

# ANKLE MRI

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

-ANTERIOR **EXTENSOR** (“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 TARSAI TUNNEL; some fluid in synovial sheath is normal if not circumferential)

-tom=PTT (most anterior; twice the size of other two, tendon sheath ends 1-2cm prior to NAVICULAR INSERTION--fluid here is not uncommon “peritendonitis”, 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; criss-crosses with FHL under foot at knot of Henry; INSERTS DISTAL PHALANX 2-5<sup>th</sup> TOES)

-posterior tibial **A/N/V**

-harry=**FHL** (COMM W/ JT; passes thru fibrous tunnel btwn lat and medial talar tubercles; under ses tali of calcaneus; injury seen in athletes with extreme plantar-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 1<sup>st</sup> DISTAL PHALANX)

-LATERAL **PERONEUS** (behind and underneath fibula as pulley; PB ant and PL post to peroneal tubercle of calcaneus)

-PB ANTERIOR AND MEDIAL TO PL; share common tendon sheath to level of tibial tip; may dislocate laterally from behind fibula with detachment of superior retinaculum; look for shallow retromalleolar groove of fibula; magic angle under fibula

-PB (FLAT or crescentic with posterior concavity; ATTACHES TO 5<sup>th</sup> 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 asymp 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 1<sup>st</sup> MT BASE OR PLANTAR ASPECT OF MED CUNIFORM)

-Peroneal quartus (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; retrocalcaneus bursa may have small amount of fluid <6mm; kager’s fat inflam/edema)

-TEAR=interstitial vs partial vs complete

-TENDINITIS= paratendonitis → peritendonitis tear (early tendonitis may be seen as edema post to tendon along paratenon—analagous to synovitis “paratenonitis”; later peritendinous edema “peritendonitis”)

-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/ovoid internal high T2 signal may represent interstitial tear or mucoid degen; striated/stippled Xanthoma in familial hypercholesterolemia; 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

-CALCANEOFIB (#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

-TIBIONAV—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 (3facets on talus and calc but only 2 subtalar jt; ant and middle facet make up ant subtalar jt=talocalcaneonavicular jt ; post facet make up post subtalar jt)

-TARSAL COALITION (CN>TC>TN; TC occurs btwn s.tali and middle facet of subtalar jt; 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)

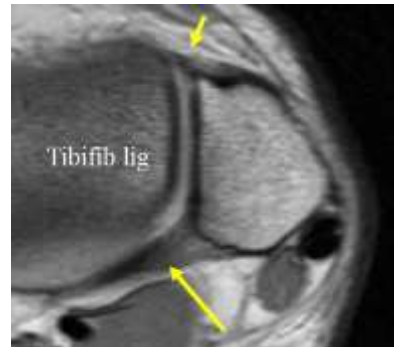
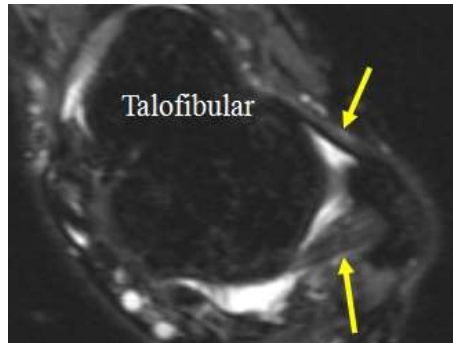
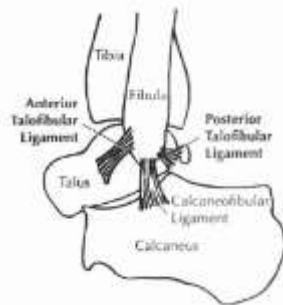
-**PLANTAR FASCIAL TEAR** (focal partial vs complete; components=Medial component, Lateral component, Central component, Digital bands)

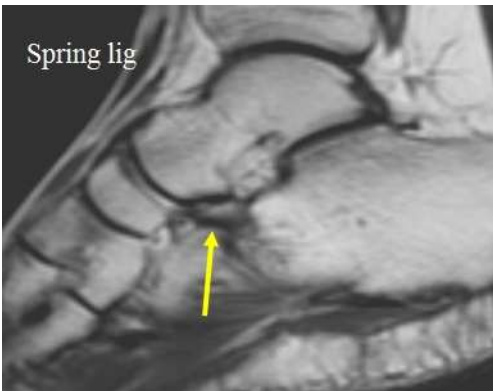
-**PLANTAR FIBROMATOSIS** (enhancing low T1/T2)

