Pathologies of the First Ray

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Goals of this lecture

- An overview of conditions of the first ray
- Goal is to provide education with respect to a full spectrum of care
- While scope of practice is acknowledged, lecture will venture beyond that, to provide information that will help you in caring for and providing information for your patients
- Practice to what the guidelines limit, educate yourself to beyond those limits.

What is the First Ray?

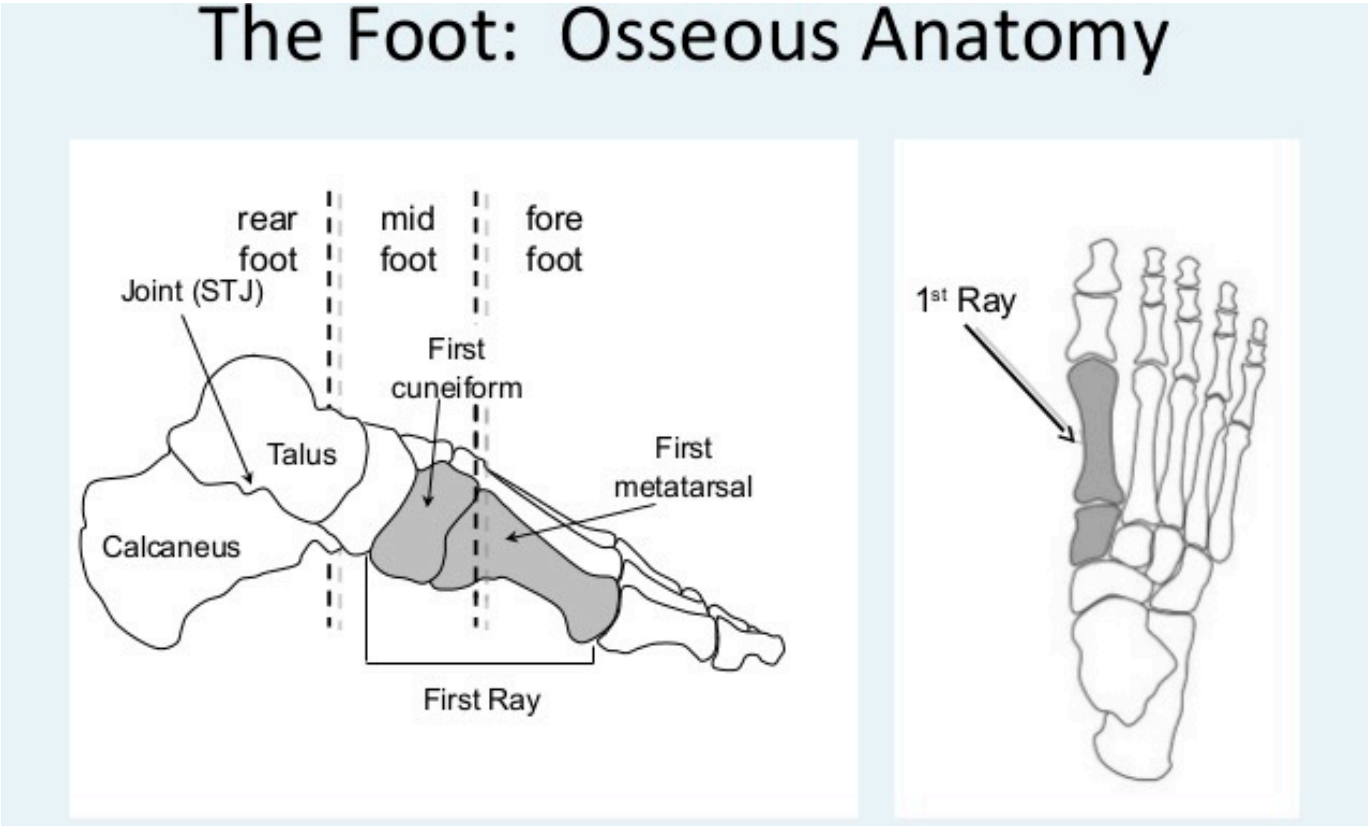
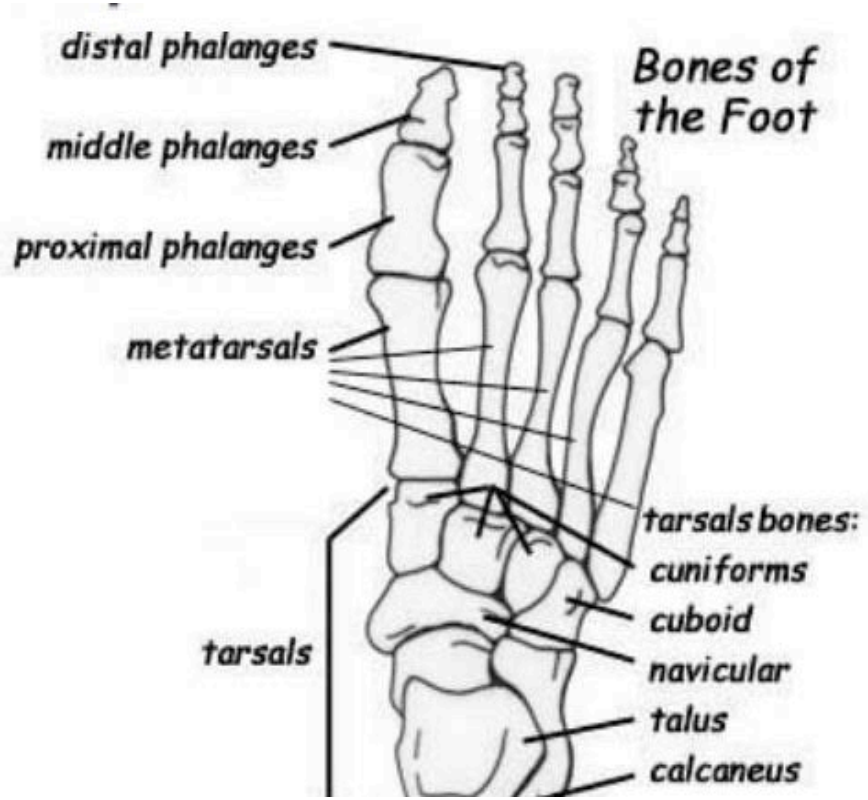
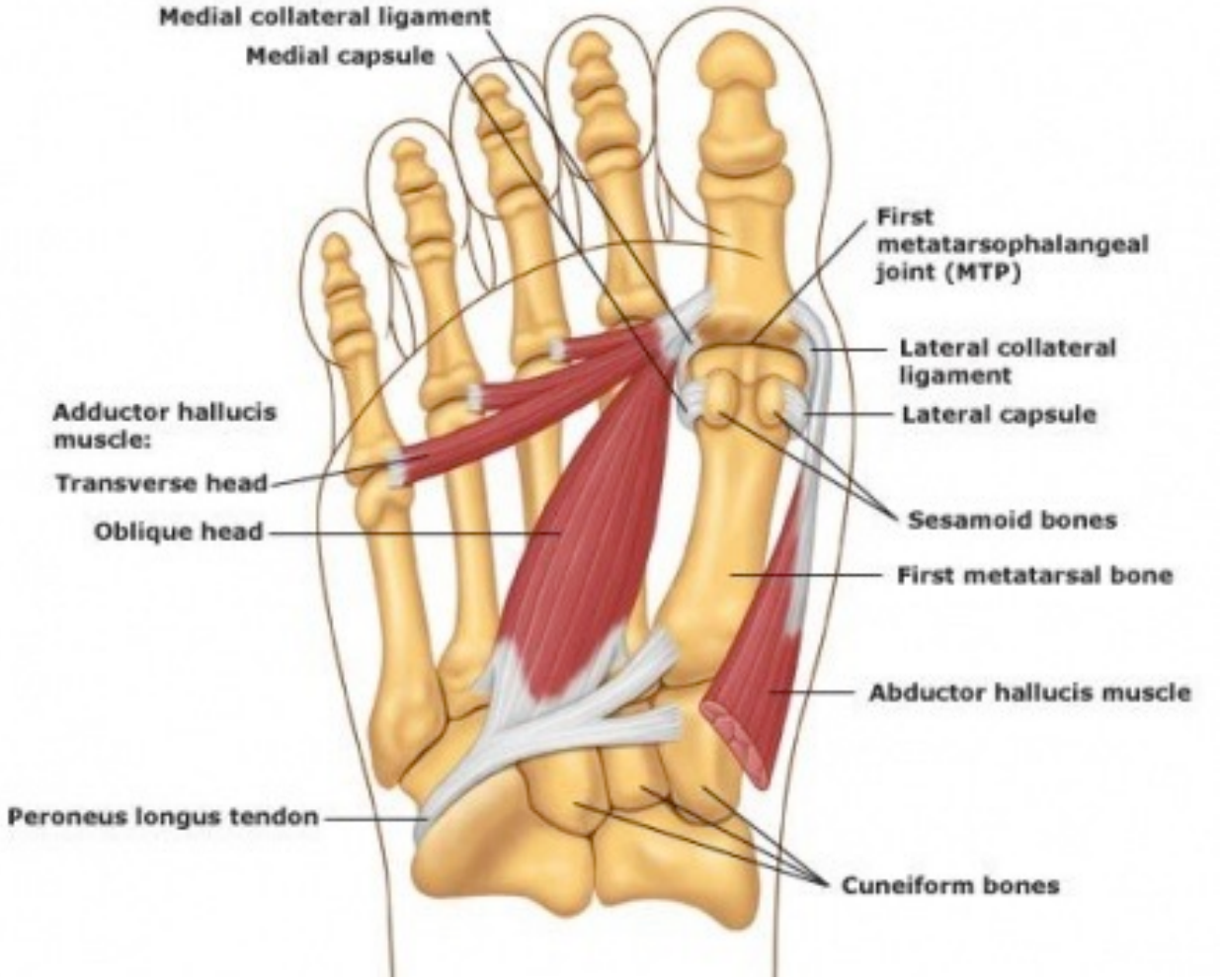


