

ANKLE and FOOT MR Pearls and approach

PROFESSOR AND CHAIR OF RADIOLOGY
UNIVERSITY OF STONY BROOK

OUTLINE

- Technical approach
- Interpretive geographic approach
- Diabetic foot
- Cryptic symptoms
- Marrow edema
- Tendon pearls
 - PTT
 - peroneals
- Soft tissue pearls
- Foot pearls

REALLY FOUR DIFFERENT EXAMINATIONS

- Ankle/hindfoot
 - most tendons, ankle sprains and typical sports
- Forefoot
 - Mortons, sesamoids, occasional tendon and occult osseous injuries
- Midfoot
 - somewhat unusual; peroneal longus, occult fracture, Lis-franc
- Diabetic foot/tumor
 - similar protocol with contrast focused on two planes on focal area of interest

INTERPRETIVE APPROACH

- Regional/Geography approach
 - sx complexes and imaging ddx
 - Usually includes a combination of ST and marrow disorders
- Also use effusions to see if articular disease is present, and/or related

INTERPRETIVE APPROACH

Geography

- Achilles "tendonitis"
 - Hypoxic degeneration
 - Paratendonitis
 - Retrocalcaneal bursitis
 - Muroid foci
 - Kager's edema
 - Proximal gastroc tear
 - Partial tears

INTERPRETIVE APPROACH

Geography

- Distal Achilles
 - Insertional tendonitis
 - Haglund's syndrome
 - Retrocalcaneal bursitis
 - Retroachilles bursitis
 - Stress fracture of calcaneus

INTERPRETIVE APPROACH Geography

- Anterior
 - ATT
 - Deep peroneal nerve
 - Anterior impingement
 - Ankle OA
 - Talo-navic OA

INTERPRETIVE APPROACH

Geography

- Distal PTT
 - unstable accessory navicular
 - Cornuate navicular
 - marrow edema from PTT
 - Insertional PTT
 - Bone bruise from ankle sprain
 - Midfoot stress fx
 - Inflammatory arthropathy

INTERPRETIVE APPROACH Geography

- POPS
 - Distal peroneal
 - Os peroneum
 - Lateral calcaneus

INTERPRETIVE APPROACH

Geography

- Plantar fascia
 - Fasciitis
 - Fascial tear
 - Muscle tear
 - Lateral plantar nerve
 - Calcaneal stress fx
 - Enthesopathy from Reactive arthritis

INTERPRETIVE APPROACH

Geography

- Overlap of nerve entrapment
 - Tarsal tunnel
 - STS
 - Medial plantar nerve
 - Inferior calcaneal branch
 - Normal variant(?)

INTERPRETIVE APPROACH

Geography

- Query Morton's
 - Morton's
 - Intermetatarsal bursitis
 - MTP synovitis
 - Stress fx MT (neck > base)

ARTICULAR or SYNOVIAL DISEASE

- Effusion
 - Criteria distention of anterior > posterior recess
 - Look within effusion for debris or synovitis
- cartilage
- OCD
- other arthritis including instability
- trauma; ligament/bone bruise/occult fracture
- Effusion tendon sheath-acute symptoms- peroneal > PTT

SPECIFIC PEARLS

- Remember FHL is the Baker's cyst of the ankle
- Evaluate for heterogeneity of fluid
- Also non- gravitational or "compartmentized" localization

INTREPRETIVE APPROACH

Diabetic Foot

- Trick is to find ulcer
 - 2 planes \perp , follow ulcer to bone on T1W image-
- Look for 2nd signs/ complications
 - Abscess
 - Sinus tracks
 - Reactive changes as STIR exaggerates
 - Post-contrast (delayed) enhancement = antibiotic response to image for this)

NEUROPATHIC DISEASE: MR Findings

- Bone
 - If acute edema/enhance without disloc, disorganization
 - If chronic D's
 - Regional/articular epicentered
- Soft Tissues
 - SQ edema
 - Periarticular enhancement
 - Effusions

WHERE INFECTIONS?

WEIGHTBEARING AREAS 2nd INOCULATORY TRAUMA

- 2nd MT head
- With Hallux Valgus
 - Medial 1st
- With metatarsus minimus varus
 - Lateral 5th
- With Hammertoe or other toe deformities
 - Dorsal toes
- When debilitated
 - Lateral malleolus/ calcaneus
- With rockerbottom
 - cuboid>calc>5th MT>4 MT

HOW DO I KNOW IF IT IS INFECTED OR NEUROPATHIC?

