Patients with a Crooked Radiograph After Ankle Fracture: What To Do?
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1) Ankle fracture malunion problems
   a) Kinematics
   b) Eventual development of post-traumatic arthritis due to altered joint contact stresses

2) Altered joint contact stresses
   a) Classically, any intra-articular fracture with step off, generally greater than 2 mm, significantly alters joint contact stresses leading to development of post-traumatic arthritis
   b) Plafond malunion/medial malleolar malunion relatively straightforward to diagnose, difficult to get anatomical reduction
   c) Distal fibular malunion is far more challenging to assess properly and achieve anatomic alignment. Ramsey/Hamilton classic study showed marked changes in contact stresses with 1-2mm lateral talar shift, we previously showed importance of fibular shortening in addition to lateral shift and external rotation
   d) Focus of talk will be on distal fibular malunions

3) Diagnosis
   a) Presentation early or late
   b) On exam may have swelling but often no grossly visible abnormality
   c) Radiographic evaluation with standard three view series of ankle

4) Radiographic findings of fibular malunion
   a) Asymmetry of medial and lateral clear space on mortise view
   b) Talar tilt > 2 mm
   c) Talar subluxation
   d) Eccentric joint space narrowing
   e) Syndesmotic instability has increased tibiofibular clear space, decreased tibiofibular overlap
   f) Shortening of fibula
i) Assessed with bimalleolar and talocrural angles

ii) Abnormal curve between lateral talus and peroneal groove of fibula

5) CT imaging of fibular malunion
   a) Anterior/posterior translation, lateral displacement, and especially fibular malrotation (i.e., external rotation), best seen on CT scan through syndesmosis, especially helpful to have contralateral ankle in view

6) Non-surgical management
   a) NSAID
   b) Activity modification
   c) Orthoses such as ankle brace
   d) Corticosteroid or sodium hyaluronate injections after arthritis develops

7) Surgical technique
   a) SER/Weber B fracture malunion
      i) Syndesmosis intact
      ii) Oblique osteotomy at old fracture site is helpful
      iii) Fibula lengthening to re-establish talocrural angle, rotated as needed and secured with lag screw, plate
b) Syndesmosis malunion
   i) Can be residual of typical PER fracture or Maisonneuve fracture
   ii) Incision over syndesmosis with aggressive debridement of interosseous membrane/ligaments with rongeur
   iii) Osteotomy if needed to re-establish fibular length/rotation and rigid syndesmotic fixation
   iv) Personally not concerned with overtightening syndesmosis
   v) Personal preference: 4.5 mm 4 cortex cortical screw; for increased purchase/rigidity either additional 4.5 mm screw or suture button augmentation

   c) PER fracture malunion
      i) Almost invariably shortened, externally rotated and laterally translated
      ii) Personal preference: Transverse osteotomy proximal to syndesmosis with distraction using mini-

         distractor or Hintermann distractor.

      iii) Must disrupt interosseous membrane down to level of ankle joint such that talar dome can be visualized from above through the tibiofibular interval
      iv) Requires rigid plate osteosynthesis with syndesmotic screw fixation
      v) Personal preference: Calcaneal bone graft to fill osteotomy gap

   d) Results
      i) Important to assess arthritic changes preoperatively as have negative prognostic value when present
      ii) Radiographic progression of arthritis ranges from 50-100% at 3 month to 22 year follow up in various studies
      iii) Intuitively, anatomic reduction leads to more normal kinematics and joint contact stresses, thus minimizing progression of arthritis

   e) Conclusion
      i) Ankle fracture malunion predisposes patients to post-traumatic arthritis
ii) In patients who are asymptomatic, older, poor surgical risk, or not desiring further surgery non-operative treatment acceptable

iii) Surgical treatment especially indicated for patients without post-traumatic arthritis at time of presentation

iv) SER fracture malunion can be treated with oblique osteotomy at the level of the old fracture

v) PER fracture can be treated with transverse osteotomy just proximal to syndesmosis (not necessarily at old fracture site)

vi) Syndesmosis malunion requires aggressive debridement of syndesmosis, appropriate length, rotation, and translational reduction

References:


