



PAIN MANAGEMENT 1st course



Sawa University

College of health and medical techniques

Department of Radiology

second stage

جامعة ساوة الاهلية \كلية
التقنيات الطبية قسم الاشعة
المادة \تثريح شعاعي
المرحلة الثانية

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Week 7 – Foot Anatomy & Radiological Anatomy

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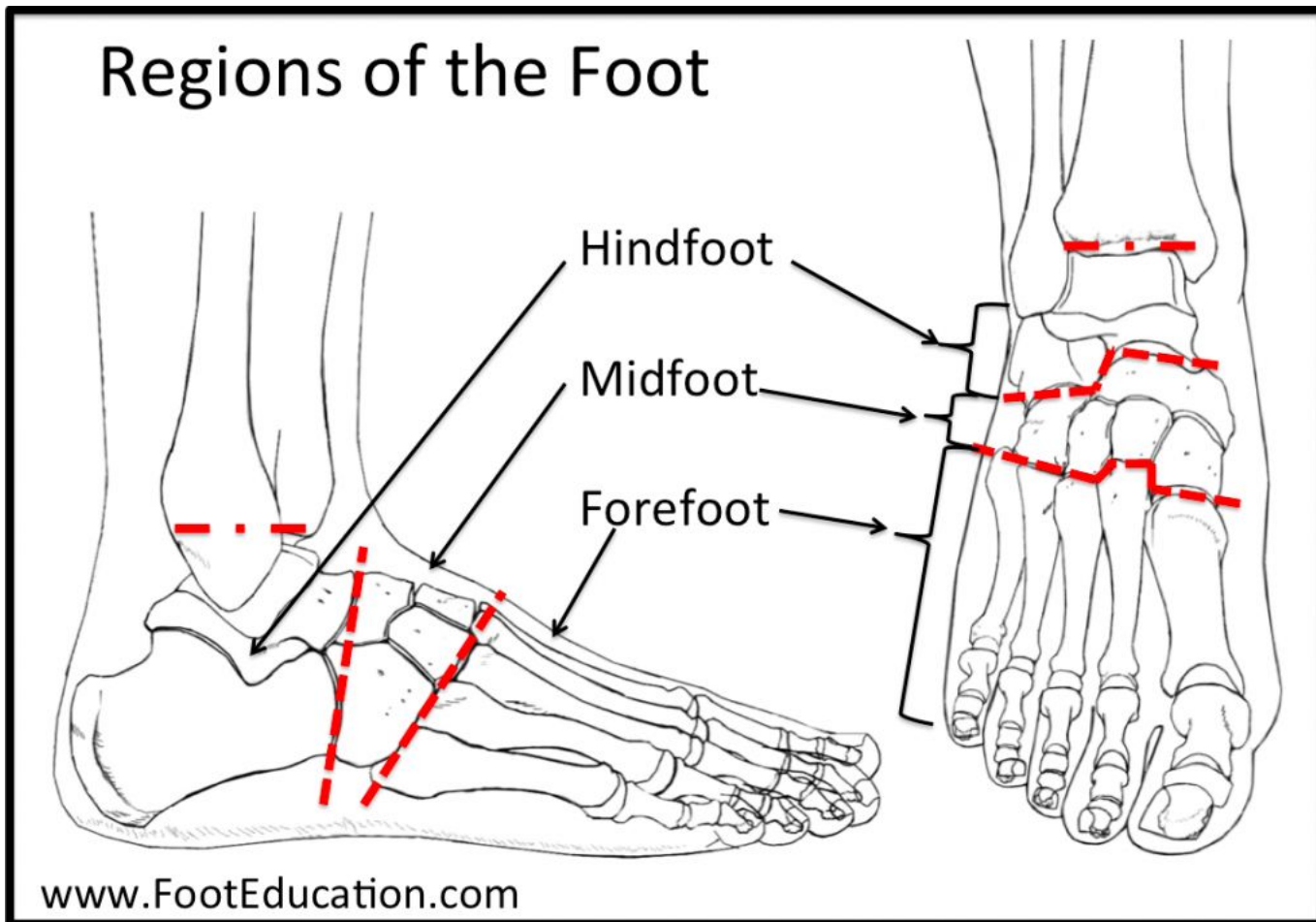
Introduction

