

Ankle & Foot



1

It is important to recognize that the stable positions of the ankle and the foot do not always coincide. For example,

when a person walks in high heels, the ankle joint is more vulnerable to injury, because the talocrural joint is in a less stable, plantarflexed position while the subtalar and transverse tarsal joints are in a close-packed (rigid) position.



2



■ **Hallux valgus.** This deformity in the great (large) toe develops as the proximal phalanx shifts laterally toward the second toe. Eventually the flexor and extensor muscles of the great toe shift laterally and further accentuate the deformity.

The bursa over the medial aspect of the metatarsal head may become inflamed and the bone may hypertrophy, causing a painful bunion.

3

▶ CLINICAL TIP

The amount of ankle dorsiflexion required while pedaling a bicycle can be adjusted by raising or lowering the seat height. A lower seat height requires greater dorsiflexion.



4

A common cause predisposing to painful syndromes is excessive pronation of the subtalar joint during weight bearing activities.

The pronation could be related to a variety of causes including

- ✓ excessive joint mobility,
- ✓ Leg length discrepancy,
- ✓ femoral anteversion,
- ✓ external tibial torsion,
- ✓ genu valgum, or
- ✓ muscle flexibility and
- ✓ Strength imbalances in the lower extremity.
- ✓ Often, there is a hypomobile gastrocnemius-soleus complex related to the abnormal foot pronation

5



6

- **Plantar fasciitis.** Pain is usually experienced along the plantar aspect of the heel, where the plantar fascia inserts on the medial tubercle of the calcaneus. The site is very tender to palpation. Pain occurs on initial weight bearing after periods of rest, then decreases, but returns as weight-bearing activity increases.
- Associated impairments include
 - ✓ hypomobile gastrocnemius-soleus muscles and
 - ✓ plantar fascia pain or restriction when extending the toes creating the windlass effect.
 - ✓ inappropriate footwear, and a flexible flat foot (pes planus) may be predisposing factors.
 - ✓ stress forces on the fascia also may occur with an cavus foot.
 - ✓ Pressure transmitted to the irritated site with weight bearing or stretch forces to the fascia, as when extending the toes during push-off, causes pain.
 - ✓ A heel spur may develop at the site of irritation on the calcaneus, causing pain whenever the heel is on the ground. The individual usually avoids heel-strike during the loading response of gait

7

Shin Splints

This term is used to describe activity-induced leg pain along the posterior medial or anterior lateral aspects of the proximal two-thirds of the tibia.

It may include different pathological conditions such as musculotendinitis, stress fractures of the tibia, periosteitis, increased pressure in a muscular compartment, or irritation of the interosseous membrane.

8

Anterior shin splints.

Overuse of the anterior tibialis muscle is the most common type of shin splint.

A hypomobile gastrocnemius-soleus complex and a weak anterior tibialis muscle as well as foot pronation are associated with anterior shin splints. Pain increases with active dorsiflexion and when the muscle is stretched into plantarflexion.



9

Acute Ankle Sprain:

MANAGEMENT in PROTECTION PHASE

- If possible, examine the ankle before joint effusion occurs.
- ✓ To minimize the swelling, use compression, elevation, and ice. The ankle should be immobilized in neutral or in slight dorsiflexion and eversion.
- Use gentle joint mobilization techniques to maintain mobility and inhibit pain.
- Educate the patient.
- Teach the patient the importance of RICE (rest, ice, compression, and elevation), and instruct the patient to apply ice every 2 hours during the first 24 to 48 hours.
- Teach partial weight bearing with crutches to decrease the stress of ambulation.
- Teach muscle-setting techniques and active toe curls to help maintain muscle integrity and assist with circulation.

10

Controlled Motion Phase

- ✓ As the acute symptoms subside, continue to provide protection for the involved ligament with a splint during weight bearing.
- ✓ Commercial splints, such as an air splint, are also available to provide medial-lateral stability while allowing dorsiflexion and plantarflexion.
- ✓ Apply cross-fiber massage to the ligaments as tolerated.
- ✓ Use grade II joint mobilization techniques to maintain mobility of the joint.
- ✓ Teach the patient exercises to be done within tissue tolerance at least three times per day.
- ✓ Suggestions include: Non weight-bearing AROM into dorsiflexion and plantarflexion , inversion and eversion, toe curls, and writing the alphabet in the air with the foot.
- ✓ Sitting with the heel on floor and scrunching (making wrinkles) paper or a towel and picking up marbles with the toes.

