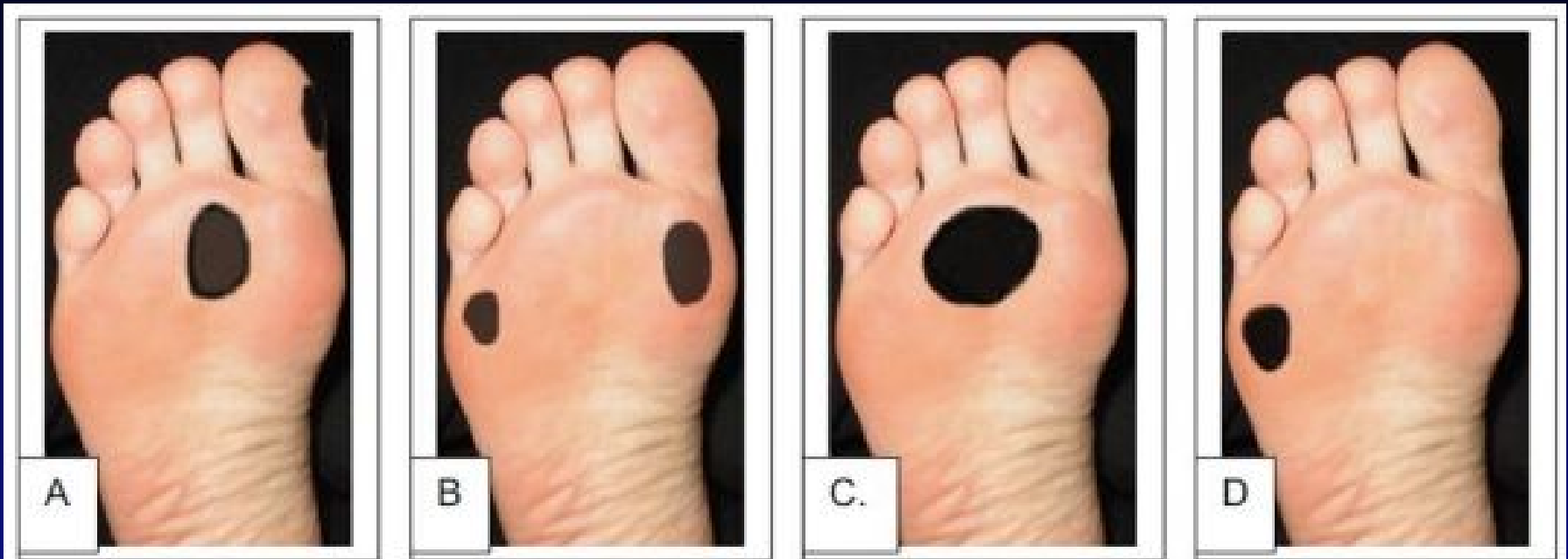
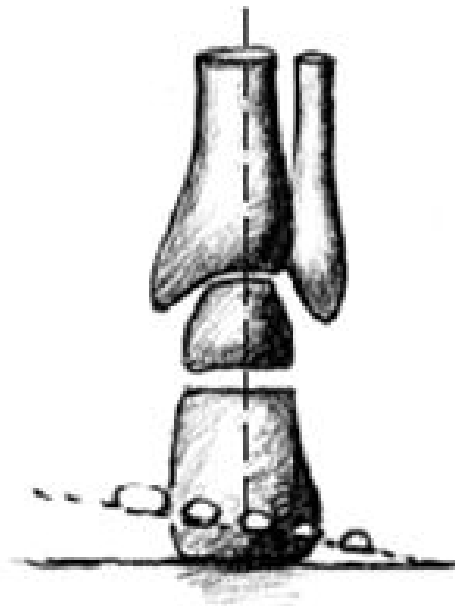


Fig. 5-8 Plantar callous patterns. A.) compensated forefoot varus B.) rigid plantarflexed first ray, C.) compensated equinus deformity D.) uncompensated rearfoot/forefoot varus / compensated FF valgus