• Location

- Midfoot infection unusual unless contiguous ulcer
- MT's, toes and heel unusual for NP
- 2nd infection in NP is rare unless there is an ulcer

• Look for ulcer: 90%

• Follow sinus track

• If unsure use ghost sign:

- See normal shaped bone on T2 or gad with infection or rare acute neuropathic joints



COMMON CAUSES OF CRYPTIC ANKLE/FOOT PAIN

- ATT
- Cartilage
- Early RA or reactive arthritis
- Gout
- Plantar plate
- DDD from spine
- Other cranial compression neuropathies

COMMON CAUSES OF CRYPTIC ANKLE/FOOT PAIN

- Denervation
 - Early diabetes
 - Check for intrinsic foot muscle fat, edema
 - Inferior calcaneal branch of lateral plantar nerve
 - Tarsal tunnel
 - Medial plantar
 - May be age related and "relatively" asymptomatic

COMMON CAUSES OF CRYPTIC FOOT PAIN OR MASS

- ATT
- Cartilage
- Reactive arthritis (Reiter's)
- Spine DDD

MARROW EDEMA LOCATION APPROACH

- Tibia-bone bruise vs PTT
- Talar dome-OCD, geode
- Talar medial/lateral- bone bruise, arthritis, PTT, peroneal
- Talar body and neck- AVN, fracture, sinus tarsi
- Talar head-bruise, cartilage
- Calcaneus-fracture (stress), reactive arthritis, plantar fasciitis

TENDONS-Achilles

- Anterior and posterior margins parallel
- Anterior margin concave on axials, except where soleus inserts
- Minimal retrocalcaneal bursal fluid
- Tears easy to diagnose, r/o edema in soleus
- Beware normal variants
 - "chickenwire" internal architecture
 - Small amount of retro-calcaneal fluid
 - Penetrating vessel vs erosion

ACHILLES II

- Degeneration can be very symptomatic and may only show enlargement without internal signal
- Internal signal may represent mucoid degeneration that has variable but most often minimal symptoms
- Partial tears tend to be posterior
- Can heal fairly quickly clinically but look like new tears on MR

TENDONS-PTT

- Same volume origin to insertion
- Minimal nl fluid ex. for distal 1.5 cm
 - However, many disorders do not lead to effusion
- Elderly tears- peri-malleolar, younger/arthritis close to insertion
- Rare to see fluid, can also not uncommonly look "normal"
- Normal variants
 - Volume averaging with spring and tibial navicular ligaments
 - Ovoid shape around malleolus
 - Small amounts of proximal fluid

TENDONS-PTT

- 2nd signs
 - Excessive fluid
 - Subjacent marrow edema
 - Cornuate or accessory navicular
 - Plantar flexion of talus on sagittal/unroofing on axial
 - Anterior displacement of FDL + sublux of PTT
 - 2nd sinus tarsi + spring lig

PTT con't

- Gaps are rare
- Occasional splits
- Beware insertional
 - Younger pts
 - Assoc with inflam arthropathies

TENDONS-peroneals

- Fluid variable but usually > then FHL\ FDL
- Fluid and tendon size should be symmetric between PB + PL
- ✓ os peroneum
- ✓ level just below distal fibula for splits, calc-cuboid and "tunnel" for PL, and occasionally distally for both PL and PB
- vinculae

TENDONS-peroneals

- Reactive marrow edema is uncommon
- Check peroneal groove
- Normal variants
 - peroneus quartus; mimics a split (inserts on calc)
 - fluid
 - ovoid shape at level of distal fibula

Peroneal Pathology

- Splits, early on looks like boomerang
- Stenosing teno with adhesions
- Disloc

SOFT TISSUES-fascia

- Perifascial edema, earlier and less severe stage than internal signal
- ✓ reactive marrow edema vs stress injury (T1)
 - Also reactive (and other) arthropathies
- ✓ for denervation atrophy or edema
- ✓ for muscle edema, usually flex dig brevis
- Variants
 - spur, true true and usually unrelated
 - Vessel deep to fascia
 - Bad fat sat can mimic edema

SOFT TISSUES

tarsal tunnel and sinus tarsi

- Many false positives and false negatives
- Know your clinicians
- Masses most important
 - neuromas vs ganglia (usually lateral)
- Remember plantar nerve denervation, a not uncommon cause of cryptic foot pain
- Unless overt, or can identify ligament disruption, undercall sinus tarsi
- Varices in TTS rare, but evaluate for edema in nerve

ANKLE AND FOOT BURSAE

- Only one anatomic bursa in the foot
- Retrocalcaneal
 - Best criteria = 6 mm C to C or > 2mm in A to P
 - Associated with Haglund's / insertional Achilles
- o/w any fluid is abnormal

ANKLE AND FOOT BURSAE

- Most common bursitis are
 - HV bursa- usually not discrete fluid
 - Plantar (usually under 1st)-may present as mass
 - 5th MT laterally (Tailors bursa)
 - Retrocalcaneal- insertional Achilles vs Haglunds vs arthritic
 - Overlap/perhaps part of natural history with/or calluses

FOREFOOT PEARLS

- Sesamoids-, plantar low signal variant; check T1, look for line on sagittal images
prob all stress fx
- Mortons- make sure not fluid on T2, √ for synovitis + intermetatarsal bursitis
- Marrow-stress vs. diabetes
- Muscle injury vs. denervation

OA

- ? True, true but unrelated
- Common locations
 - Ankle
 - Usually anterior
 - Hallux
 - Hallux rigidus if dorsal osteophyte
 - Talo-navicular
 - Lis-frank
 - Often cryptic
 - May be related to chronic instability

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