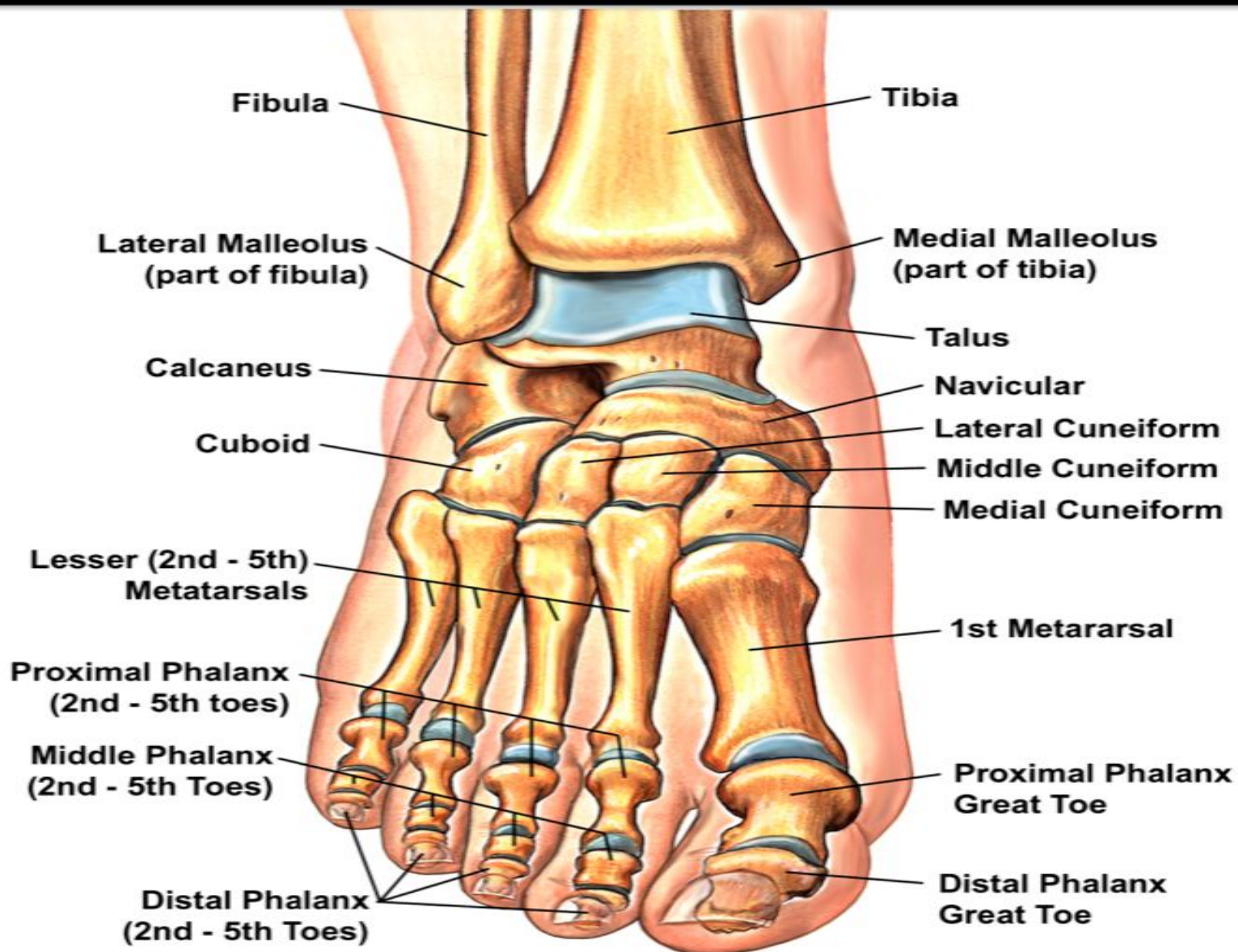
- • Comprehensive overview of bony, joint, ligamentous, and soft tissue anatomy of the foot.
- • Emphasis on structural arrangement before interpreting radiographs.
- • Understanding normal is essential before diagnosing pathology.

Normal Anatomy: Regions of the Foot

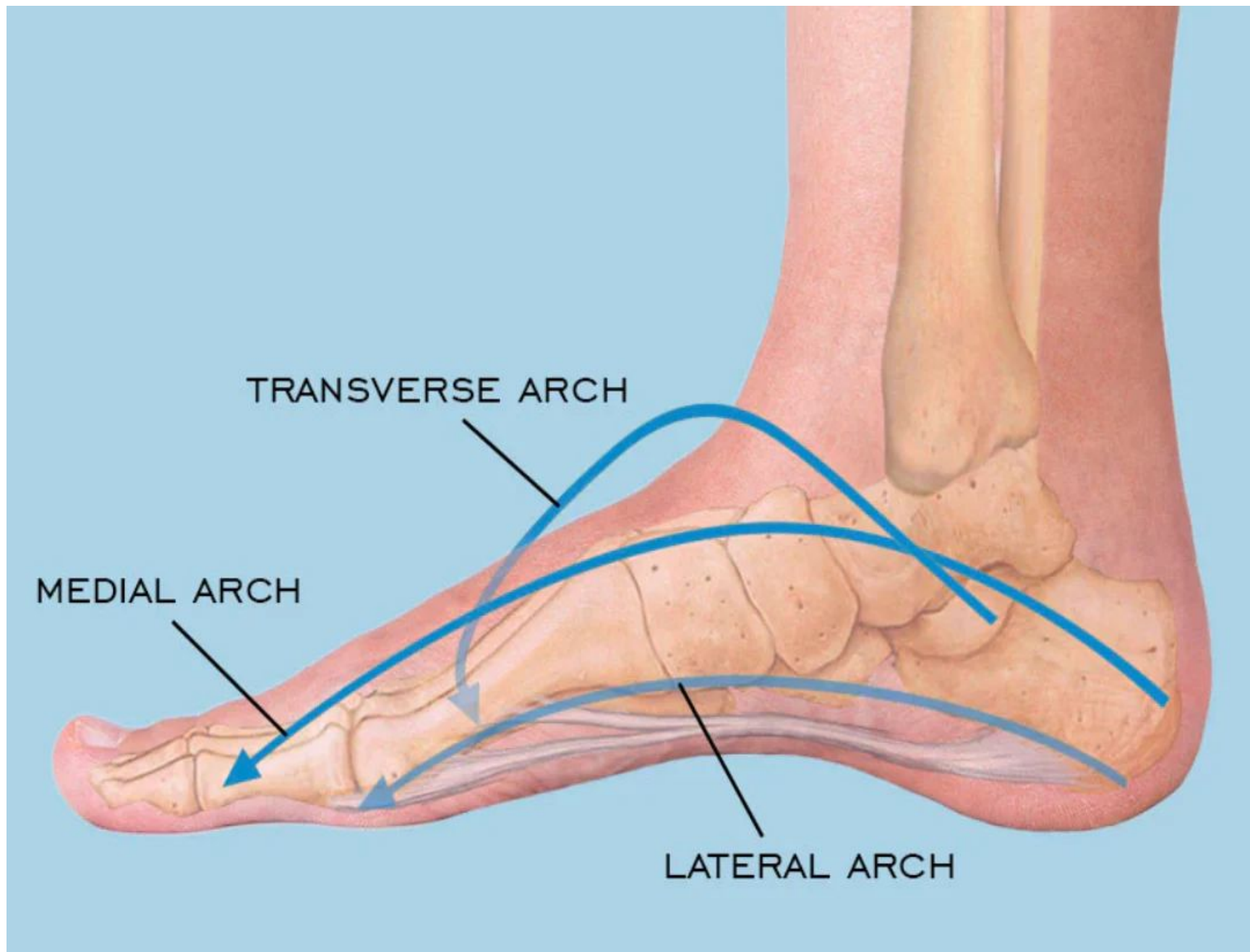
- • Hindfoot: talus and calcaneus.
- • Midfoot: navicular, cuboid, and three cuneiforms.
- • Forefoot: metatarsals and phalanges.
- • Functional arches: medial longitudinal, lateral longitudinal, and transverse arches.