11

If adhesions are developing in the healing ligament, have the patient actively move the foot in the direction opposite the line of pull of the ligament.

For the anterior talofibular ligament, the motion is plantarflexion and inversion.

12

As swelling decreases and weight-bearing tolerance increases, progress to strengthening, endurance, and stabilization exercises; include isometric resistance to the peroneals , bicycle ergometry , and partial to full weight bearing balance board exercises.

Have the patient wear a brace or splint that restricts end-range motion to control the range and prevent excessive stress on the healing ligament.

13

Return to Function Phase

- Progress strengthening exercises by adding elastic resistance to foot movements in long-sitting (open-chain) and sitting with the heel on the floor for partial weight bearing.

14

- Progress postural/stabilization and proprioceptive / balance training for ankle stability, coordination, and neuromuscular response with full weight-bearing activities.
- Incorporate movement patterns, such as forward/ backward walking and cross-over side stepping with elastic resistance secured around the unaffected lower extremity.
- Utilize an unstable surface, such as a BOSU® or BAPS® board.
- Depending on the final goals of rehabilitation, train the ankle with weight-bearing activities, such as walking , jogging, jumping, hopping, and running, and with agility activities, such as controlled twisting, turning, and lateral weight shifting.
- When the patient is involved in sports activities, the ankle should be splinted, taped, or wrapped, and proper shoes should be worn to protect the ligament from re injury

15



FIGURE 22.9 Self-stretching the ankle to increase dorsiflexion (stretching the gastrocnemius muscle).

16

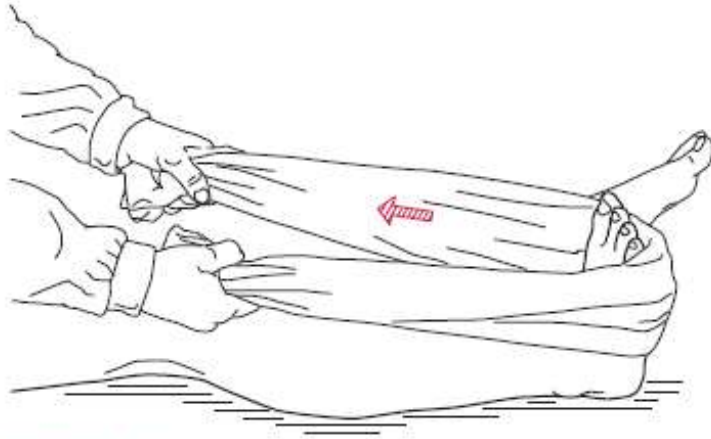


FIGURE 22.10 Self-stretching the foot into inversion by pulling on the towel on the medial side of the foot.

17



FIGURE 22.11 Using a rocker board to develop control of ankle motions with the patient sitting. When both feet are on the board, the normal foot can assist the involved side. With only the involved foot on the board, the activity is more difficult.

18

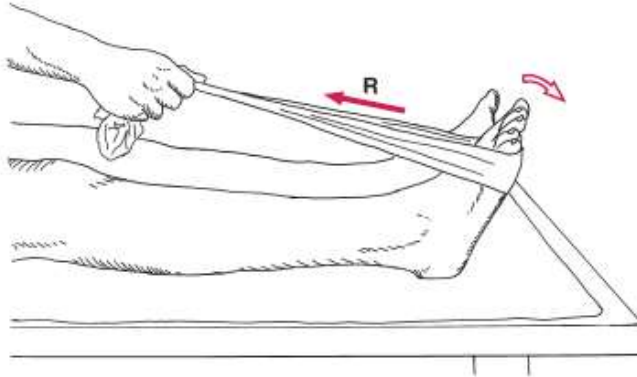


FIGURE 22.12 Resisting the ankle plantarflexor muscles with an elasticized material.