Image Source: Pudendal Neuralgia and Lower Extremity (Feet) Biomechanics - ICS 2011, Glasgow, Scotland. Available at https://www.slideshare.net/crisshupe/pudendal-neuralgia-and-lower-extremity-feet-biomechanics


Bones of the Foot
distal phalanges
middle phalanges
proximal phalanges
metatarsals
tarsals
tarsals bones:
cuniforms
cuboid
navicular
talus
calcaneus


Medial collateral ligament
Medial capsule
First metatarsophalangeal joint (MTP)
Lateral collateral ligament
Lateral capsule
Adductor hallucis muscle:
Transverse head
Oblique head
Sesamoid bones
First metatarsal bone
Abductor hallucis muscle
Peroneus longus tendon
Cuneiform bones

Osseous Deformities

First Ray Pathomechanics

- Hypermobile first ray is most common cause of hallux abducto valgus and hallux limitus/rigidus
- Begins with subtalar joint pronation, leading to dorsiflexed first ray
- Mechanical advantage to adductor hallucis and peroneal longus tendons begin the cascade for pathologies to develop.

Hallux Abducto Valgus

- Commonly known as a “bunion”
- A condition where the big toe is deviated in the transverse plane towards the lesser toes.
- The toe can override or underride the adjacent lesser digits.
- Etiology is muscular, and therefore a genetic predeposition exists.
- Can present with an overlying bursitis. (sack of fluid)


bunion


L
R

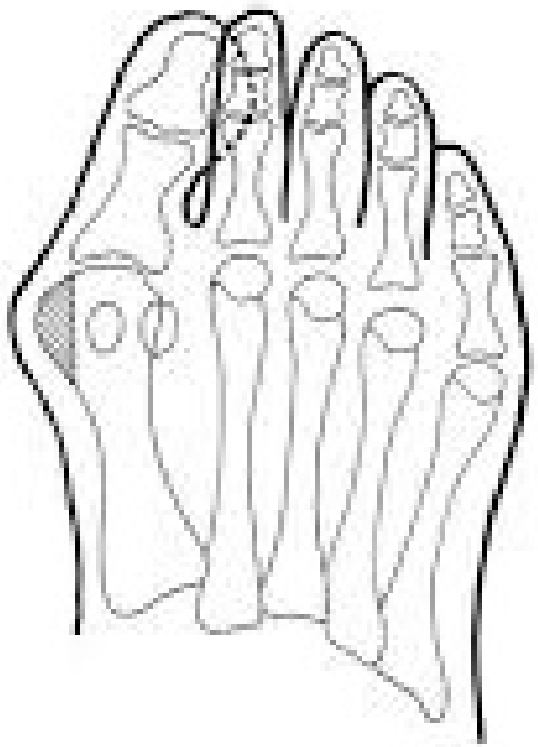
Conservative Treatment

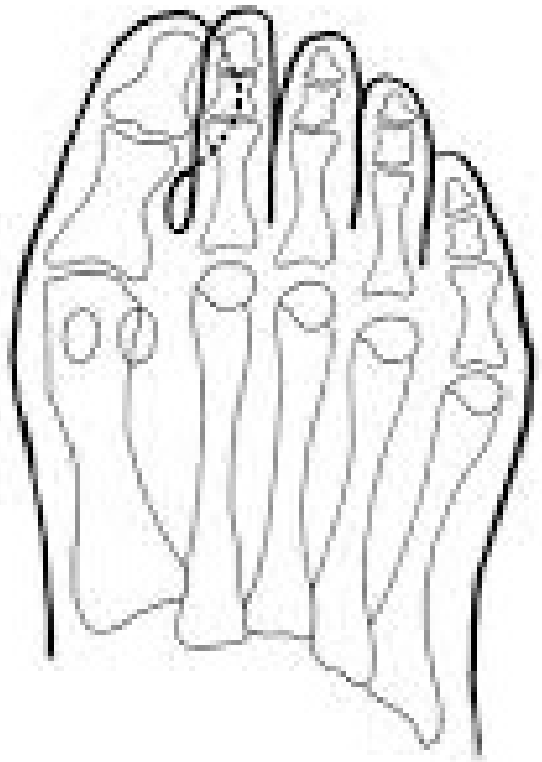
- Shoegear modfication
- Medicine to control inflammation
- Cortisone injections
- Ultrasound
- Custom orthotics
- Splints?

Image Source: Tynor Bunion Splint by Halo Health Care. Available at https://www.halohealthcare.com/orthopedic/tynor-bunion-splint/?gclid=Cj0KCQjw_r3nBRDxARIsAJljleHVMsdughT9BOcdvbJQVPg9qXtJ5hQn0sC8ZUeSo60LzOeXA05QkxgaAvWLEALw_wcB