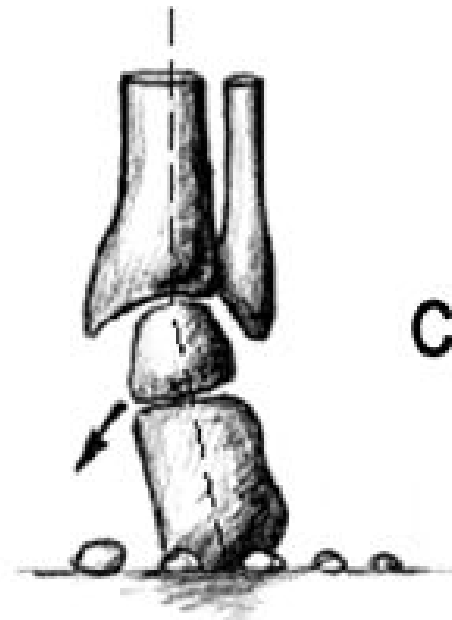
forefoot varus

Posterior View of Right Foot
Forefoot varus

Uncompensated



Compensated

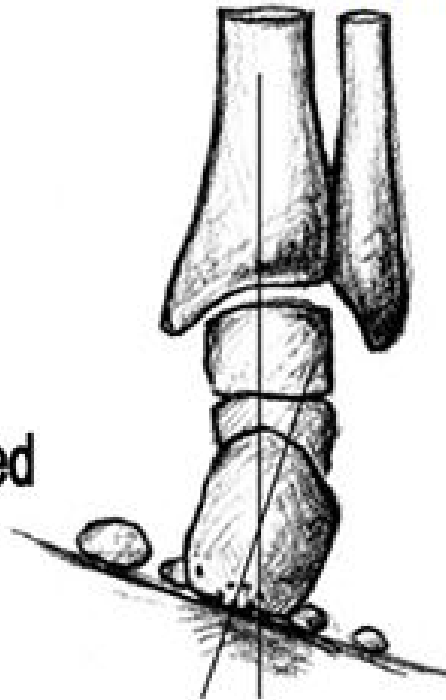


forefoot varus

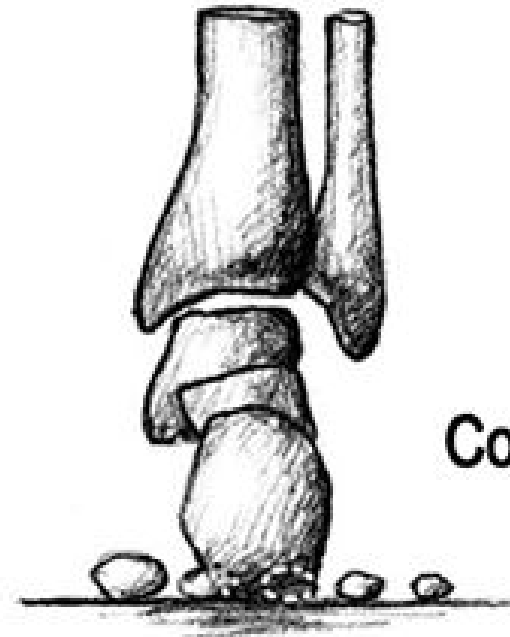
rearfoot varus

Posterior View of Right Foot

Uncompensated



Compensated

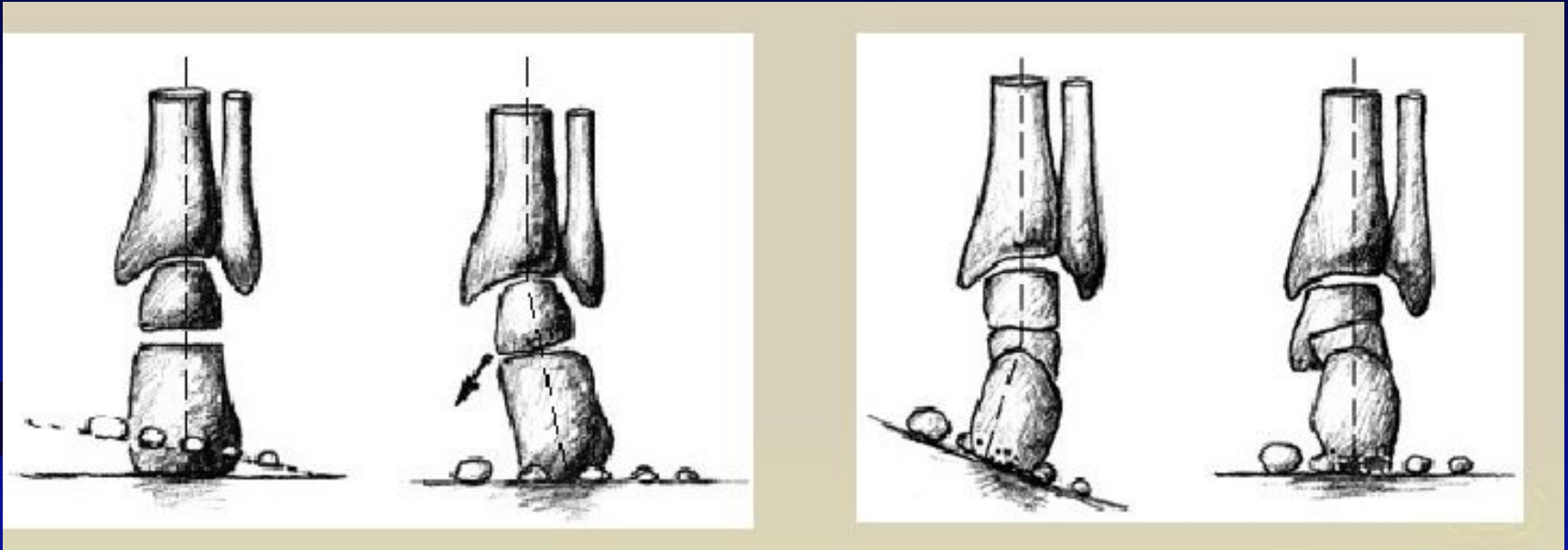


rearfoot varus (subtalar varus)

FFV vs. RFV

forefoot varus

rearfoot varus



forefoot supinatus