Regions of foot









Normal Anatomy: Calcaneus

- • Largest foot bone forming heel and lever arm for gait.
- • Key structures: sustentaculum tali, peroneal tubercle, posterior facet.
- • Articulates with talus (subtalar joint) and cuboid (calcaneocuboid joint).

Calcaneus



Lateral view



Medial view



Dorsal (superior)
view



Plantar (inferior)
view

Normal Anatomy: Talus

- • Second largest tarsal bone; no muscular attachments.
- • Parts: head, neck, body, and dome.
- • Articulations: tibia, fibula, calcaneus, navicular.
- • Critical for ankle stability and weight transfer.

Normal Anatomy: Navicular & Cuneiforms

- • Navicular: keystone of medial arch; articulates with talus and cuneiforms.
- • Medial, intermediate, lateral cuneiforms articulate with corresponding metatarsals.
- • Contribute to flexibility and load distribution.

Normal Anatomy: Cuboid

- • Lateral column bone articulating with calcaneus and metatarsals.
- • Groove for peroneus longus tendon on plantar surface.
- • Key stabilizer of the lateral longitudinal arch.

Normal Anatomy: Metatarsals

- • Five long bones numbered medial → lateral.
- • Bases articulate with tarsals; heads articulate with proximal phalanges.
- • 1st is thickest; 2nd is longest; 5th has styloid process.

Normal Anatomy: Phalanges

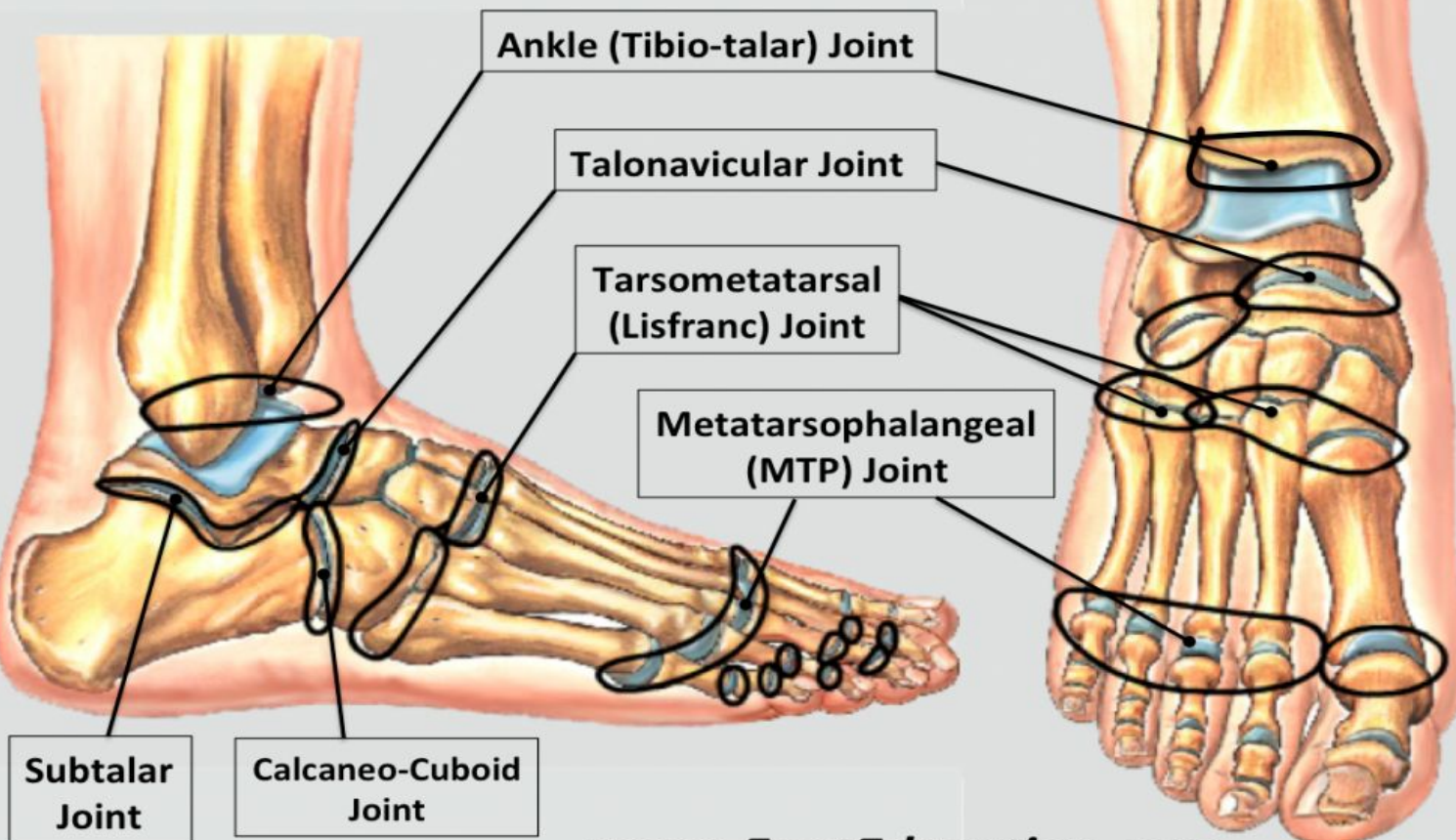
- • Hallux has 2 phalanges; digits 2–5 have 3 each.
- • Structured to allow push-off mechanics during gait.
- • Surrounded by fibrous sheaths and extensor expansions.

