Neuropathic (Charcot) Arthropathy

- Clinical Issues
  - Diabetes mellitus is common in general population
    - » 15% of diabetic patients develop Charcot joints, especially in lower limb (such as foot and ankle)
  - 20% of syringomyelia patients develop Charcot joints
  - Worldwide; 10-20% of patients with tabes dorsalis develop Charcot joints.
- Etiology
  - Primary pathogenesis uncertain
  - Polyneuropathy → ↓ pain sensation and proprioception → recurrent mechanical injury
    - Multifactorial: likely combination of long-term progressive microrepetitive trauma and abnormal vascular innervation
      - Neuromuscular abnormality → joint instability → abnormal joint loading → progressive joint destruction
      - Hyperemia → inflammatory response → osteoclast/osteoblast imbalance → osteolysis/bone resorption

Associated etiologies by location

- Ankle/foot: diabetes mellitus, amyloidosis, meningomyelocele
- Shoulder: syringomyelia (if suspected, consider MR of cervical spine)
- Wrist: diabetes mellitus; syringomyelia (if suspected, consider MR of cervical spine)
- Hip: alcoholism, tabes dorsalis
- Knee: tabes dorsalis, congenital indifference or insensitivity to pain, steroid injection, amyloidosis
- Spine: spinal cord injury, tabes dorsalis, diabetes mellitus

Imaging

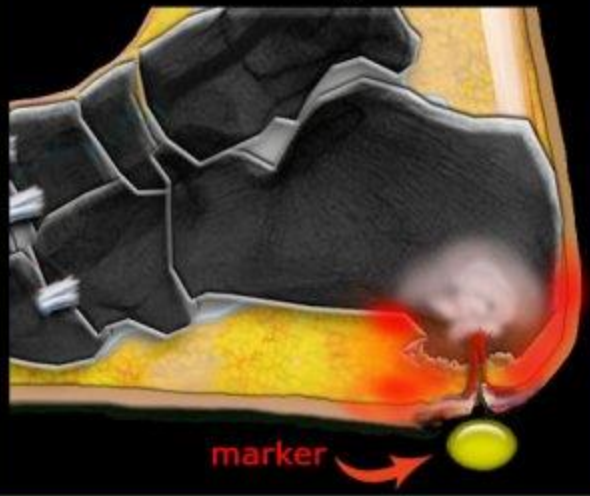
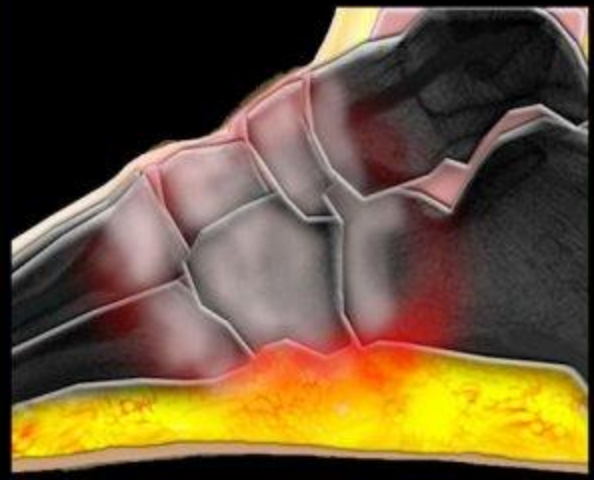
- Early-stage disease
  - May appear normal or resemble osteoarthritis (OA)
  - Osteopenia
  - Subtle subluxations (commonly Lisfranc joint at foot)
  - Collapse of longitudinal arch (at foot)
  - Mixed erosion-like cysts and productive changes
- Middle- and late-stage disease
  - Prominent osseous debris
  - Prominent joint dislocation/subluxation, disorganization
  - Large joint effusions
    - » May present as palpable soft tissue mass/prominent soft tissue density
    - » May contain floating osseous debris, mimicking juxtaarticular or paraspinal mass
  - Prominent osteophyte formation, bone proliferation, ± bone consolidation
  - ± sclerosis
  - Prominent bone/joint deformity