Long term compensatory calcaneal eversion, leading to a forefoot soft tissue malalignment.

Non-osseous, mimics forefoot varus.

Responds well to orthotic use.



first ray

mobility drives gait

root cause for many LE dysfunctional patterns

- hallux rigidus
- hallus limitis
- hallux valgus
- sesmoiditis

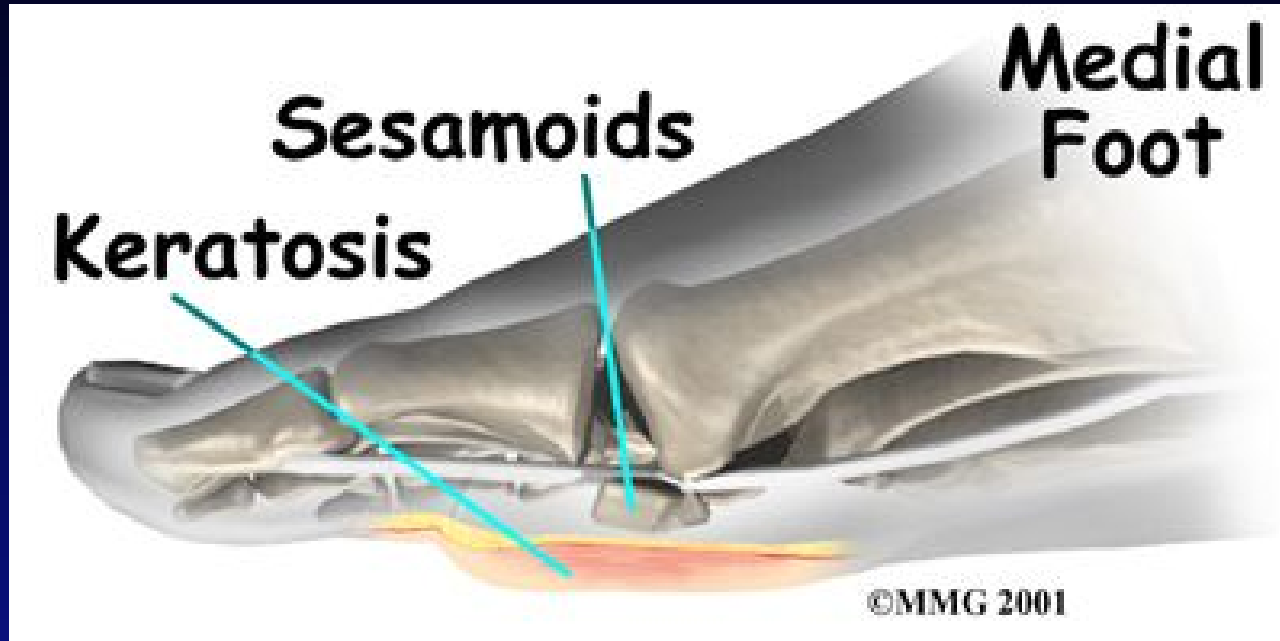


sesamoiditis

- Boike A, Schnirring-Judge M, McMillin S. **Sesamoid disorders of the first metatarsophalangeal joint** Clin Podiatr Med Surg. 2011 Apr;28(2):269-85,