Normal Anatomy: Major Joints

- • Talocrural (ankle) joint: tibia/fibula with talus.
- • Subtalar joint: articulation between talus and calcaneus.
- • Midtarsal (Chopart) joint: calcaneocuboid + talonavicular.
- • Lisfranc (tarsometatarsal) joints: bases of metatarsals with cuneiforms/cuboid.
- • Metatarsophalangeal and interphalangeal joints.

Major joints

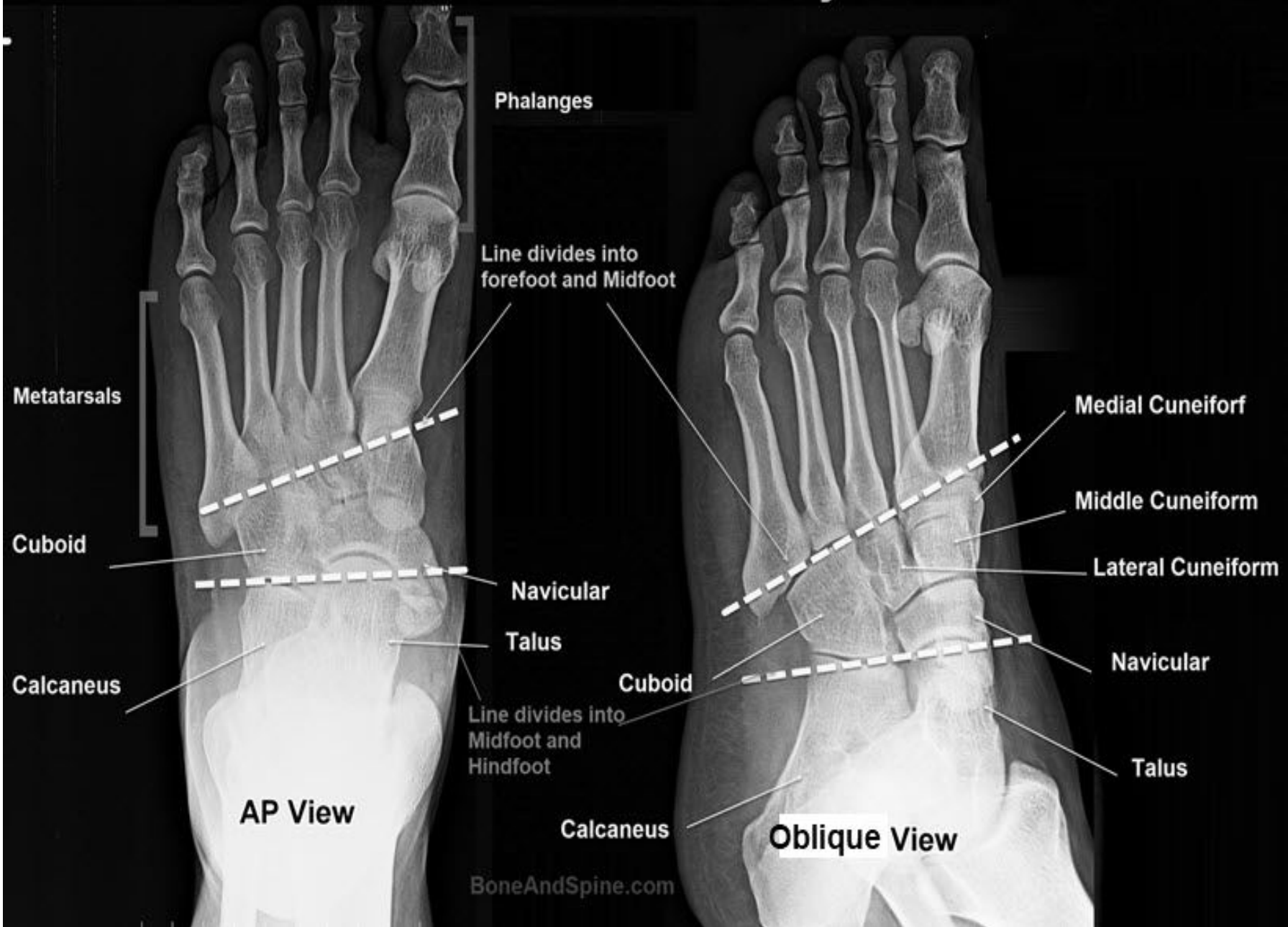
Common Joints of the Foot & Ankle



Radiological Anatomy: General Principles

- • Evaluate alignment, cortical integrity, trabecular patterns, and joint congruity.