-Morton's neuroma (give Gad; teardrop or dumbbell shaped; low to int T2; best seen on coronal T1; inferior along 3<sup>rd</sup> web space or btwn 3<sup>rd</sup>/4<sup>th</sup> interMT space and less commonly along 2<sup>nd</sup> 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)





Below

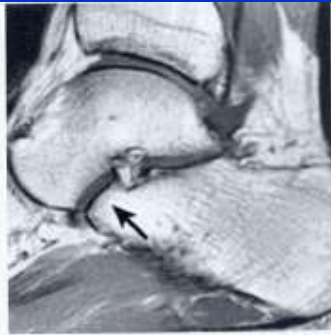


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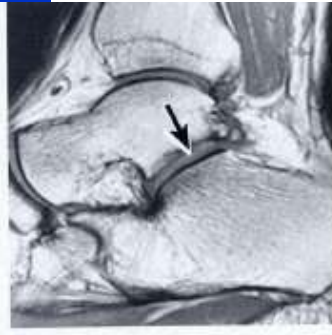
- **Subtalar jt**-3 facets (**ant**, **middle**, **post**-largest)
- *Sustentaculum tali*-middle facet
- Sinus tarsi



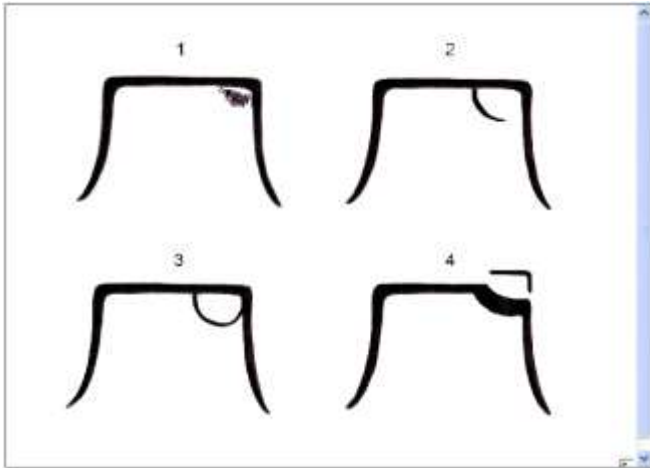
Anterior Subtalar Facet



Middle Subtalar Facet

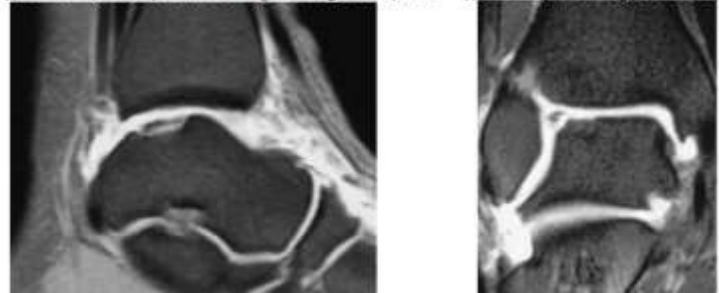


Posterior Subtalar Facet



Type I=BM edema and cortex/cartilage intact Type II=cystic changes with partial separation of frag