sesamoiditis



- rigid or PF first ray
- high arch
- callus formation

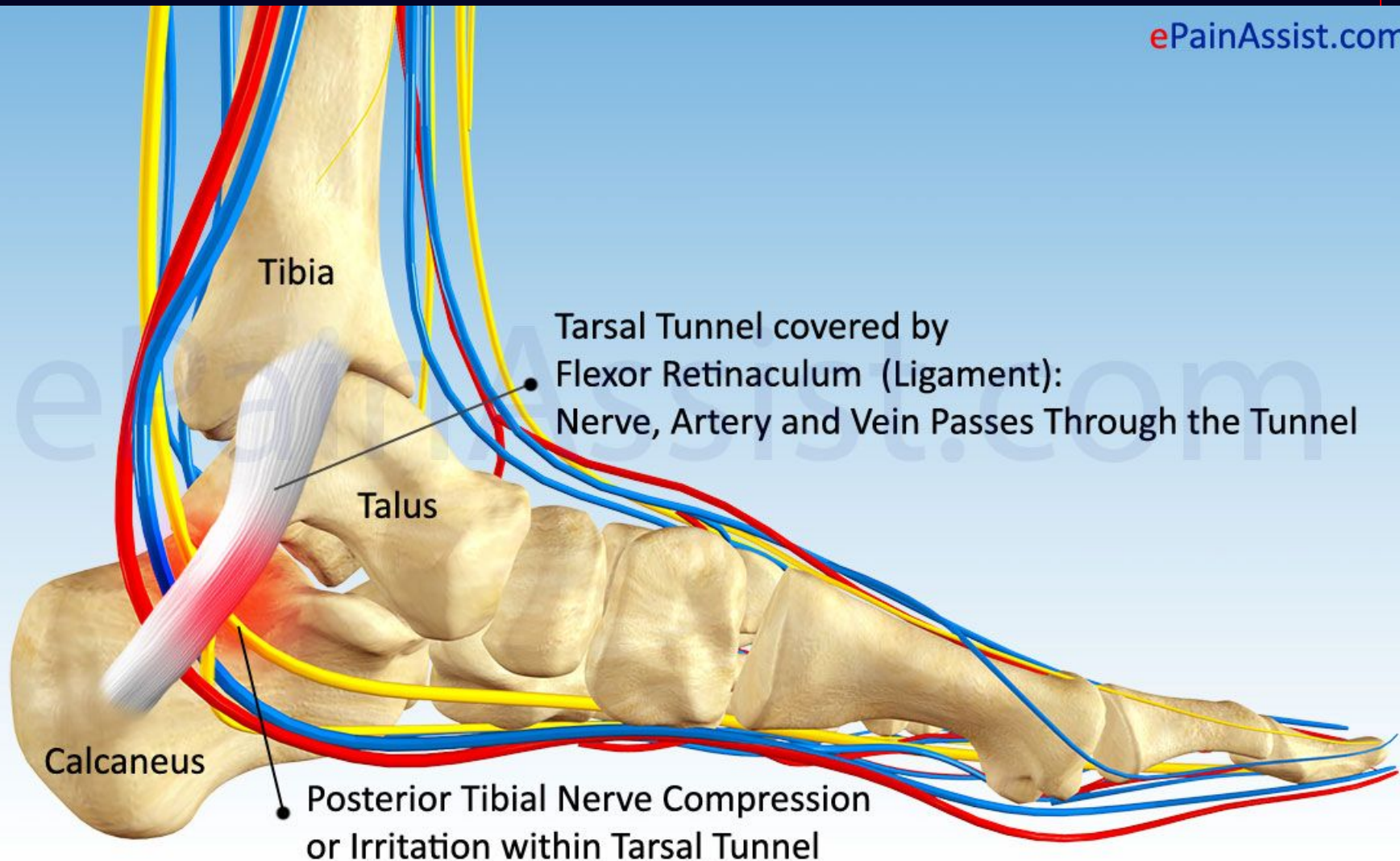


morton's neruoma



tarsal tunnel syndrome

ePainAssist.com



foot/LE resources

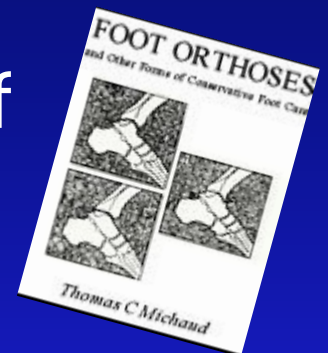