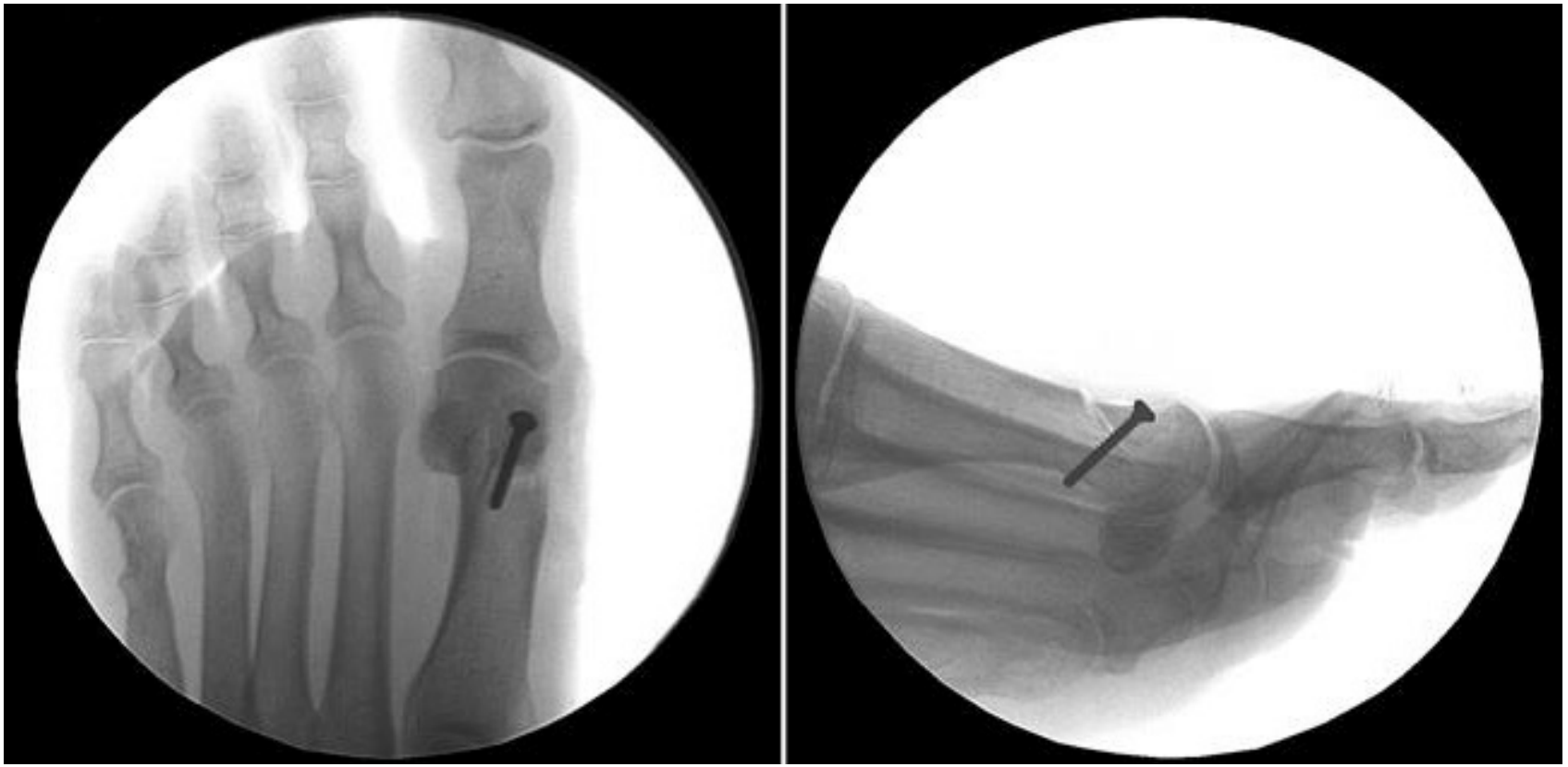
Surgical Treatment

- Goal is to address the deformity and/or correcting the angular abnormality.
- Simple procedures known as a “bump & run” type. No time off the foot.
- More complex procedures can require anywhere from 48 hours to 4 weeks off the foot.

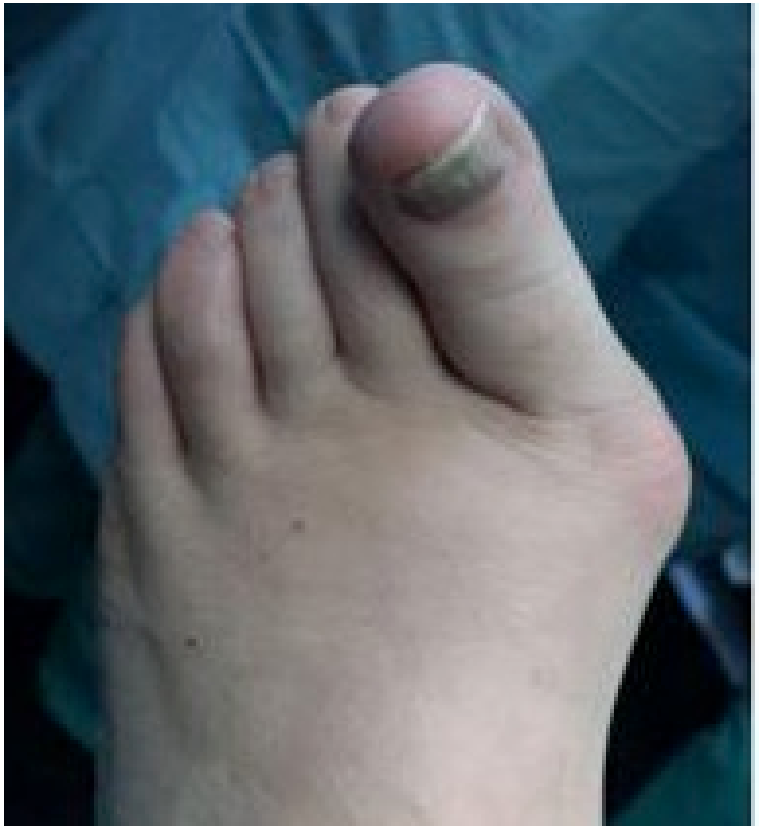





Ligament Cut
Bone and Tissue Removed
Bunion
Bunionectomy
After Bunion Surgery



Pre-Op



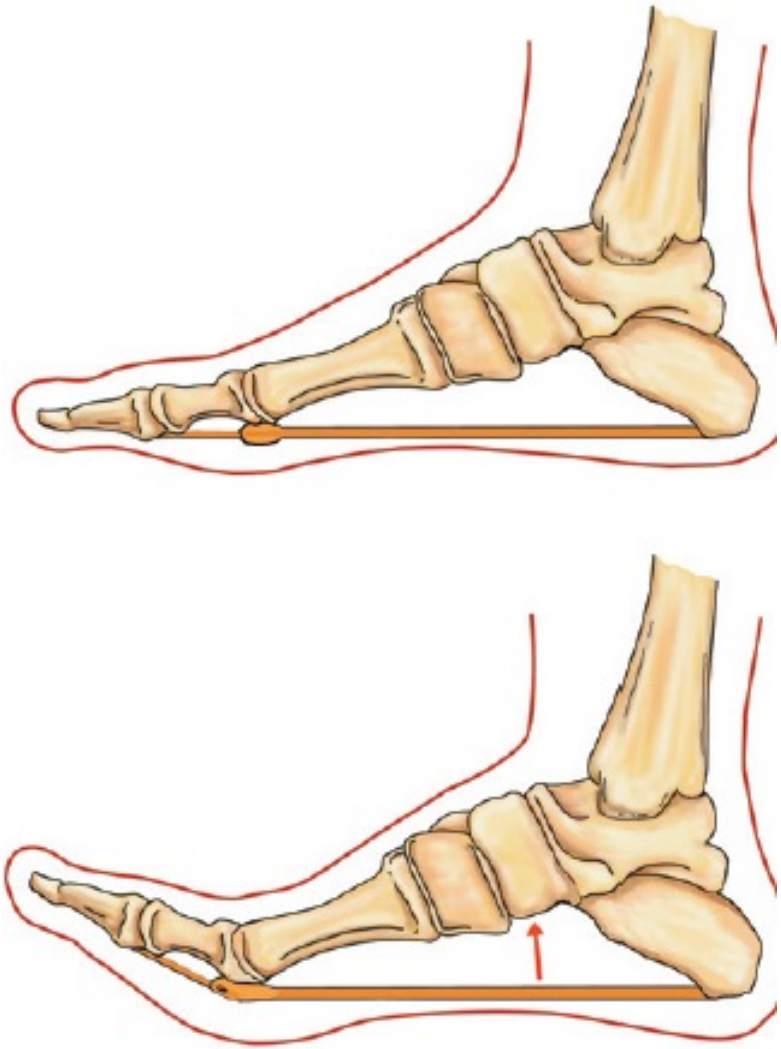
Post -Op

“Can Bad Shoes Cause A Bunion?”