- • Compare bilateral structures when unsure.
- • Understand normal variants to avoid misdiagnosis.

AP and Lateral View X-rays of Foot



Lateral view

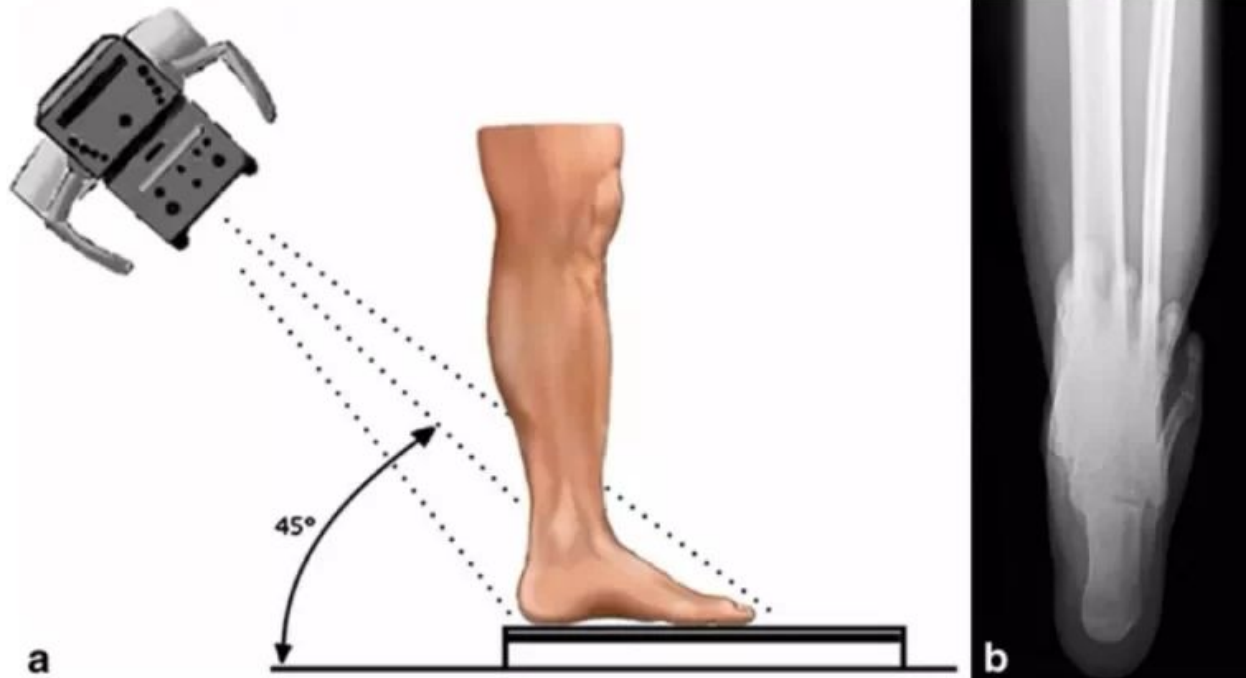


Radiological Anatomy: Calcaneus

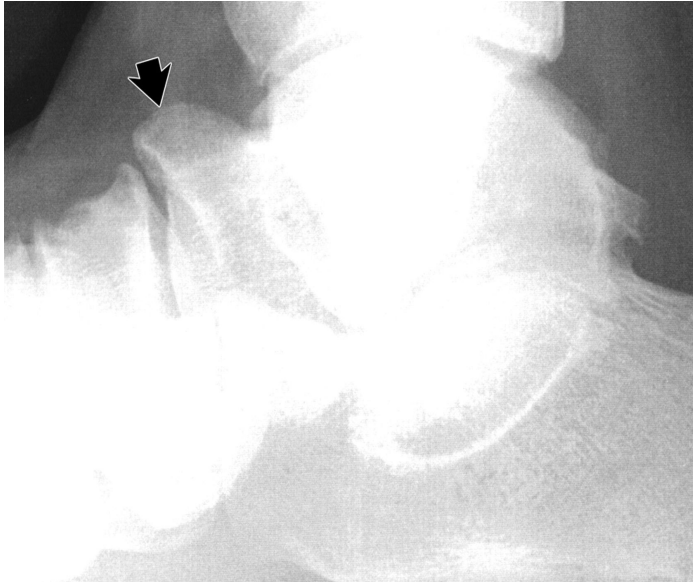
- • Lateral view: Böhler's angle, Gissane's angle, subtalar joint.
- • AP view: limited value; cortical outline important.
- • Harris–Beath axial view: coalition evaluation.
- • Key trabecular patterns: vertical compressive and horizontal tensile bands.