David Tiberio

biomechanical services - videos

“the gait guys” podcasts

FOOT ORTHOSES and Other Forms of
Conservative Foot Care

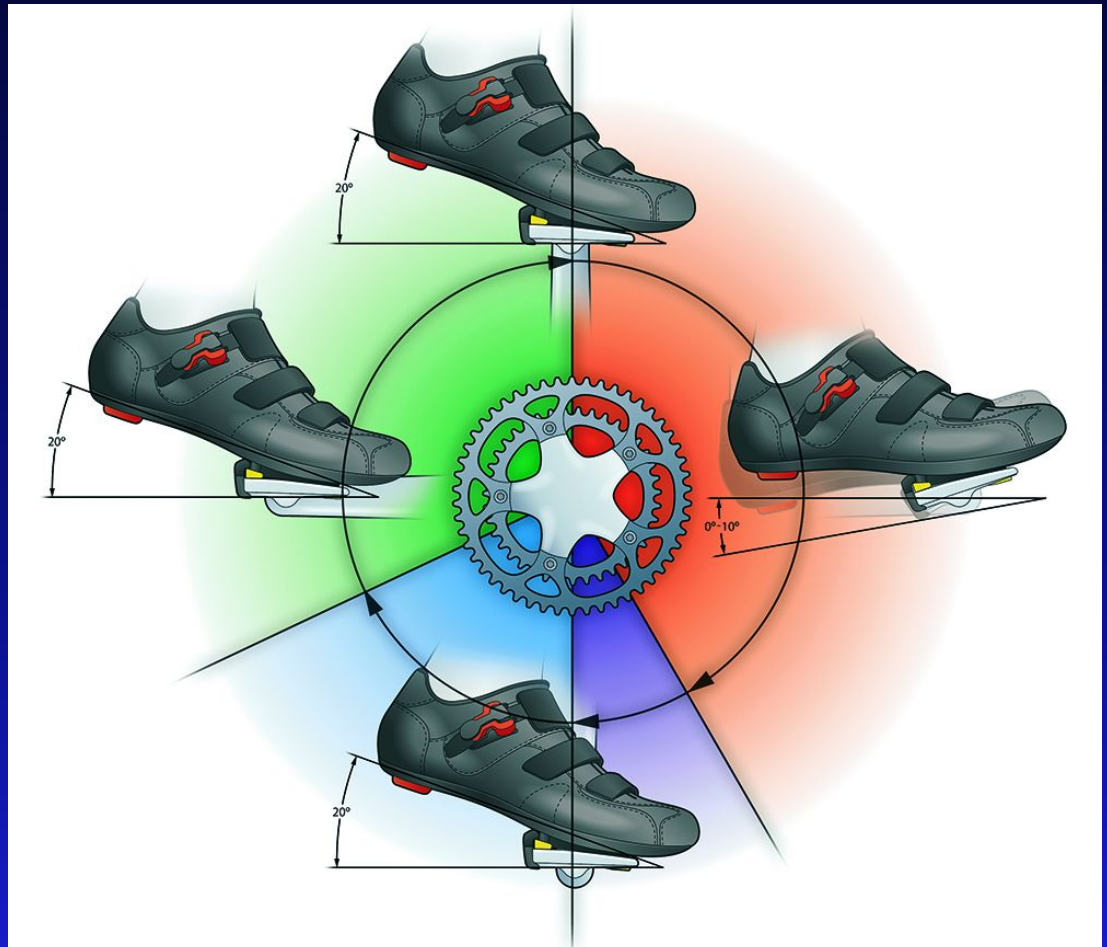
-Thomas C. Michaud, DC.