19

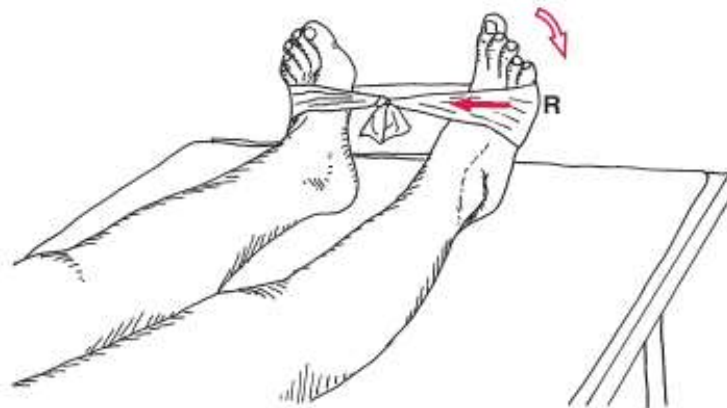


FIGURE 22.13 Resisting the evertor muscles of the foot with an elasticized material.

20

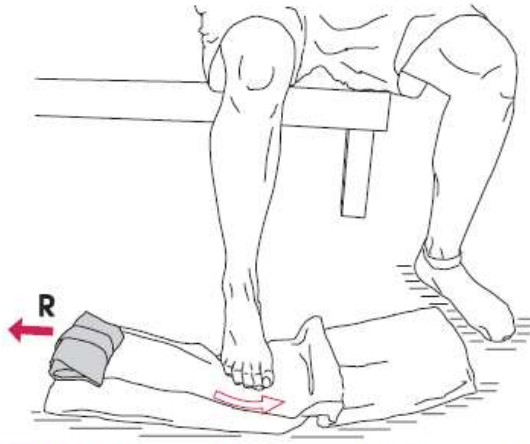


FIGURE 22.14 Resisting adduction and inversion with a weight on the end of the towel. The heel is kept stationary while a windshield wiper motion of the foot is used to pull the towel along the floor. Abduction with eversion is resisted by placing the weight on the medial side of the foot.

21

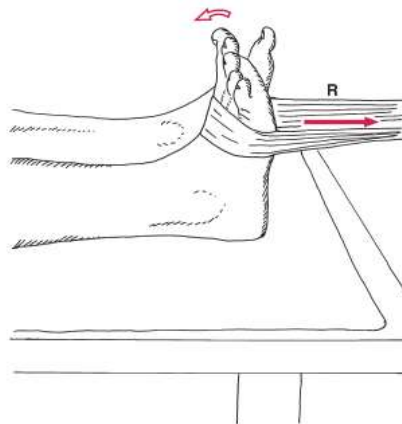


FIGURE 22.15 Resisting the ankle dorsiflexor muscles with an elasticized material.

22

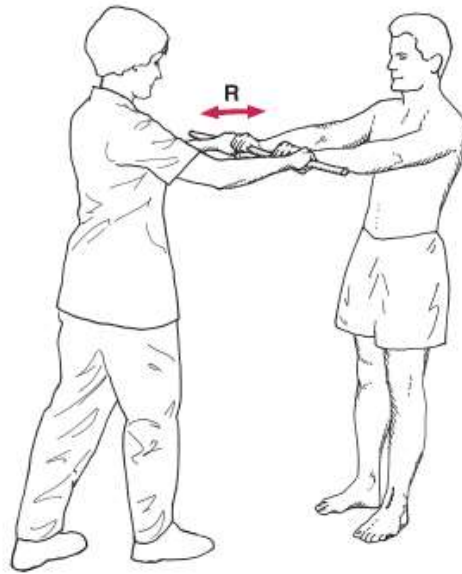


FIGURE 22.16 Stabilization exercises with the patient standing and maintaining balance against the alternating resistance forces from the therapist. The therapist applies force through the rod in backward/forward, side-to-side, and rotational directions.

23

BOX 22.9 A Progression of Heel-Raising/ Lowering Exercises for Calf Muscle Strengthening

- Begin in a *sitting* position with feet on the floor or a rocker board.
- Add resistance by crossing the thigh of one leg over the other thigh.
- Perform *standing* heel raising/lowering on a level surface in bilateral stance before progressing to unilateral stance.
- Perform heel raising/lowering exercises starting with heels over edge of a step.
- For additional challenge, use hand-held weights, a weighted backpack, or weight belt during standing heel raising/lowering.
- Progress to jumping, then hopping on level surfaces and then on and off a platform for explosive concentric and eccentric loading.

24

Eccentric loading of Gastrocnemius



FIGURE 22.17 Eccentric loading of the gastrocnemius-soleus muscle group by performing heel lowering of the affected ankle.