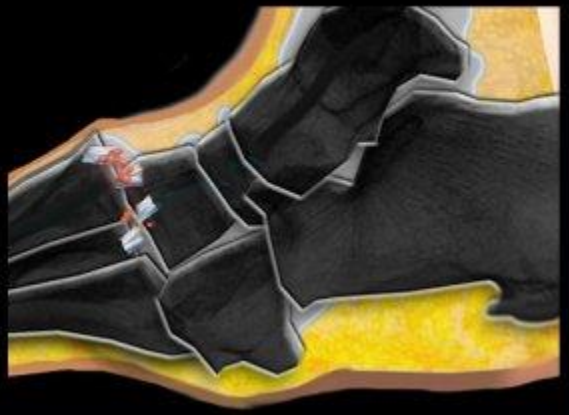
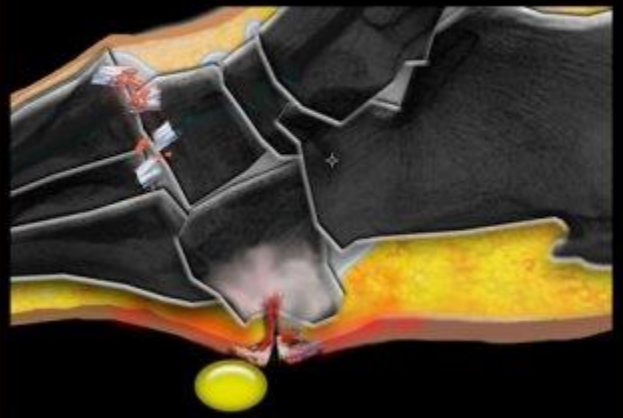
Tabes dorsalis

- Tertiary late neurosyphilis in which there is demyelination of the posterior columns of the spinal cord.
- These patients have lancinating nerve root pain which is aggravated by coughing, and features of sensory ataxia with ocular involvement

Neuropathic joint “5 D’s”

- Dense Subchondral bone
- Dislocation
- Destruction
- Deformity
- Debris

Osteomyelitis	Active Charcot
	
Hot red foot with ulcer Forefoot: MTP's IP's Hindfoot: calcaneus *X-ray* normal first weeks ***MRI*** marrow edema in forefoot and hindfoot near ulcer	Hot red foot - no ulcer Midfoot subarticular *X-ray* normal first weeks ***MRI*** marrow edema in midfoot subchondral

Chronic Charcot	Superimposed infection
	
Swollen neuropathic foot no ulcer	Hot red foot with ulcer or sinus tract
X-ray Joint deformity dislocation Rocker-bottom	*X-ray* Joint deformity dislocation Rocker-bottom
MRI no marrow edema	*MRI* marrow edema in cuboid near ulcer

3. Charcot neuro-osteo arthropathy

A. Normal bone *density* is shown without joint *distention*, bony *debris*, joint *disorganization*, or *dislocation* in a patient with clinical complaints: no radiological characteristics of neuro-osteoarthropathy.

B-D. Progressive neuro-osteoarthropathy with subchondral cysts, erosions, joint distention and (sub)luxation (B-C), and joint dislocations (D). Subluxation of the first and second tarsometatarsal joints is efficiently evaluated on a dorsoplantar film of the foot (A, C, D), whereas subluxation at the third through fifth tarsometatarsal joints is best evaluated on a pronated oblique foot film (B)

Progressive Charcot neuro-osteoarthropathy – dislocation of the Lisfranc joint.

Dr IG Schoots & Dr M. Maas, Dept. of Radiology, AMC, Amsterdam, The Netherlands

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AP view of hypertrophic Charcot arthropathy of the foot in a middle-aged woman with chronic foot swelling and deformity shows lateral subluxation → at the 2nd-5th tarsometatarsal (TMT) joints and chronic-appearing smooth periosteal reaction ⇨. An old healed 2nd metatarsal neck fracture → is also present.