achilles tendinopathy

quick point:

- ankling
- under load
- eccentric



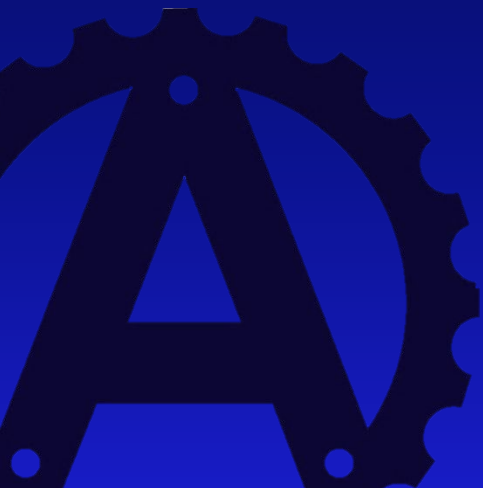
OTHER

overuse

bone

hydration

sleep



WOLFF'S LAW

“**Wolff's law** is a theory that states that bone in a healthy person or animal will adapt to the loads under which it is placed.



From Wikipedia

CYCLING

- bone density




Normal bone



Osteoporotic bone



A grayscale, high-magnification micrograph of bone tissue, showing a complex, porous, and interconnected network of bone trabeculae and lamellae, characteristic of cancellous bone. The structure is highly textured and three-dimensional.

“It is necessary to pay greater attention to the bone status of high-level athletes to prevent an increased risk of fractures.”

Guillaume Medicine and Science in Sports and Exercise. 2014

DAVIS' LAW

“**Davis's Law** is used in anatomy to describe how soft tissue models along imposed demands. It is the corollary to Wolff's law”



