ANKLE MRI

TENDONS: (dark on all sequences except distal PTT and Achilles)

-ANTERIOR EXTLORER (“Tom Hates Dick”)
  -Tibialis anterior (medial and largest; abnormal in “grumpy old men” with DM or Gout; may appear mass-like), Extensor hallucis longus, Extensor digitorum longus

-MEDIAL FLEXOR (PASS THRU TARSAL TUNNEL; some fluid in synovial sheath is normal if not circumferential)
  -tome=PTT (most anterior; twice the size of other two, tendon sheath ends 1-2cm prior to NAVICULAR INSERTION—fluid here is not uncommon “peritendinitis,” elsewhere called “tenosynovitis”); severe tendinosis vs partial tear if 5x thickened with internal high T2 foci; type II tears if tendon smaller or same size as FDL; PTT dysfunction in middle-aged women leads to flat-foot and assoc medial malleolar edema; passes beneath medial mall as a pulley; may dislocate anteromedial to medial mall with tear of flexor retinaculum; higher incidence of tear with acc navicular ossicle
  -dick=FLEX DIGIT LONGUS (rarely injured; under foot like fan; cris-crosses with FHL under foot at knot of Henry; INSERTS DISTAL PHALANX 2-5 TOES)
  -posterior tibial A/N/V
  -harry=FHL (COMM W/ JT; passes thru fibro-osseous tunnel btw lat and medial talar tubercles; under ses tali of calcaneus; injury seen in athletes with extreme planar-flexion; injury accentuated by os trigonum “stenosing tenosynovitis” loculated fluid with septa; tenosynovitis if fluid> ankle eff; magic angle vs tenosynovitis as it goes btwn sesamoids along great toe; INSERTS 1st DISTAL PHALANX)

-LATERAL PERONEUS (behind and underneath fibula as pulley; PB ant and PL post to peroneal tubercle of calcaneus)
  -PB ANT AND MEDIAL TO PL; share common tendon sheath to level of tibial tip; may dislocate anteriorly from behind fibula with detachment of superior retinaculum; look for shallow retromalleolar groove of fibula; magic angle under fibula
  -PB (FLAT or cresenteric with posterior concavity; ATTACHES TO 5th MT BASE; injured more commonly than PL; may have longitudinal tear “boomerang” or C-shaped appearance with medial/lateral limbs and PL in center—symptomatic in young adults or asym in elderly; “PB split” longitudinal tear vs bifurcated brevis vs accessory peroneus quartus muscle)
  -PL (distal tear at level of cuboid tunnel; may be located post to or anterior to peroneal tubercle of lat calcaneus; INSERTS ONTO PLANTAR ASPECT OF 1st MT BASE OR PLANTAR ASPECT OF MED CUNIEFORM)
  -Peroneal (accessory muscle)

-POSTERIOR ACHILLES
  -ACHILLES (no tendon sheath; “smiling” concave or flat anteriorly below soleus insertion; parallel and uniform thickness ~7mm AP on sagittal; rupture ~2-6cm proximal to calcaneal insertion; retrocalcaneal bursa may have small amount of fluid <6mm; kager’s fat inflam/edema)
    -TEAR=interstitial vs partial complete
    -TENDINITIS= paratendonitis -> peritendinitis tear (early tendonitis may be seen as edema post to tendon along paratenon—analagous to synovitis “paratenonitis”; later peritendinous edema “peritendinitis”)
    -TENDINOSIS=fusiform thickened tendon with or w/o internal signal
    -haglunds=post-sup calcaneus prom (pump’s bump) +insertional Achilles tear/tendinosis +retrocalcaneal +retroachilles bursitis
    -round/void internal high T2 signal may represent interstitial tear or mucoid degen; striated/stippled Xanthoma in familial hypercholestoremia; enlarged/heterogenous/wavy=partial tear;
    -PLANTARIS (90%, skinny tendon medial and anterior to Achilles, may insert on Achilles or post calcaneus)
    -ACC SOLEUS MUSCLE (btwn Achilles and FHL tendon)

LIGAMENTS:

-LATERAL (BEST ON AXIAL, except calcaneofibular):
  -HIGH ANKLE LIG (TIB/FIB + inteross memb = syndesmosis)
  -ant and post TALOFIB(ATAF#1=anterolat gutter, post#3=concave mall fossa)
  -acute ATAF tear=edema/torn; chronic ATAF tear=thickened
  -CALCANEOTIB (ATAF#2; difficult to see; use both cor and axial; deep to peroneal tendons)

-MEDIAL (superficial and deep DELTOID lig) deep deltoid lig=striated on coronal
  -TIBIO/NAV—not well seen, TIBIOCALC (ses tali), TIBIOTALAR (striated)
  -SPRING (btwn s.tali and navicular)—important for support
  -located deep to flexor tendons; loss of normal striation of deltoid lig may mean chronic contusion/tear

BONES/CARTILAGE:

-TALAR DOME OCD (lesion size; surrounding BM edema & cyst; cortical-cartilage component; fluid-undercutting “unstable frag”; articular surface incongruity or depression; loose body)
  -SUBTALAR JT (3 facets on talus and calc but only 2 subtalar jt; ant and middle facet make up ant subtalar jt=talocalcaneonavicularent jnt; post facet make up post subtalar jnt)
  -TARSAL COALITION (CN>TC>TN; TC occurs btwn s.tali and middle facet of subtalar jnt; osseous/fibrous/cartilagenous or combo)
  -OS TRIGONUM SYNDROME (FHL; post ankle impingement) or POST ANKLE IMPINGEMENT (edema within posterior lateral talar tubercle or os trigonum; may involve FHL)
Neuropathic joint: hypointense BM on T1 and T2 (chronic); 4D’s (density, destruction, dislocation/disorganized, debris/loose bodies)

OM: ST ulcer/cellulitis/abscess w/ early periostitis → later cortical bone disruption or osteolysis w/ 30-50% bone loss=specific; periostitis or BM edema alone may be reactive “osteitis”; MOST SPECIFIC=loss of dark cortex with abnl cortical signal; Gad not necessary but useful to identify ST abscess or dead bone=sequestrum; +CRP in 98% but WBC not reliable; culture often -ve; usually hematogenous spread in kids (starts in subphyseal metaphysis and spread to subperiosteum or intra-articular but in neonates can spread to epiphysis across physis); brodie’s abscess=subphyseal lytic lesion in metaphysis with draining sinus; chronic OM can have draining sinus in adults

AVN or Osteonecrosis: serpentine double line sign on T2 (dark sclerotic zone with parallel bright zone of granulation) or diffuse low signal on T1/T2 (Navicular=Kohler kids, Mueller-Weiss in adults; Frieberg’s; Lat aspect of navicular secondary to stress fx; lateral sesamoid)

TIBIAL STRESS REACTION OR SHIN SPLINTS: Medial Tibial Stress Syndrome (MTSS) gradeI=periosteal edema, gradeII=also endosteal/BM edema on T2, gradeIII=also abnl BM signal on T1; gradeIV=fx line visible

TIBIAL STRESS INJURY OR FRACTURE: endosteal and periosteal edema; on axial imaging may see linear dark fracture cleft bordered by callus; also see adjacent deep subcut edema; gradeI=periosteal edema (shin splint), gradeII=plus BM edema on T2 (early stress injury), gradeIII=BM edema also on T1, gradeIV=visible cortical fx line—dark on all seq (stress fx)

Longitudinal stress fx= rare

Non-specific BM edema: may be stress reaction/response vs contusion (bone bruise)

TARSAL TUNNEL (medial under ses tali; flexor retinaculum)

SINUS Tarsi (cone-shaped wide lateral; interosseous lig med and cervical lig lat; fat; don’t make this dx in setting of acute trauma)

ANTEROLAT GUTTER (synovitis/fibrosis deep to ant tibiofib lig+ATAF)

MISCELLANEOUS:

EFFUSION

LOOSE BODY

MUSCLES

KAGER’S TRIANGLE

PLANTAR FASCITIS (>4mm; fascial/perifascial edema, calcaneal tuberosity edema)

PLANTAR FASCIAL TEAR (focal partial vs complete; components=Medial component, Lateral component, Central component, Digital bands)

PLANTAR FIBROMATOSIS (enhancing low T1/T2)

Morton’s neuroma (give Gad; teardrop or dumbbell shaped; low to int T2; best seen on coronal T1; inferior along 3rd web space or btwn 3rd/4th interMT space and less commonly along 2nd web space; plantar digital nerve perineural fibrosis) w/ or w/o intermetatarsal bursitis (high T2; vertical inbtwn MT) → ddx=plantar plate injury

Enthesitis (enhancement surrounding distal tendons and at insertion site; seen with seronegative spondylo-arthropathies)

Medial plantar nerve entrapment (aka jogger’s foot; usual site of compression is at knot of Henry where FDL and FHL criss-cross)
- **Subtalar** it-3 facets (ant, middle, post-largest)
- *Sustentaculum tali-middle facet*
- Sinus tarsi
Berndt & Hardy Grading of Osteochondritis Dessicans (OCD)

<table>
<thead>
<tr>
<th>Grading</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>undisplaced</td>
</tr>
<tr>
<td>II</td>
<td>partially detached</td>
</tr>
<tr>
<td>III</td>
<td>detached but not displaced</td>
</tr>
<tr>
<td>IV</td>
<td>detached + displaced or rotated</td>
</tr>
</tbody>
</table>

Type I: BM edema and cortex/cartilage intact  
Type II: cystic changes with partial separation of frag  
Type III: complete separation of frag but frag not displaced  
Type IV: displaced frag (loose body)
Fredericson classification system
for medial tibial stress syndrome on MRI

Grade 0
Normal

Grade 1
periosteal edema

Grade 2
marrow edema visible on T1-weighted images

Grade 3
marrow edema visible on T1 and T2-weighted images

Grade 4a
intracortical signal changes multiperipheral

Grade 4b
linear region of intracortical signal change

Lateral compartment

Anterior compartment

Deep posterior compartment

Superficial posterior compartment
Sinus Tarsi (Subtalar Joint)

- Superficial to deep

- Extensor Retinaculum

- Cervical Ligament

- Interosseous Ligament