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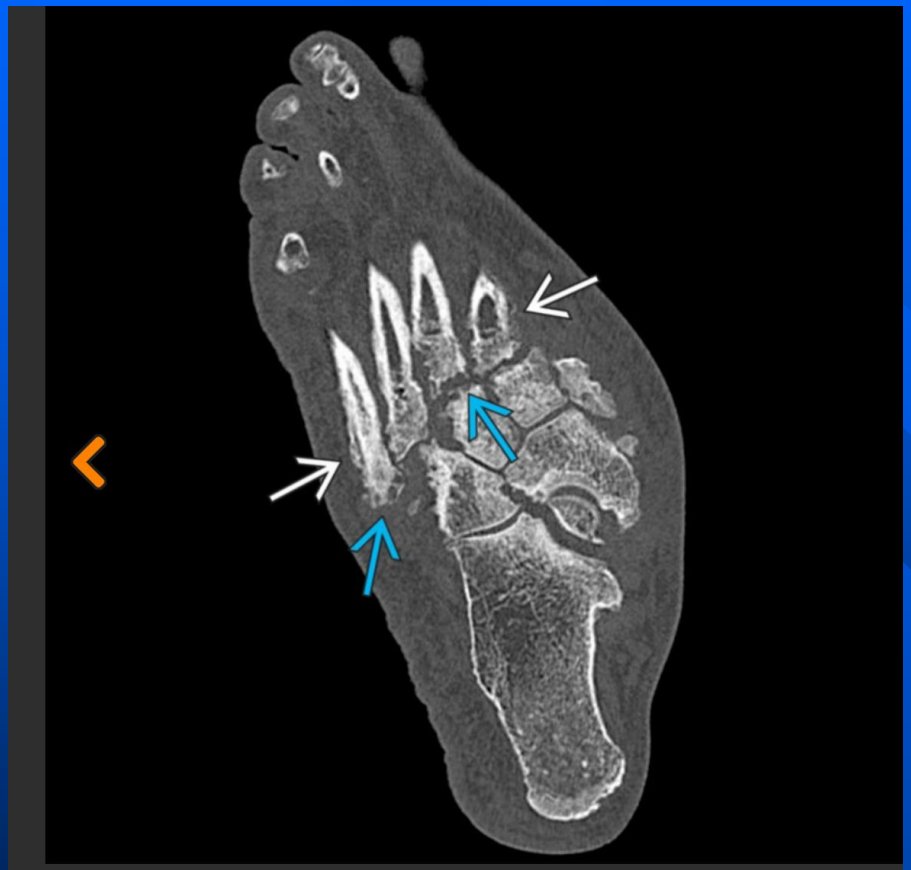
Weight-bearing lateral view in the same patient shows hypertrophic changes at the Lisfranc joint with flattened arch and likely tarsal joint destruction →.



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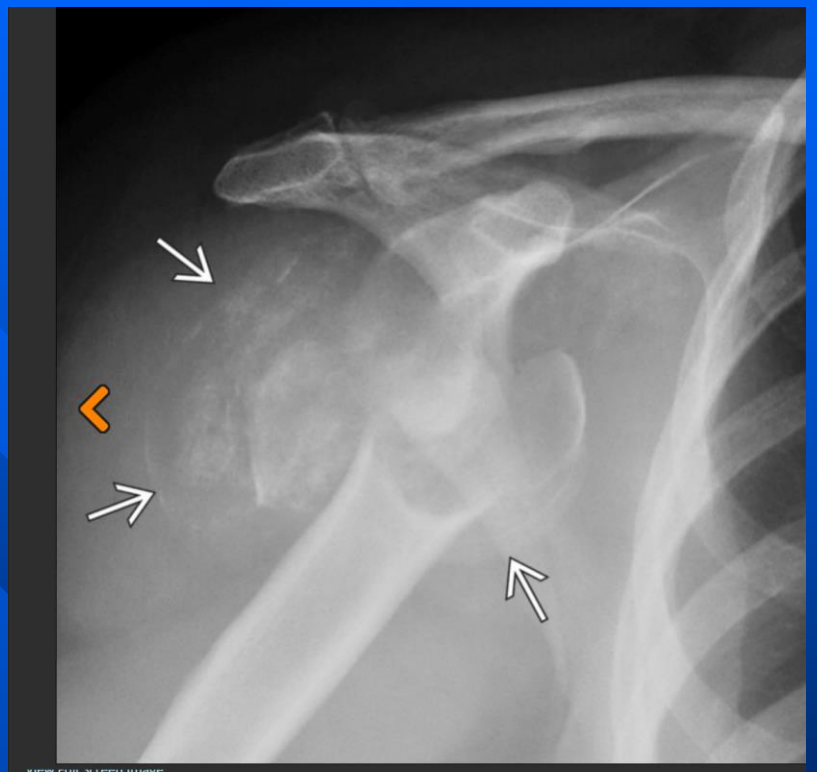
Reformatted long-axis NECT in the same patient shows prominent erosion-like changes → and bone production → involving the 2nd-5th TMT joints with subluxation, consistent with Charcot arthropathy.