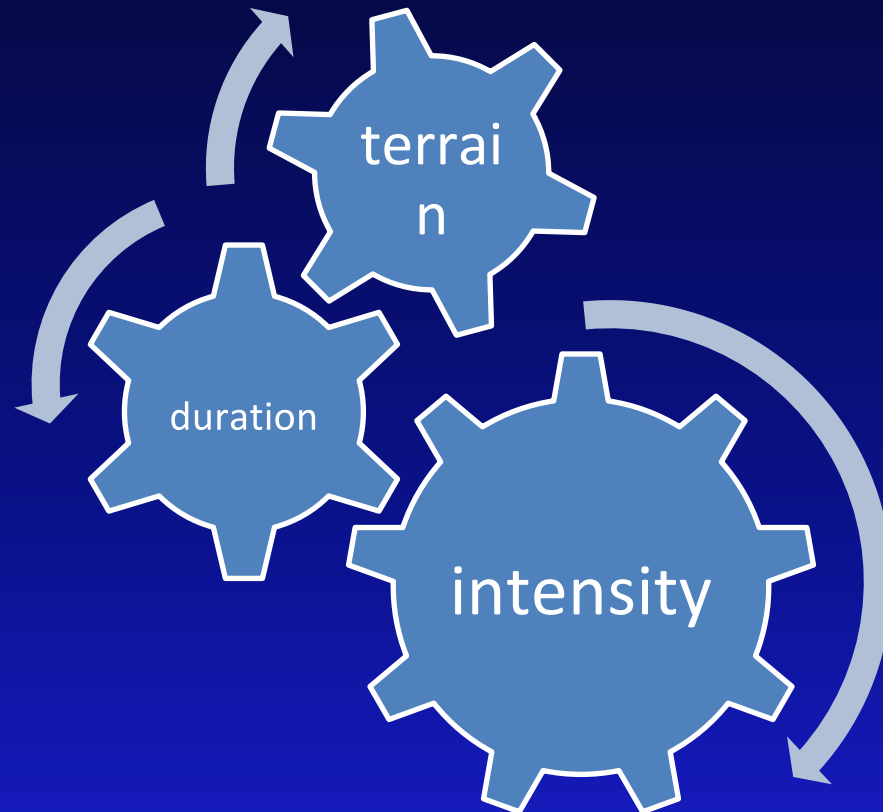
Training dose

- Volume
- Intensity
- terrain



LOAD

Training **Load** = volume x intensity



10% Rule

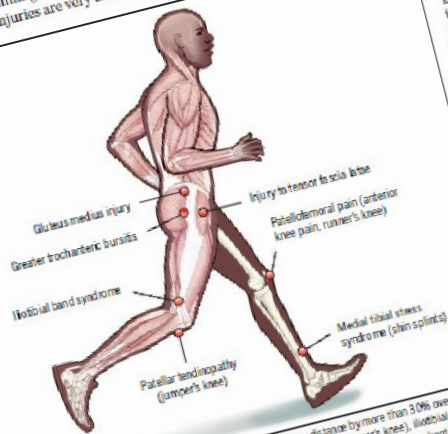
JOSPT PERSPECTIVES FOR PATIENTS

Running How to Safely Increase Your Mileage

J Orthop Sports Phys Ther 2014;44(10):748. doi:10.2519/jospt.2014.0506

Do you want to start a running program? Are you already a runner and want to increase your miles? Are you recovering from an injury and trying to return to running? If you are working to accomplish any of these goals, you have probably wondered how to increase your running miles safely so that you are not hurt. Running-related injuries are very common, and training errors

are the leading cause of preventable injuries. Most training injuries are the result of "too much, too soon, too fast, too quick." Although preventing running injuries is complicated and scientists still have a lot to discover, one rule familiar to many runners is the 10% rule, which states that you should not increase running mileage more than 10% each week. A study published in the October 2014 issue of JOSPT puts the 10% rule to the test.



RUNNING-RELATED INJURIES. A sudden increase in weekly running distance by more than 30% over a 2-week period may put runners at an increased risk for developing patellofemoral pain (runner's knee), iliotibial band syndrome, medial tibial stress syndrome (shin splints), patellar tendinopathy (jumper's knee), injury to the tensor fasciae latae, and injury to the gluteus medius or tensor fasciae latae.

For this and more topics, visit JOSPT Perspectives for Patients online at www.jospt.org. This Perspectives article was written by a team of JOSPT's editorial board and staff, with Deayne S. Tjehnen, PT, PhD, Editor, and Jeanne Robertson, Illustrator.

This JOSPT Perspectives for Patients is based on an article by Nielsen et al. titled "Excessive Progression in Weekly Running Distance and Risk of Running-Related Injuries: An Association Which Varies According to Type of Injury," J Orthop Sports Phys Ther 2014;44(10):739-742 Epub 25 August 2014. doi:10.2519/jospt.2014.0564



JOSPT PERSPECTIVES FOR PATIENTS is a public service of the Journal of Orthopaedic & Sports Physical Therapy. The information and recommendations contained herein are a summary of the referenced research article and are not a substitute for seeking proper healthcare to diagnose and treat the condition. For more information on the management of this condition, contact your physical therapist or health care provider specializing in musculoskeletal disorders. JOSPT Perspectives for Patients may be photocopied/reproduced by physical therapists and other health care providers to share with patients. The official journal of quality research, immediately applicable clinical material, and useful supplemental information on musculoskeletal sports-related health, injury, and rehabilitation. Copyright ©2014. Journal of Orthopaedic & Sports Physical Therapy

NEW INSIGHTS

Although runners, coaches, and health care providers commonly use the 10% rule, more science is needed to understand its role in injury prevention. Researchers followed 873 new runners for 1 year; during this period, 202 runners had a running-related injury. The researchers compared runner injuries based on each participant's weekly increase in running distance: less than 10%, 10% to 30%, and more than 30%. In the 2 weeks prior to injury, runners who increased their mileage by more than 30% had a higher injury rate than those who increased their mileage by less than 10%. Runners who ran farther faster were at higher risk for patellofemoral pain (runner's knee), iliotibial band syndrome, medial tibial stress syndrome (shin splints), patellar tendinopathy (jumper's knee), greater trochanteric bursitis, and injury to the gluteus medius or tensor fasciae latae (see illustration). However, other types of injuries were not linked to the 10% rule, such as plantar fasciitis, Achilles tendinopathy, calf injuries, hamstring injuries, tibial stress fractures, and hip flexor strains. The authors suggest that these injuries may be related to other training errors.