- Harris–Beath axial view:

Harris Beath (axial) view

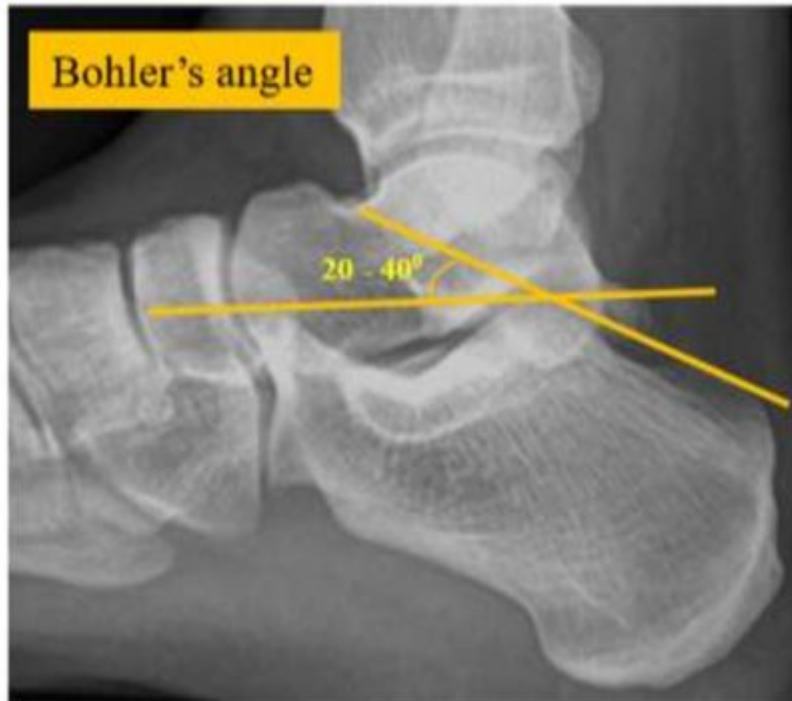


للاطلاع فقط



—Lateral radiography of foot used to evaluate subtalar coalition. Lateral radiograph of 55-year-old man with tarsal coalition and equivocal talar beak (arrow) shows that projection from head of talus could be interpreted as either beak or osteophyte. Correct diagnosis was made on basis of dysmorphic sustentaculum tali and positive C sign.

Lateral view angles



الشرح للاطلاع فقط

- Bohler's and Gissane's angle are drawn in lateral view Bohler's angle is the intersection of a line drawn from the highest point of the calcaneal tuberosity to the highest point of the posterior facet and a line between the anterior and posterior articulating facets.
- Bohler's angle of 20° or less is a sign of a calcaneal fracture . Gissane angle is the intersection of two lines drawn parallel to the anterior and posterior facets of the subtalar joint. A normal angle of Gissane is 100 to 130

Radiological Anatomy: Talus

- • Dome curvature smooth and symmetric.
- • Talar neck: sensitive to subtle fractures.
- • Sinus tarsi visibility: indicates absence of coalition.
- • Lateral radiograph: talar tilt and talonavicular coverage.

Radiological Anatomy: Navicular & Midfoot

- • Navicular tuberosity seen in AP/oblique.
- • Stress fractures often subtle: look for cortical disruption.
- • Evaluate naviculocuneiform joint alignment.
- • Lateral column visualization in oblique view.

Radiological Anatomy: Cuneiforms

- • AP/oblique best for joint spaces.
- • Alignment with metatarsal bases critical for Lisfranc integrity.
- • Note wedge shapes contributing to transverse arch.

Radiological Anatomy: Cuboid

- • Medial oblique view optimal.
- • Assess cuboid–metatarsal articulations.
- • “Cuboid syndrome” correlates with subtle lateral column misalignment.



Radiological Anatomy: Metatarsals

- • AP: intermetatarsal angle evaluation.
- • Oblique: best for base fractures and Lisfranc evaluation.
- • Shaft uniformity used to detect early stress reactions.
- • 5th metatarsal: differentiate avulsion vs Jones fracture.