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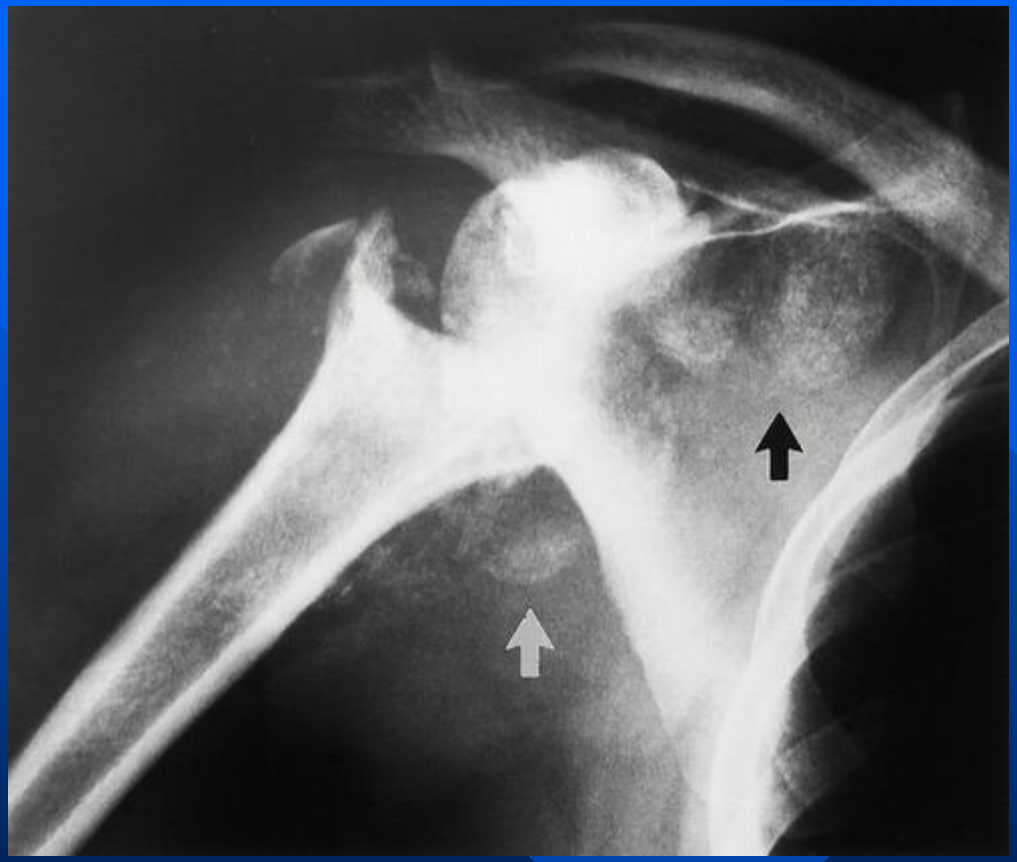
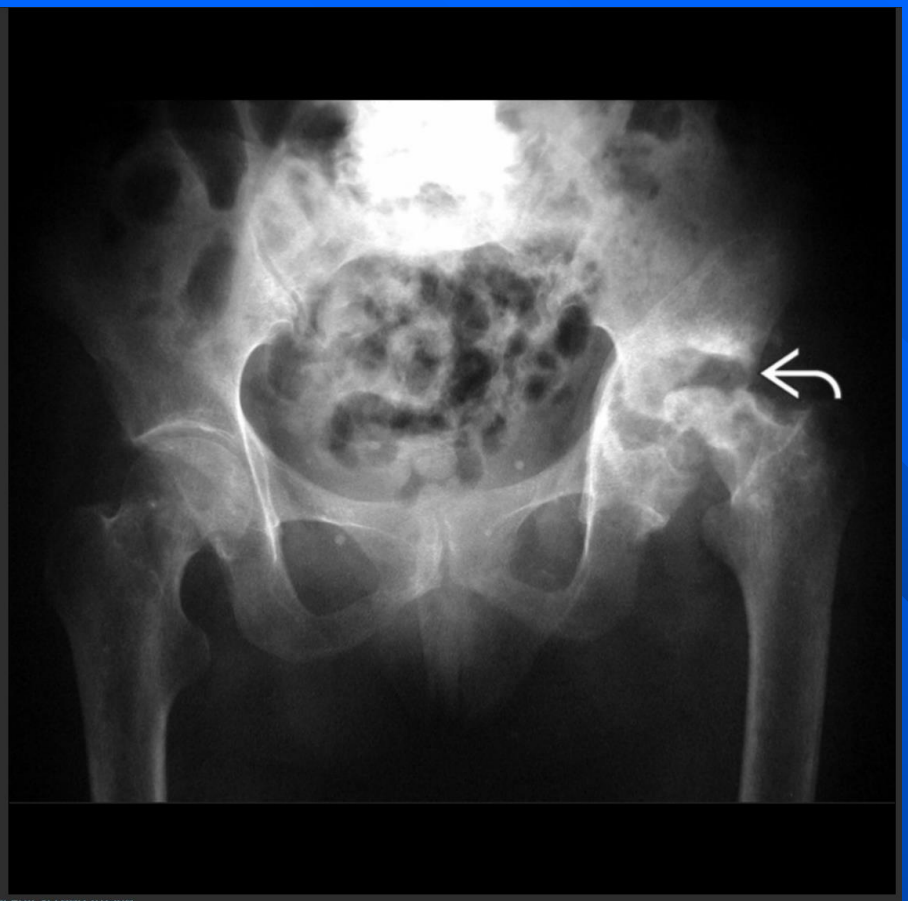
AP view shows a dislocated shoulder with severe fragmentation and resorption of the humeral head with bone debris. The placement of the debris suggests massive distention of the glenohumeral joint and subacromial-subdeltoid bursa →. The combination of findings is typical of Charcot (neuropathic) shoulder.