25

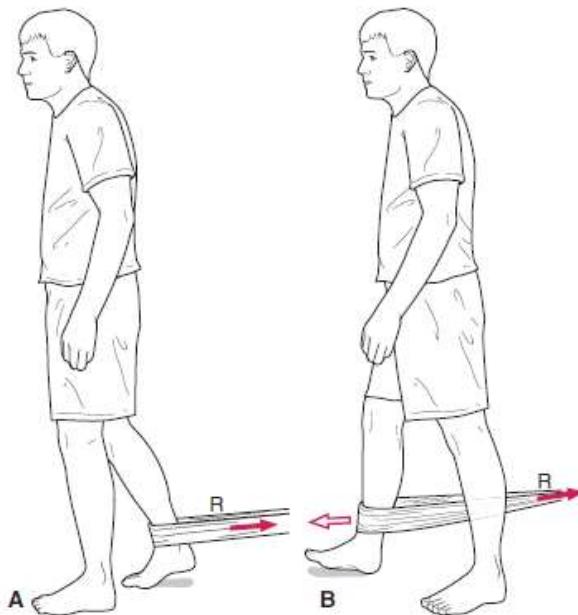


FIGURE 22.18 (A) Starting position for activation of the ankle dorsiflexors of the *weight-bearing limb* by moving opposite limb forward against resistance of an elastic band; (B) ending position.

26

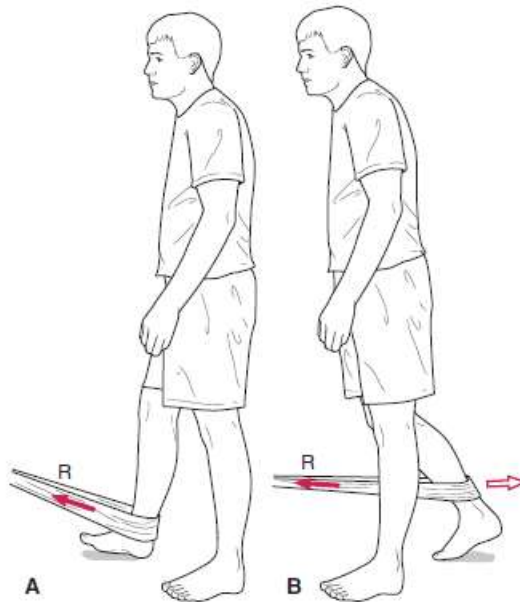


FIGURE 22.19 (A) Starting position for activation of the ankle plantarflexors of the *weight-bearing limb* by moving opposite limb backward against resistance of an elastic band; (B) ending position.

27

TABLE 22.1 Suggested Activity Recommendations Following TAA ⁷⁹⁷		
Allow All Patients	Allow Patients With Previous Experience	Not Recommended
Aquatic Fitness/Swimming	Doubles tennis	Court Sports
Biking	Hiking	• Badminton
• Road	Skating	• Basketball
• Stationary	• Rollerblading	• Racquetball/Squash
Bowling	• Ice skating	• Singles tennis
Dancing	Skiing	• Volleyball
Elliptical and stairclimber	• Cross country	Field Sports
Golf	• Downhill	• American football
Low-impact aerobics	Lower extremity resistance training	• Soccer
Pilates/Yoga	• Free weights	• Lacrosse
Walking/Speed walking	• Machines	• Baseball/Softball
	Mountain biking	Gymnastics
		High-impact aerobics
		Jogging/Running
		Snowboarding
		Waterskiing

BOX 22.3 Potential Postoperative Complications of Total Ankle Arthroplasty

Early Postoperative Complications → Potential Consequence(s)

- Delayed wound healing → an extended period of restricted ankle motion
- Delayed union or nonunion of a tibiofibular syndesmosis fusion → an extended immobilization and restricted weight-bearing period
- Tarsal tunnel syndrome or complex regional pain syndrome

Late Postoperative Complications → Potential Consequence(s)

- Component migration or impaction → malalignment and premature component wear
- Mechanical (aseptic) loosening (most often the talar component) → pain and impaired functional mobility
- Hindfoot arthritis (most often the subtalar joint) → pain and impaired weight-bearing abilities
- Heterotopic bone formation → restricted motion

28