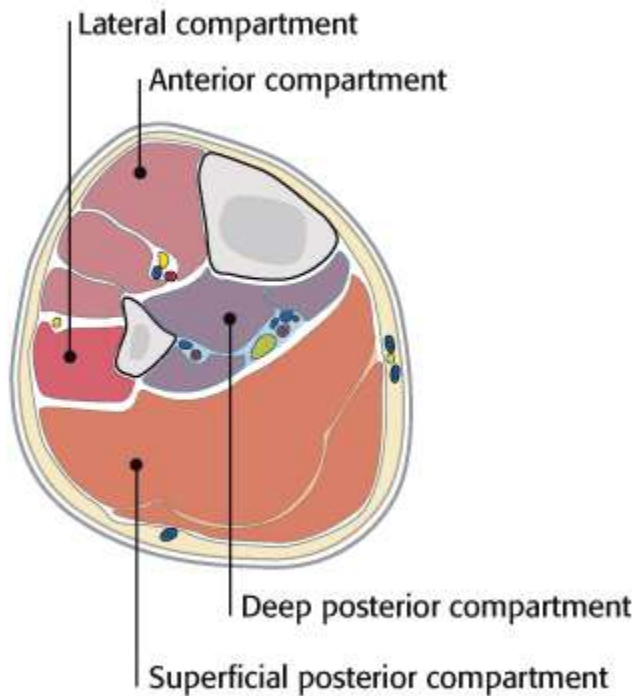
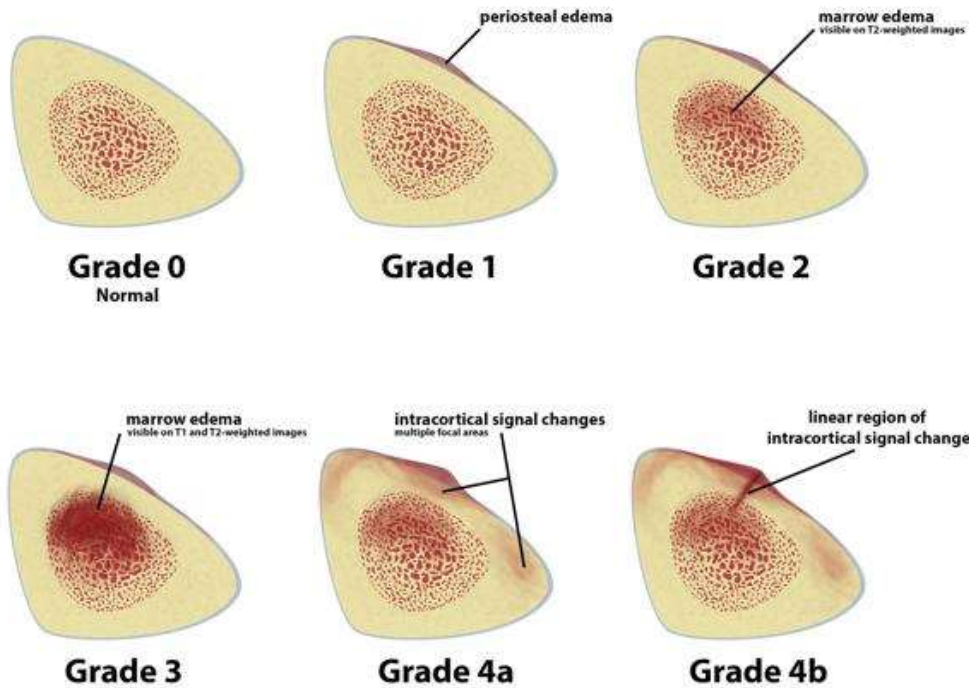
Type III=complete separation of frag but frag not displaced Type IV=displaced frag (loose body)

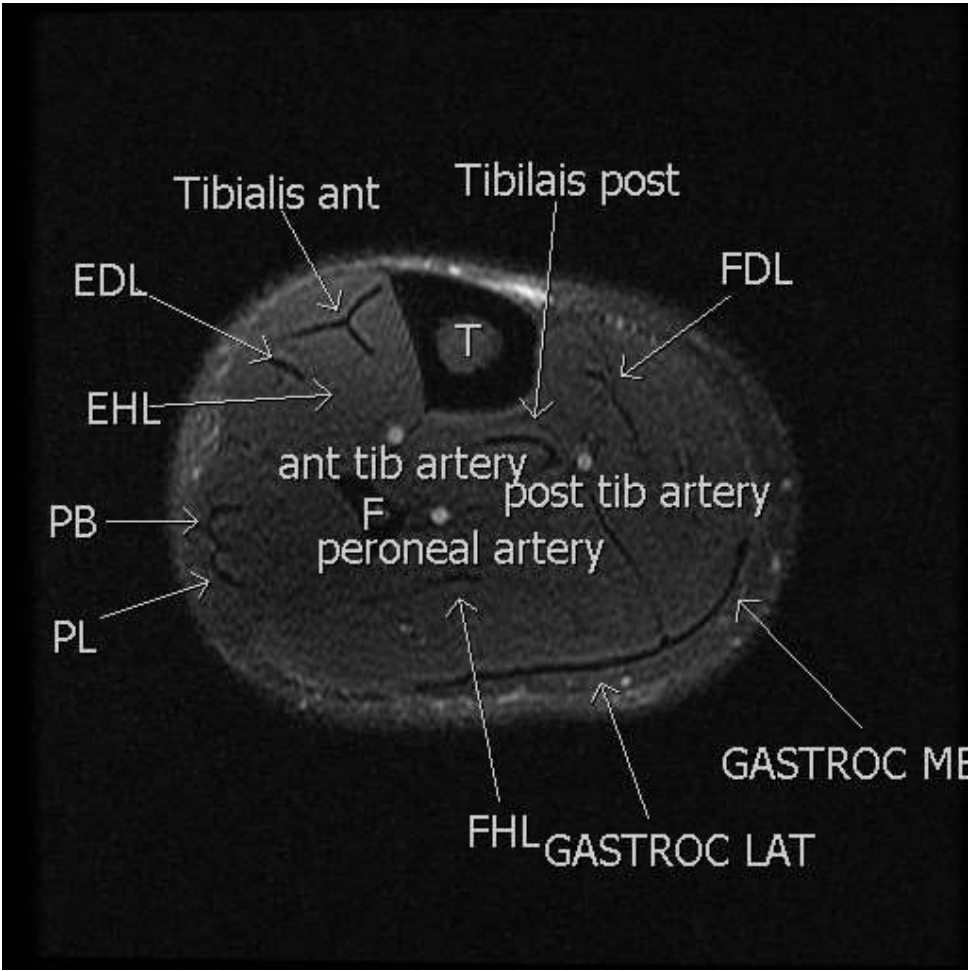


### ***Berndt & Hardy Grading of Osteochondritis Dessicans (OCD)***

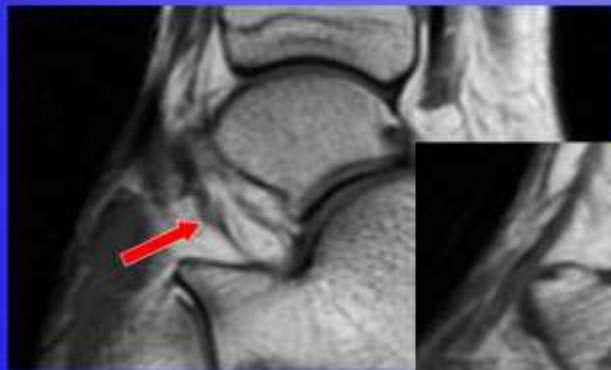
<b>Grading</b>	<b>Description</b>
I	undisplaced
II	partially detached
III	detached but not displaced
IV	detached + displaced or rotated

# Fredericson classification system for medial tibial stress syndrome on MRI



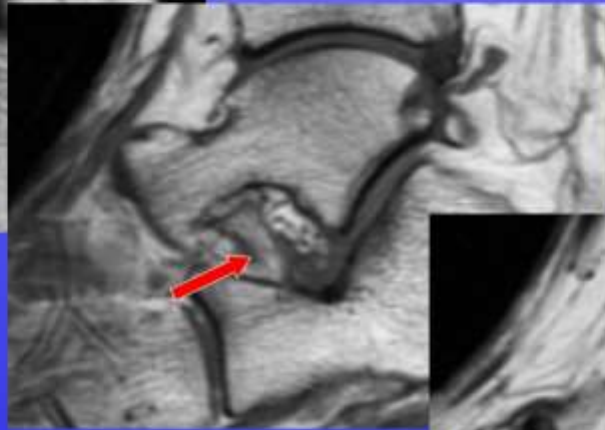


# Sinus Tarsi (Subtalar Joint)



-Superficial to deep

-Extensor  
Retinaculum



-Cervical  
Ligament



-Interosseous  
Ligament