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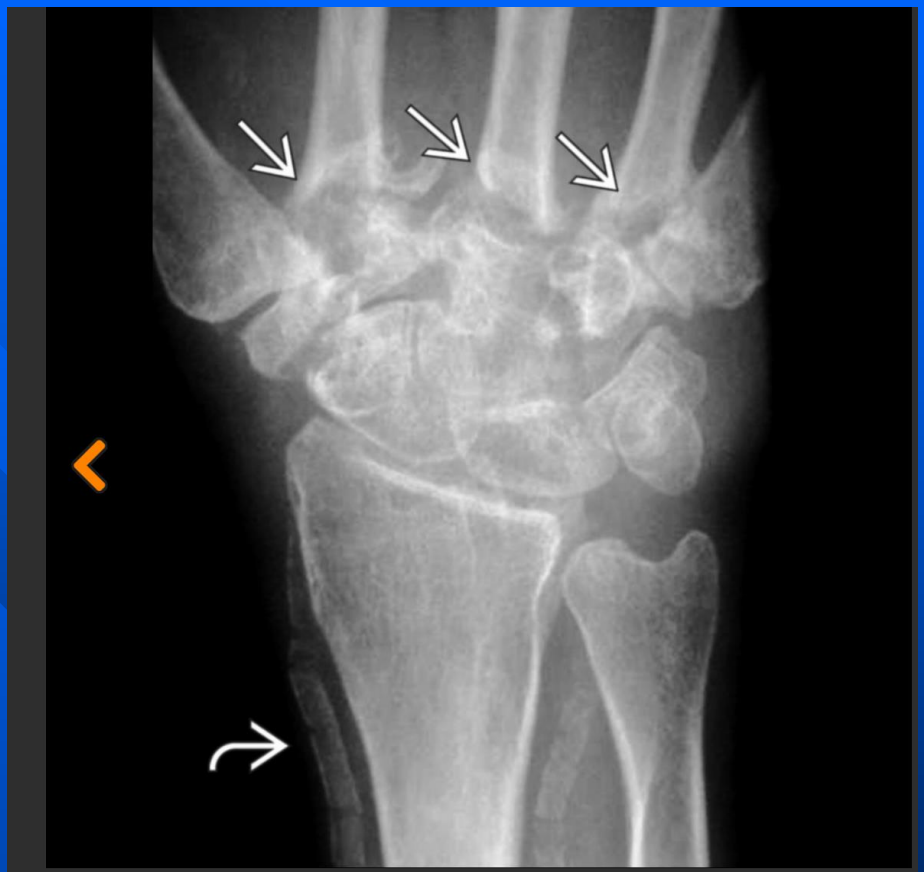
AP view of the pelvis shows destruction of the left hip, typical of a Charcot joint, in this case from tabes dorsalis. The multiple foci of metallic density within the soft tissues of the buttocks were from heavy metal injections for the treatment of syphilis, a historic treatment.



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PA view of the wrist shows neuropathic carpometacarpal joints. There is vascular calcification. This is carpal diabetes-related Charcot arthropathy.


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