PRACTICAL ADVICE

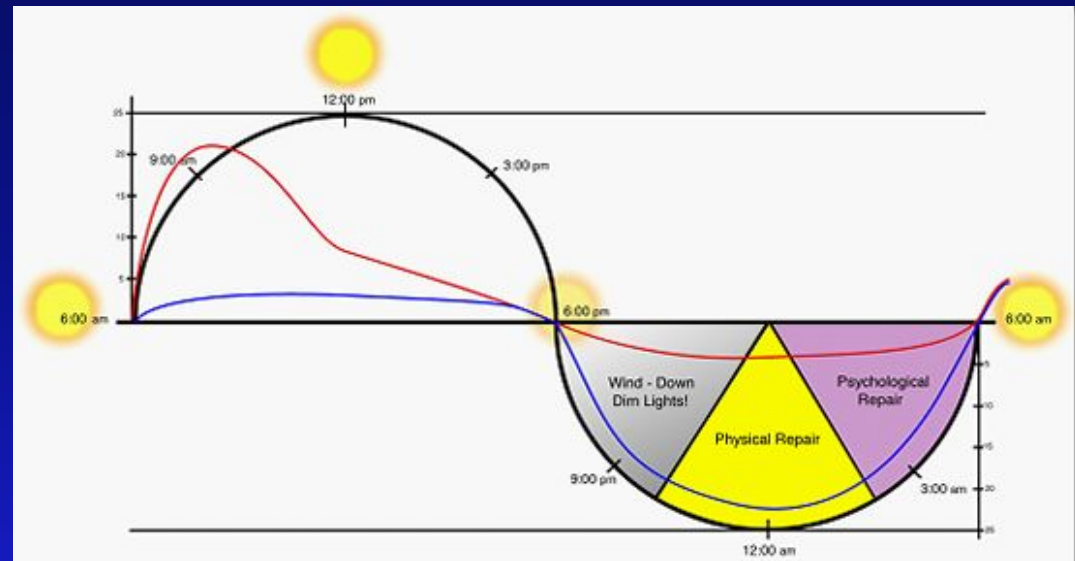
A sudden increase in weekly running distance by more than 30% over a 2-week period may put runners at increased risk for developing running-related injuries. The lowest injury rates were found in new runners who increased their weekly mileage by less than 10% over 2 weeks. However, other running injuries may be linked to increased running speed, sprint training, running pace, increasing running speed, or other training errors. If you are starting a running program, your physical therapist can help customize a safe running progression to meet your needs. For more information on a personalized running program, contact your physical therapist specializing in musculoskeletal disorders and running-related injuries.

"Novice runners who progressed their running distance by more than 30% over a 2-week period seem to be more vulnerable to distance-related injuries than runners who increase their running distance by less than 10%."

-Nielsen JOSPT OCT 2014

SLEEP

- circadian rhythm
- adrenal stress,
- cortisol, melatonin
- growth hormone





SPEAKERS AND FACULTY FROM:



Medicine of Cycling Research Library

No more need to spend hours to find the cycling medicine articles you need. We've done the work for you! Below you'll find a comprehensive cycling research library of over 8,000 articles pertaining exclusively to cyclists or cycling, all sorted by category to make it easier to find what you need, with links to either the abstract or full text when available. We estimate that we've compiled over 90% of all of the available cycling research published in major medical journals.

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[Gender Differences](#)

[Health Benefits of Cycling](#)

[Healthcare Costs](#)

ABOUT THE CYCLING RESEARCH LIBRARY:

Our goal is to make it easier for healthcare professionals and the cycling public to have greater and simplified access to the medical literature. We recognize the search process can be time consuming and daunting if you are a busy provider or are unfamiliar with research search strategies. Hopefully you will find this library useful. Due to the overwhelming amount of physiology only related articles, we focused our efforts on the medical, nutritional, and training articles and resources. This library will be updated on a bi-monthly basis. If you have any feedback, questions, or articles to add to this list, please contact: alynn@medicineofcycling.com

Sincerely,

ALYNN KAKUK, DPT, CSCS



Chair, MOC Research Task Force

Contributors:



DOUG BAUER, MD

COLLABORATION

*In the long history of humankind ...
those who learned to collaborate and
improvise most effectively have
prevailed.*

– Charles Darwin





take away

understand the dif.dx...

...look deeper and correlate...

...keep or refer...

...collaborate!

thank you

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