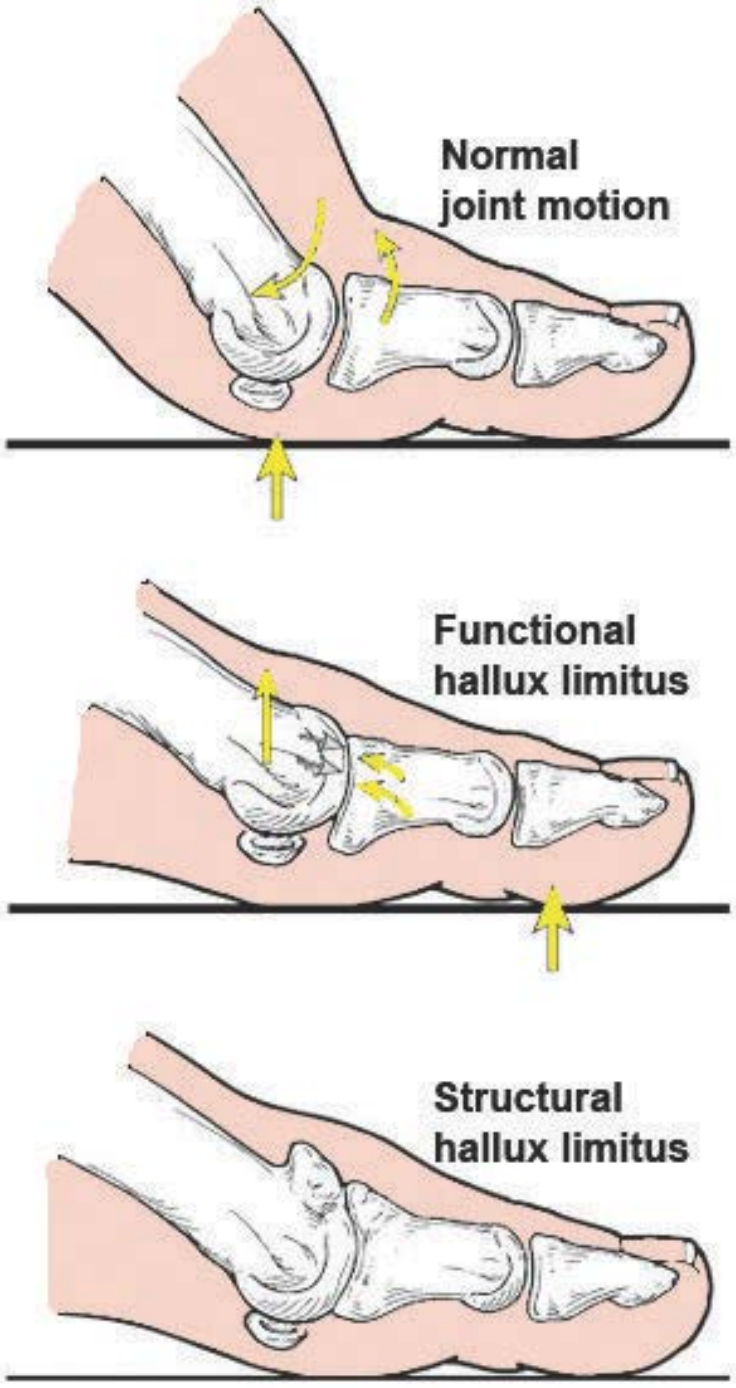
- Shoes inhibit the development of arch-supporting muscles.
- An adducted forefoot that is placed in a straight-last shoe will create a more pronated rearfoot, relative to the forefoot.
- Therefore shoes shouldn’t fit just the length of the foot, but the shape of the foot.
- Cultures that don’t wear shoes, or wear very open foot supports still develop bunions at a similar rate.