Radiological Anatomy: Phalanges

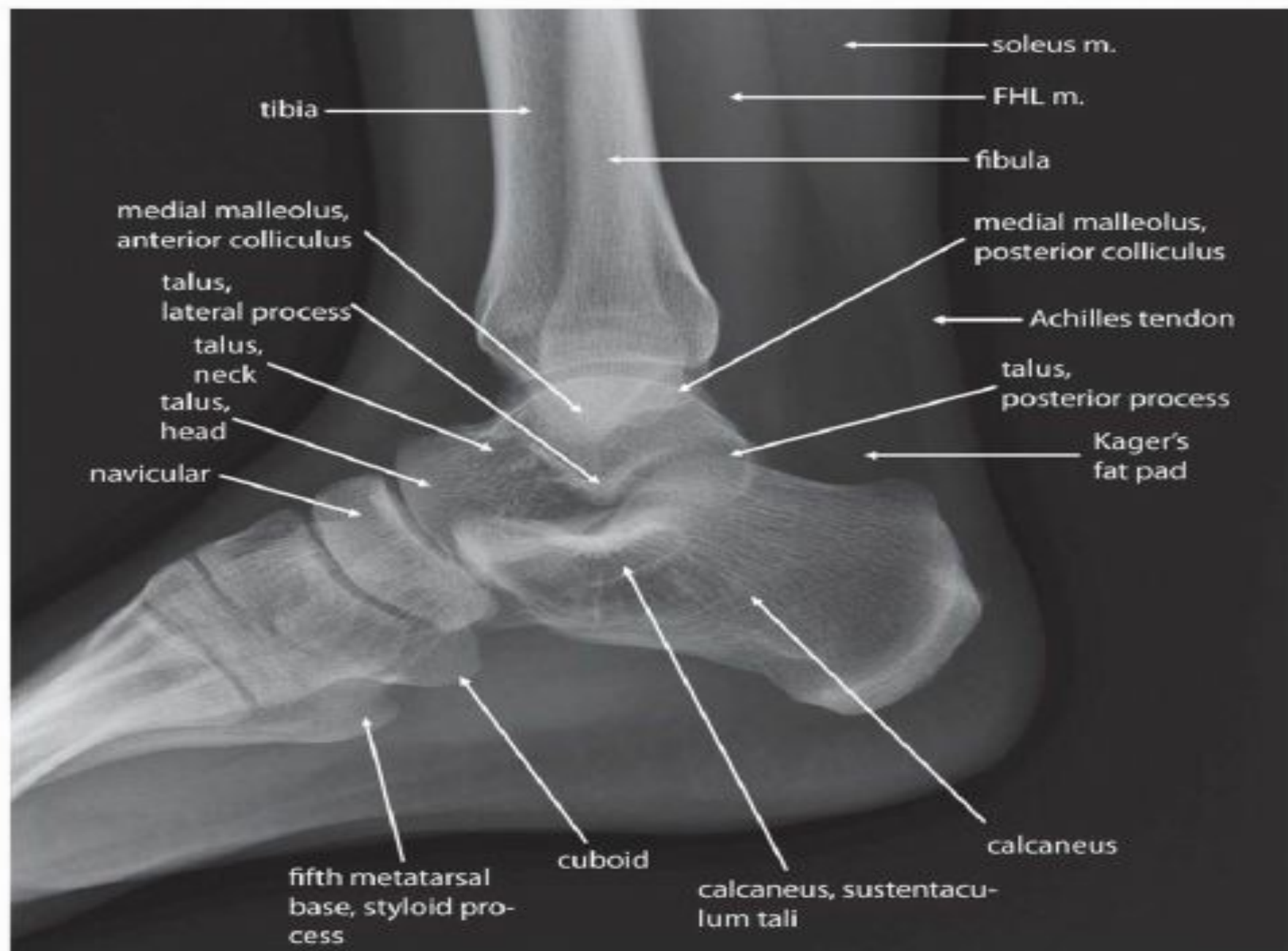
- • Clear joint margins indicate normal cartilage thickness.
- • Growth plates easily mistaken for fractures in pediatrics.
- • Distal tuft useful in identifying systemic diseases (e.g., scleroderma).

Radiological Anatomy: Joints

- • Talocrural joint: mortise symmetry essential.
- • Subtalar joint: posterior, middle, anterior facets visible on oblique/lateral.
- • Lisfranc: alignment between medial cuneiform and 2nd metatarsal.
- • Chopart joint: evaluated mainly in oblique views.

Standard Radiographic Views

- • AP view: forefoot alignment, cuneiform-metatarsal congruity.
- • Lateral view: arches and talar alignment.
- • Oblique (30° medial): tarsometatarsal articulation clarity.
- • Axial calcaneal view: subtalar joint and coalition analysis.
- • Weight-bearing films required for biomechanical assessment.



Important Radiological Angles

- • Böhler's Angle ($20-40^\circ$): depression indicates calcaneal fracture.
- • Gissane's Angle ($120-145^\circ$): increased values = calcaneal disruption.
- • Meary's Angle: talo-1st metatarsal angle; indicates arch deformity.
- • Calcaneal Pitch Angle: evaluates pes planus vs cavus.
- • Intermetatarsal angles used in hallux valgus grading.

Lisfranc Joint Radiology (Advanced)

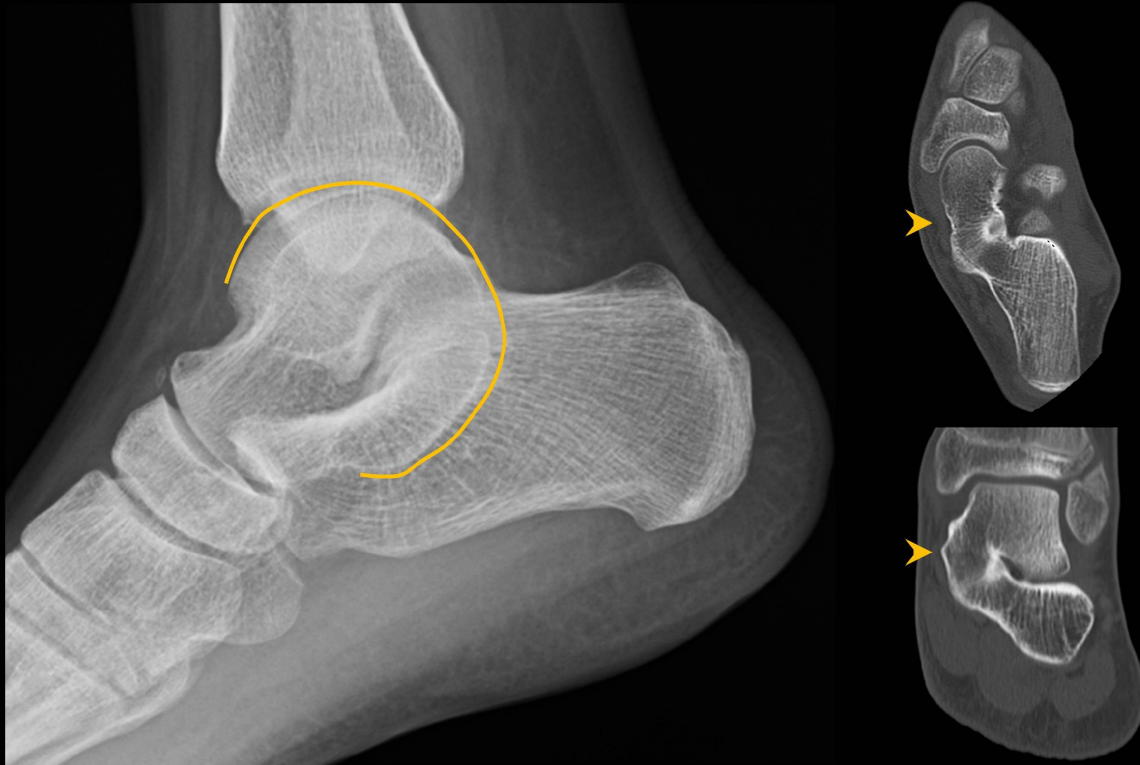
- • Diastasis >2 mm between 1st & 2nd metatarsal bases is abnormal.
- • Fleck sign: pathognomonic for Lisfranc injury.
- • Stress views needed when routine films appear normal.
- • Lateral column alignment critical in severe injuries.

