ANKLE FRACTURES – NON-OPERATIVE  
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Ankle fractures are the most common intra-articular fracture of a weight-bearing joint (Phillips WA et al. J Bone Joint Surg 67A:67-78, 1985). The ankle joint is made up of three bones – the tibia, fibula, and talus – along with their connecting ligaments – the deltoid, lateral ankle ligaments, and the syndesmosis. These structures together for a highly congruent joint and allow complex motion in several planes. Disruption of these structures, whether bony or ligamentous, can lead to abnormal contact stresses and ligamentous instability. This in turn, can lead to the development of arthritis of the ankle joint.

Ankle fractures come in many different forms and not all of them require surgical intervention. Those fractures that alter the congruency and stability of the ankle joint need to be treated with surgery in order to re-establish the normal contact pressures of the ankle joint and delay the development of arthritis. Although the bony anatomy can be restored in many cases, the cartilage injury associated with this trauma is not reversible or reparable. This, in many cases, can lead to the development of post-traumatic arthritis of the ankle, regardless of the quality of the repair.

There are multiple classification systems for ankle fractures, but the two most commonly used are the Danis-Weber and the Lauge-Hansen. These subdivide the fracture type by the level of the injury and the mechanism of the injury, respectively. Although these classification systems are good for describing the fracture, the stability of the fracture and the congruency of the joint should guide the treatment decisions.

Danis-Weber Ankle Fracture Classification
Lauge-Hansen Supination and Adduction Injury

Lauge-Hansen Pronation and Abduction Injury
Treatment

Your doctor has determined that your ankle fracture is one that can be treated nonoperatively - without surgery. This decision was made as a result of the stability of the fracture. When the deltoid ligament is intact, there is no abnormal lateral translation - side to side motion - of the talus within the ankle joint. In this scenario, the fibula fracture typically heals uneventfully, and the ankle stability is maintained.

Initial Visit

During the initial evaluation, a physical examination of your ankle joint is performed by the doctor in order to determine the degree of injury and also the stability of the ankle joint. 3 views of the ankle in weightbearing fashion are also performed. We prefer weightbearing x-rays as they stressed the ankle ligaments and will allow better visualization of any injuries that can render the ankle unstable. In addition, our doctors typically order a gravity stress radiograph, in order to better assess the stability of the deltoid ligament. If the ankle is found to be stable, you will be placed in a tall boot in order to protect the ankle during ambulatory activities. This also makes the pain more manageable so that you can continue to weight-bear as tolerated. This boot is kept in place for a total of 4 to 6 weeks. It only has to be used during ambulatory activities. The boot can be removed at night for sleeping. It also does not have to be worn during sitting activities. In addition, you will be able to stand in the shower without the boot.

4-week follow-up

You will be seen 4 weeks after the injury for reevaluation of the ankle joint. Repeat radiographs of the ankle in weightbearing fashion are performed in order to make sure that the fracture is healing nicely. At this stage, the fracture line is typically still visible, but there would likely be changes that suggest healing. In addition, the ankle joint is reevaluated in order to determine the stability is still present. If the pain is manageable, he will be transition to a lace up ankle brace and physical therapy will be started. In some patients, the pain prevents him from weaning off of the boot. In this situation we typically allow patients to wear the boot for an additional 2 weeks. We prefer transitioning to a regular shoe in order to stress the ankle during normal ambulatory activities. It also helps prevent some stiffness.

12-week follow-up

You will be seen 12 weeks after the injury for reevaluation. At that stage, you should have completed 4 to 6 weeks of immobilization in a tall boot followed by 6 weeks of physical therapy using an ankle fracture protocol. 3 views of the ankle will be performed in order to evaluate the fracture and the stability of the ankle once again. At this stage, in most cases, the fracture line is still partially visible. This is still normal. You should be able to advance activities to tolerance. It is still normal to experience swelling and soreness of the ankle.

6-month follow-up

You will be seen for a final visit 6 months after the injury. At this time you should be able to be involved in all your typical daily activities. It is still normal to experience some swelling and soreness of the ankle joint as well as the fracture. 3 views of the ankle will be performed in order to evaluate the fracture healing. At this visit, the fracture should be fully healed and the ankle should appear stable.