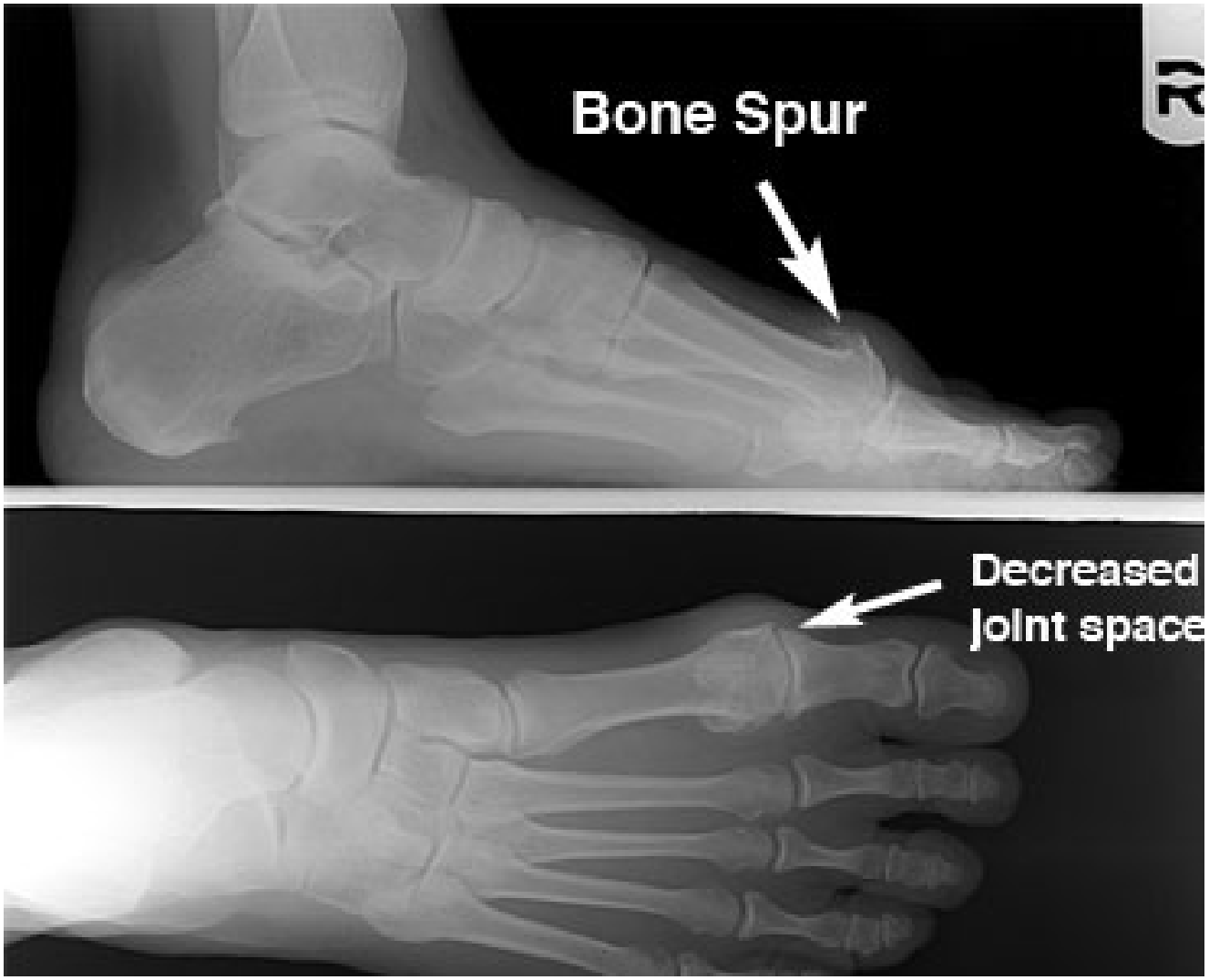
Hallux Limitus/Rigidus

- The toe doesn't move like it should
- Understanding the importance of the 1st MPJ in propulsion during the GAIT cycle.
- Check ROM in clinic chair by stabilizing 1st met head and moving proximal phalanx up and down.



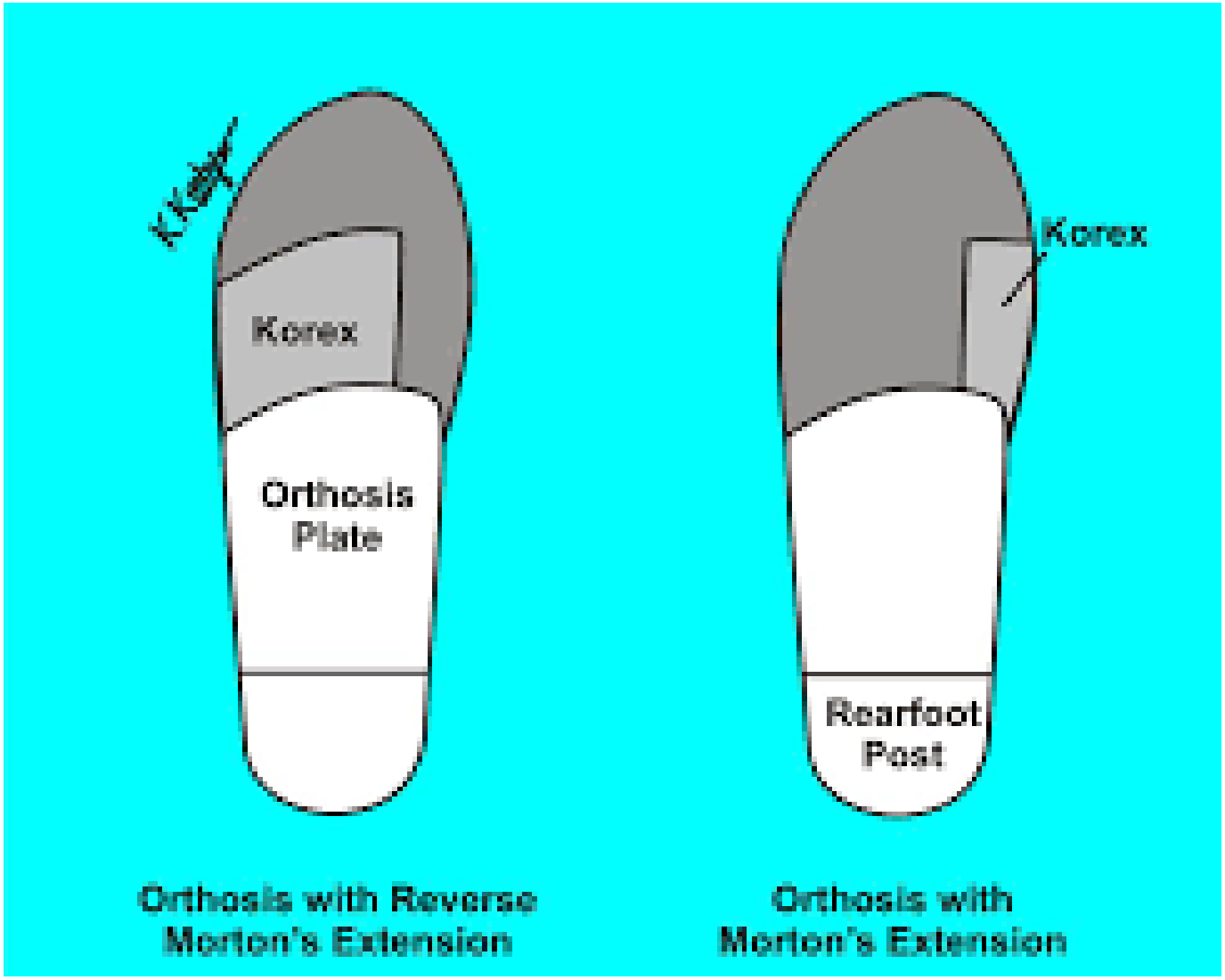
- An inability for the hallux to flex to peak efficiency on the first metatarsal.
- Leads to decreased motion. Which then becomes painful motion.
- Sometimes becomes a “dorsal bunion”. A bump on top of the joint, rather than on the medial aspect. Sagittal plane deformity
- This is a progressive arthritic condition


Normal
joint motion
Functional
hallux limitus
Structural
hallux limitus


Bone Spur
Decreased
Joint space

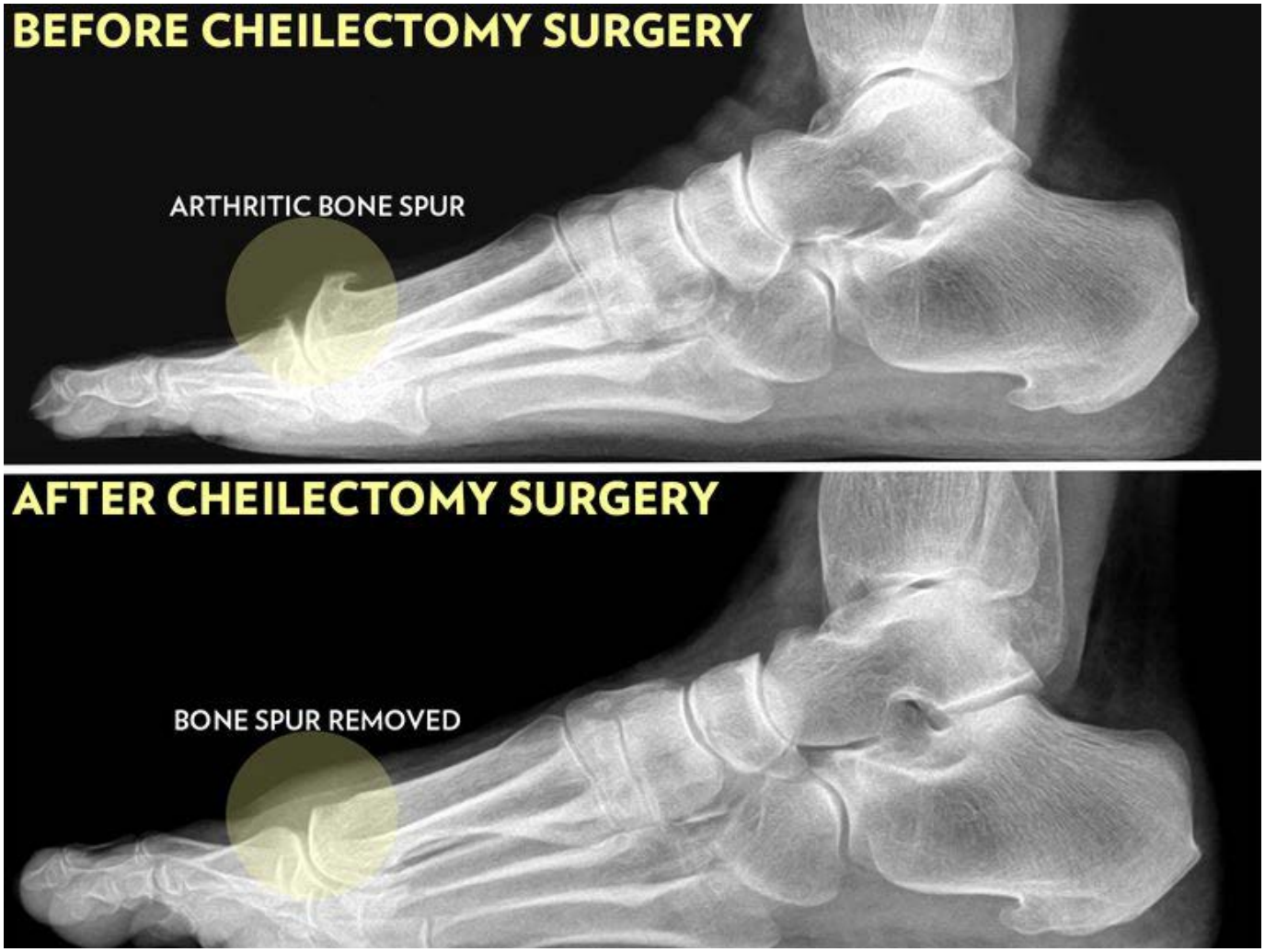
Conservative Treatment

- Same as bunion treatment
- Orthotics can work very well in these cases.
- Reverse Mortons extension for patients with fair bit of mobility
- Mortons extension for patients without mobility

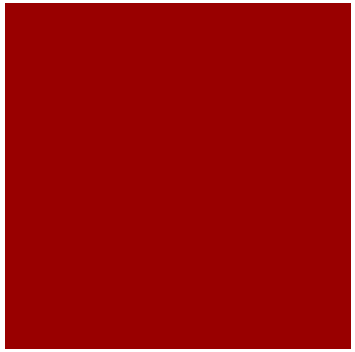

Korex
Orthosis
Plate
Orthosis with Reverse
Morton's Extension
Korex
Rearfoot
Post
Orthosis with
Morton's Extension

Surgical Treatment

- Chilectomy is the most favored procedure
- Joint preservation
- Joint destruction


BEFORE CHEILECTOMY SURGERY
ARTHRITIC BONE SPUR
AFTER CHEILECTOMY SURGERY
BONE SPUR REMOVED


Right
Scale : 10 cm



Sesamoiditis

- Related to hallux limitus
- Commonly referred to as “turf toe”
- Provide a mechanical advantage to the flexor hallucis longus and brevis tendons
- Difficult to flex toe, and sustained pain, especially for athletes

Image Source: Pain Assist - Sesamoiditis: Symptoms, Causes, Treatment- Anti-inflammatory Medications, Orthotics, Insoles. Available at https://www.epainassist.com/sports-injuries/foot-and-heel-injuries/sesamoiditis

Conservative Treatment

- PRICE for 4-6 weeks
- NSAIDs
- Orthotic modification, with cutouts at the metatarsal head
- Ultrasound to increase vascularity
- Cortisone injections
- In extreme cases, NWB with crutches for 4-6 weeks

Surgical Treatment

- Very rarely.
- Opening a pandoras box of problems

Stress Fractures

- Patients complain of dull aches that progressively worsen.
- No one singular event that creates it, the proverbial “straw that broke the camels back”
- Can be diagnosed in office by using a guitar tuning fork.
- X-rays have a lag period of 14 days. Can often times be non-definitive. CT scans are the gold standard

Treatment

- Non-weightbearing for 4-6 weeks.
- Either casts or CAM walker boot.
- Surgical ORIF in only rare cases, and after conservative care has failed.

