Indications: The ankle joint consists of three bones (tibia, fibula, and talus) and two joints (talocrural and tibio-fibular syndesmosis) that create a slot-and-peg joint that is commonly referred to as the “mortise”. The bony components of the tibia and fibula are well seen on x-ray. These include the distal fibula (lateral malleolus), medial malleolus (most medial and distal part of the non-weightbearing segment of the tibia), and the posterior segment of the tibial joint surface (posterior malleolus). A ligament, the deep branch of the deltoid ligament, attaches the medial malleolus to the medial body of the talus and prevents lateral translation of the talus under the weight-bearing surface of the tibia (plafond). Injuries to a single structure are typically stable and will go to union in an acceptable position with minimal orthopedic involvement. Injuries to both the medial and lateral side of the joint are unstable and will tend to displace, even at a relatively late time.

Minimally displaced ankle fractures involving only one side of the joint may be treated with protected weight-bearing in a walking boot orthosis. Isolated fractures of the medial malleolus require confirmation of the absence of a high fibula fracture (Maisonneuve pattern) requiring surgical repair with a tibia-fibula view. Isolated fractures of the lateral malleolus require confirmation of the absence of injury to either the deep deltoid or syndesmotic ligaments with a stressed mortise view of the ankle. This is done in one of two ways. First, the patient may be positioned lying on their injured side with the ankle hanging off the end of the x-ray gantry. A mortise view is obtained in this position, using gravity as the stressing force. A second technique requires the patient to be positioned supine in the usual mortise position. The foot is then gently externally rotated by a trained provider to obtain a stressed view. Medial clear space widening relative to the superior joint space suggests an associated ligamentous injury.

Presence of any of the above signs of fracture instability suggest that the injury would benefit from additional, surgical stabilization.

Technique: An incision is made over the lateral aspect of the ankle and the superficial peroneal nerve is identified, mobilized, and protected for the entirety of the case. The lateral malleolus is exposed using extraperiosteal dissection and the fracture site cleared of interposed soft tissues. The talocrural joint is inspected through the fracture (when possible) and any loose bodies or osteochondral defects are addressed appropriately. The lateral malleolus is then reduced and secured with lag screws. Rotational forces across the fracture site are further neutralized with a laterally applied plate. In many cases, the anatomic reduction of the lateral malleolus will indirectly reduce the medial malleolus and percutaneous lag screws may be used to secure the medial tibia. Pure soft-tissue injuries do not benefit from direct repair. Persistently displaced medial malleolus fractures are then addressed with open repair, taking care to protect the saphenous vein and nerve during exposure and fixation. Posterior malleolar fractures may now

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be addressed in one of three ways. First, non- or minimally-displaced fractures through <25% of the articular surface may be safely ignored, having adequate stabilization from the previously placed fixation. Second, non-displaced fractures of the posterior malleolus >25% of the articular surface may be secured with percutaneous lag screws from anterior to posterior. Finally, fractures with persistent displacement >2mm at the joint surface may be secured using a limited posterolateral exposure with lag screws or a buttress plate from posterior.

Once the mortise has been reduced and secured, the syndesmosis is tested under live fluoroscopy. With widening of the syndesmosis, the joint is reduced under fluoroscopic guidance and compressed using a large clamp. A drill hole is then placed through the syndesmosis and a dual cortical button system is used to secure the reduction. Wounds are then irrigated and closed in layers. The patient is placed in a sterile dressing with a well-padded, well-molded posterior mold splint with side slabs.

**Postoperative Care-- Phase 1. Protect fracture repair and promote soft-tissue healing.**

_1st 10-14 days postop:_

- Patient teaching emphasizes edema control with strict elevation and non-weightbearing, keeping their splint and surgical dressing clean, dry, and intact, and optimizing pain control.

_1st postoperative visit at 10-14 days after surgery_

- Dressing and splint off. No routine x-ray required.
- Stitches out if wound well coapted.
  - If wound does not appear sufficiently mature or if patient has superficial epidermolysis, then leave stitches in, redress steriley, and return to posterior mold splint with side slabs. Return for wound check, possible removal of stitches in 5-7 days.
- Short leg cast
- Assess pain control. Refill pain medications as indicated.
- Smoking cessation counseling for patients who continue to abuse tobacco.
- Work Note:
  - May not drive or operate heavy machinery.
  - Sedentary activity only.
  - Must be allowed 15 minute breaks q 2 hours for leg elevation
  - No standing >5 minutes.
  - No lifting, pushing, pulling, or carrying.
- Expected Return To Work:
  - Sedentary/ Cognitive: 2 weeks
  - Light Manual: 7 weeks
  - Heavy Manual/ Factory: 12 weeks
- Schedule Follow-up visit for 6 weeks after surgery.

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Phase II follow-up at 6 weeks after surgery

- Cast off. AP/lat/mortise views of ankle.
- Assess pain control. Counsel patient on weaning from narcotic pain medications as needed.
- Smoking cessation counseling as needed.
- Assess for clinical/radiographic union.
  - 3+ cortices bridged with callus and fracture site non-tender ⇒ Advance to Phase II Therapy and schedule follow-up for 10 weeks after surgery.
  - 2 or fewer cortices bridged and/or fracture site still tender ⇒ return to short leg cast and follow-up in office 2 weeks later for reassessment.
- CAM Boot to injured extremity, initially for full-time use. Wean from crutches/walker first, then from boot.
- Encourage over-the-counter compression hose use for edema control, as needed.
- Therapy prescription.
- Phase II restrictions:
  - May drive.
  - 20# weightlifting restriction.
  - Must take 15 minute break every 4 hours for leg elevation.

Therapy prescription for Phase II--
Physical Therapy 2-3 x/week for 6 weeks
- Start AROM/PROM of ankle and hindfoot
- Achilles stretch with 1 cm bump under 1st MTP to lock midfoot and focus stretch on gastrocnemius complex.
- Ankle dorsiflexion, plantarflexion, inversion, eversion strengthening
- Balance and proprioception exercises
- modalities prn
- HEP--wean to HEP and sport-specific conditioning as tolerated.
- Wean to shoes as tolerated.

Phase III advancement visit between 10-12 weeks (return to full activity/sport)

- AP/lat/Mortise view of ankle
- Assess ankle stability.
  - anterior drawer.
  - inversion/eversion strength
- Therapy: consider sport-specific exercise program for cutting/pivoting athletes & work-conditioning for patients with particularly strenuous laboring jobs.