Post-traumatic arthritis

Even though your ankle fracture was found to be stable and treated in a nonoperative fashion, there are commonly injuries to the cartilage inside the ankle joint that can predispose the ankle to the development of arthritis. Cartilage is a smooth gliding surface that allows her joints to move without friction. When there is injuries to the cartilage it directly affects the gliding surface of the joint. These injuries can slowly worsen over time and lead to arthritis of the ankle joint. Patients commonly perform of pain along the ankle joint with activities. In most cases, early treatment of this arthritis is symptomatic. It includes anti-inflammatory
medications and icing. In some cases there may be the need for activity modifications. If the pain related to your ankle fracture persist longer than a year you should go back to your doctor for reevaluation.
REHABILITATION
Remember, the patient has been NWB for quite some time and will have atrophy not only of the calf, but the entire LE. This needs to be addressed in the therapy program. Exercises are progressed on an individual basis depending on symptoms. Younger patients tend to heal faster and can be progressed as tolerated. Swelling is usually the biggest problem and patients must be advised to limit weight bearing to control this.

Week 6-10
Gait training – FWB in walking boot progressing to no crutches
Modalities
Whirlpool or hot pack to help increase ROM (can do ROM ex in W/P)
Ultrasound (pulsed) around incisional area to increase circulation and decrease swelling
Cold pack – following exercises and again at night to help control soreness and swelling
Manual therapy
Soft tissue mobilization – scar massage, petrissage to decrease swelling and increase mobility
Joint mobilization – to surrounding joints (not ankle joint) if needed to normalize mobility
ROM
AROM all planes:
  - Ankle pumps
  - Inversion/eversion
  - Ankle circles
  - Ankle alphabet
 Toe curls – flexion/extension
 Towel squeeze with digits
 Marble pick-up with digits
 Calf stretching – standing gastroc/soleus stretch, towel stretch
 Lower extremity stretching – hamstring, piriformis, iliopsoas, quad, etc.
Strength
Ankle theraband – inversion, eversion, plantarflexion, dorsiflexion
Cycling – in boot with resistance and time as tolerated
Exercises in boot:
  - Weight shifting – lat, fwd/retro
  - Step-ups: lateral, forward
  - Leg press: Bilateral, unilateral
  - Hamstring curls
  - Single leg squats
  - Single leg balance
  - Reverse lunges

Week 10-16
ROM – full
Stretch – continue with all LE stretching
Strength – out of boot per MD discretion
  - Leg press – bilateral and unilateral calf raises
  - Hamstring curls with plantar flexion
  - Biodex – inversion/eversion, plantarflexion/dorsiflexion
  - Walking lunges with heel raise
  - Step-ups on toes
  - Sports cord – side-step, forward-retro walk
  - Single leg squats
  - Wall Squats
  - Eccentric standing calf raises progressing to full single leg calf raise
Balance/Proprioception
  - Single leg balance – progress to unstable surface or eyes closed
  - Tandem cone walking
  - Steamboats – 4 way kick with theraband – progress to unstable surface
  - Plyoball toss on trampoline or with partner
Balance board squats
Step-ups using airex
Four corner reach drill – reach using other foot or one hand

*Unstable surfaces can include mats, airex, balance board, wobble board, etc.
*For increased levels of difficulty, increase the speed of exercise and/or hold dumbbells or medicine balls at side or overhead

Weeks 16-24
Continue with strengthening with goal of being able to perform single leg calf raises throughout full ROM
Initiate jogging program – treadmill or track progressing to hard surfaces (i.e., street)
Initiate plyometric program – bilateral progressing to unilateral hops

Core exercises
Swiss Ball Activities:
Bridge w/knee ext: Bilateral or Unilateral
Bridge w/knee flexion: B and/or unilat
HS curls
Bridge w/knee flexion and alt hip fl

Prone on elbows 3x1min
Sidelying on elbow 3X30"
Prone on ball – LE extension
Prone on ball – upper body ext
Prone on ball – scissor kick
Walk outs on ball

Table top – knee extension
Crunches on ball
Supine knee ext w/ball b/x legs
Push-ups on ball

Abdominal routine
Reverse sit-ups
Crunch – reach to toes
Crunch – alt reach to toes
Sidelying crunches
Sit-backs controlled hold
Sit-ups w/plate
Leg lowering
Side to side leg swing
Diagonal leg swing
Cable column ab curls
D2 at C Col seated on ball
V-ups
Ball toss in sit-up position
Ball toss from side
Back to back ball toss
Ball toss doing sit-up w/feet supported

Roman Chair
LE extension on table
Flutter kicks w/LE ext