Tarsal Coalition Radiology

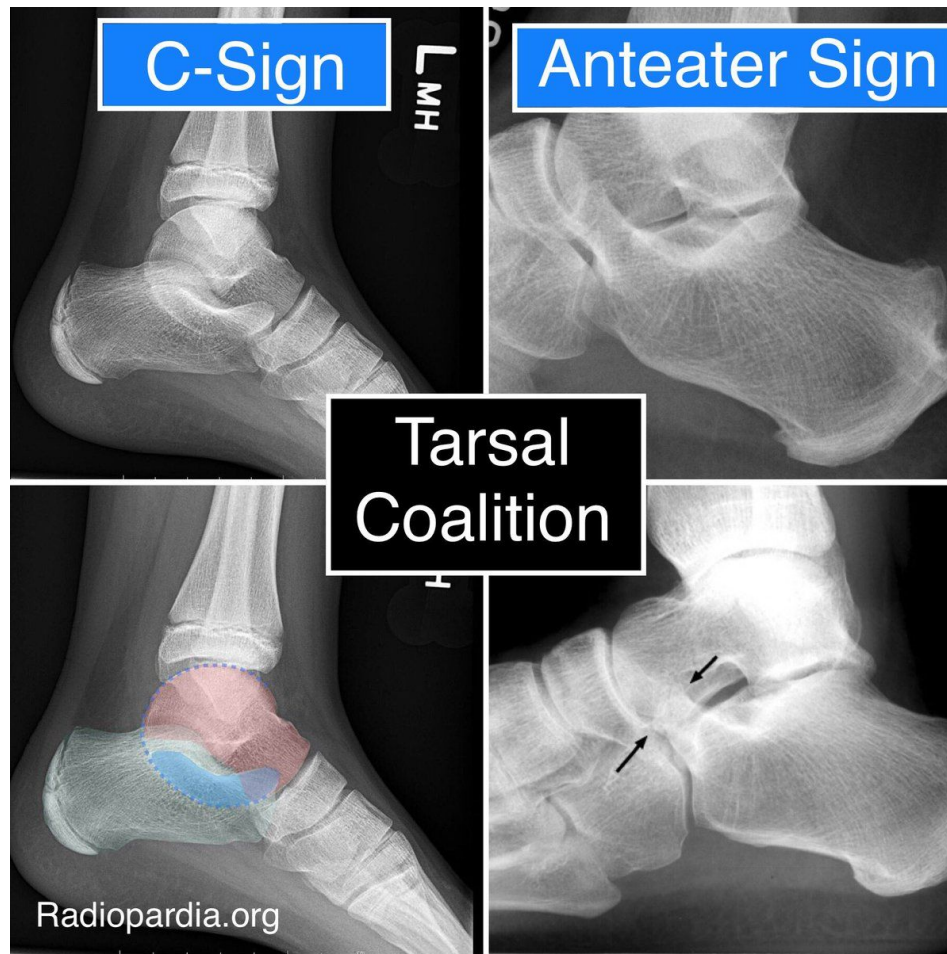
- • Talocalcaneal coalition: C-sign on lateral view.
- • Calcaneonavicular coalition: “anteater sign”.
- • Harris view helps visualize middle facet.
- • Coalition alters subtalar biomechanics and arch mechanics.

C sign

C SIGN (TALOCALCANEAL COALITION)



Anteater sign and C sign



Pediatric Foot Radiology

- • Multiple open growth plates require age-specific interpretation.
- • Navicular ossifies last (3–5 years).
- • Apophyseal injuries mimic fractures.
- • Compare with contralateral foot in questionable cases.

pediatric foot



Summary

- • Normal anatomy must be mastered before radiologic interpretation.
- • Radiological anatomy involves alignment, angles, trabeculae, and joint congruity.
- • Multiple views and weight-bearing films enhance diagnostic accuracy.
- • Pediatric imaging requires special caution due to open physes.