Arthritic Conditions

Rheumatoid Arthritis

- Genetic marker HLA-DR4
- The skin becomes “just a bag of bones”
- Synovitis causes joint pain, warmth, erythema and edema.
- Long term resorption of bone and cartilage
- Often related to callus development at areas of bony protrusions

Treatment

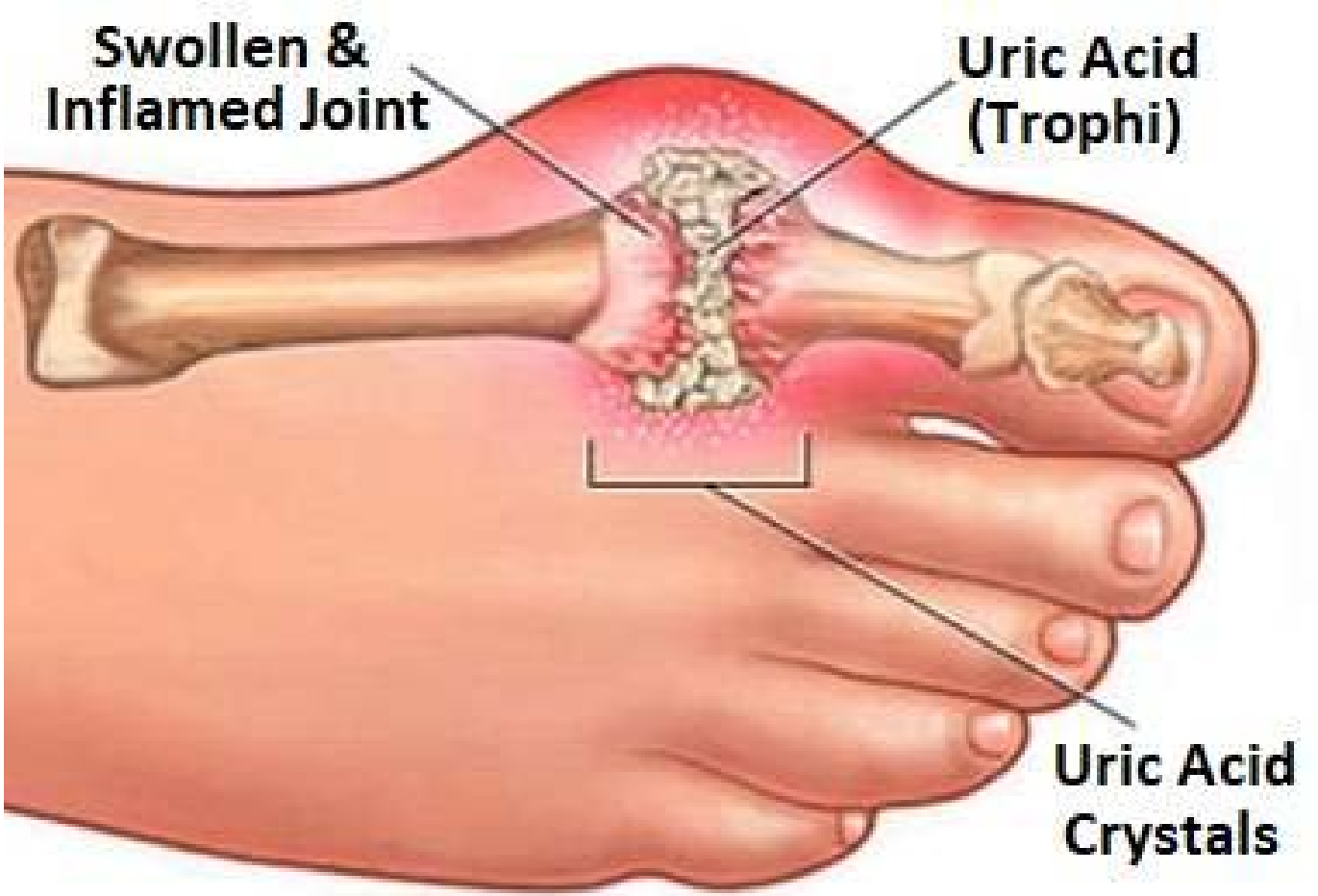
- Shoegear modifications, as open and unobtrusive as possible
- Specially prescribed shoegear, Canes, walkers, braces.
- Aqua therapy and rehab in warm water, joints need to move around.
- Medical intervention; DMARDs
- Surgical correction

Gout

- A violent articular inflammation, precipitated by joint crystals.
- As crystals accumulate, and combine with synovitis, there is an accumulation of tophi.
- Patient presents with a swollen, red, hot big toe.
- Pain out of proportion. Even light touch can create excruciating discomfort

Treatment

- PRICE
- Indomethacin
- Immediate diet restrictions; alcohol, seafood, red meat, peanut butter, beans & legumes. Avoid any foods high in purine.


Swollen &
Inflamed Joint
Uric Acid
(Trophi)
Uric Acid
Crystals

Other Arthritic Conditions

- Felty's Syndroms
- Systemic Lupus Erythematous
- Ankylosing Spondylitis
- Reiter's Syndrome
- Psoriatic Arthritis

Soft Tissue Disorders

Tendonitis, Bursitis, Fasciitis

- Inflammation conditions of the soft tissues of the plantar/dorsal aspect of the 1st MPJ.
- Aggravated with ambulation.
- Orthotics should be designed with mechanical advantage conferred to the tendon or soft tissue in question.
- PRICE

Sprains of the 1st MPJ

- Commonly a hyperextension of the 1st MPJ in the saggital plane. Over dorsiflexion.
- Depending on severity, the soft tissue can be torn partially or fully.
- Rigid stabilization of the joint
- Straight last orthotic or CAM walker
- Taping

Questions?

Follow-Up Correspondence

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