

CLOSED REDUCTION AND CAST IMMOBILIZATION

Closed reduction and the application of a plaster cast is the most commonly used method for treating fractures of the tibia and the fibula. Weight-bearing methods were popularized by Dehne ([27-29](#)), Brown ([20](#)), and Sarmiento ([120-126](#)). I almost never use non-weight-bearing casts. The technique of applying an immediate weight-bearing cast is demanding and requires as much motor skill as internal fixation.

Initially, use a long-leg cast. Change to a Sarmiento cast or brace as soon as early axial and translational stability are present, usually about 4–6 weeks after injury. Use a Sarmiento cast initially in stable fractures in the distal half of the tibia.

Closed reduction and cast application usually do not require a regional or general anesthetic if the patient is cooperative. Medicate him well, and use local anesthesia. Place a padded crutch or board beneath the thigh and secure it to the table. Gently place hand traction on the leg and position it as illustrated in [Figure 24.8](#).



Figure 24.8. Position for application of a Sarmiento, short-leg, or the initial portion of a long-leg plaster cast for a fracture of the tibia. (From Chapman MW. Fractures of the Tibial and Fibular Shafts. In: Evarts CM, ed. *Surgery of the Musculoskeletal System*. New York: Churchill-Livingston, 1983, with permission.)

Application of a Removable Ankle Traction Bandage

A traction bandage and gentle traction are used to stabilize the tibia ([Fig. 24.9](#)).



Figure 24.9 Removable ankle traction bandage. (From Chapman MW. Fractures of

the Tibial and Fibular Shafts. In: Evarts CM, ed. *Surgery of the Musculoskeletal System*. New York: Churchill-Livingston, 1983, with permission.)

- Cut a strip of muslin 65 cm in length and 2.5 cm wide, and bring the ends together. Make a second strip.
- Place one strip over the instep and one over the heel, and connect them with 12 mm tape level with the bottom of the foot. Locate the junction of the strips directly below the malleoli. Apply a thin layer of petroleum jelly beneath each strip to ease removal.
- Tie a bucket of water to the strips or use a foot loop. Apply enough traction (add water or increase foot pressure) to stabilize the fracture and achieve alignment.
- After cast application, cut the tape, remove the strips completely, and seal the cast. Do not leave the traction bandages in the cast, as they can cause pressure sores.

Application of a Long-leg Weight-bearing Cast

Note the anatomic molding in [Figure 24.10](#).



Figure 24.10. Long-leg weight-bearing cast. (From Chapman MW. *Fractures of the Tibial and Fibular Shafts*. In: Evarts CM, ed. *Surgery of the Musculoskeletal System*. New York: Churchill-Livingston, 1983, with permission.)

- Apply the short-leg section first up to the mid patella.
- Place a 15–20 cm piece of tubular stockinet at each end of the cast for trimming.
- Apply a double layer of cast padding with a triple layer over bony prominences. It must be free of wrinkles.
- Dip one 10 cm roll and three 15 cm rolls of plaster into 72°F water. Apply the 10 cm roll about the foot and ankle and follow with the 15 cm rolls. Apply rapidly and smoothly. Place tucks posteriorly.
- Mold the cast as it sets. Mold in the transverse and longitudinal arches of the foot and about the malleoli. The malleolar molding produces a posterior bulge for the Achilles tendon. Smooth the cast along the entire anteromedial border of the tibia. As the plaster sets, mold posteriorly to push the leg anteriorly to fit against the smooth anterior aspect of the cast. The cast should assume a triangular shape with a slight bulge for the sharp anterior border of the tibia and relatively flat surfaces over the posterior and anterior compartments and medial surface. Fit the cast to the medial and lateral flares of the proximal tibia.

- When the cast has set, extend the knee. Remove the ankle bandage. Trim the proximal end of the cast.
- Apply the thigh portion of the cast. Support the cast at the fracture site with the foot against an assistant's chest (or use a leg holder). Keep the knee flexed 5° short of full extension. Wrap on two layers of cast padding. Apply three or four 15 cm rolls of plaster. Extend proximally to the greater trochanter.
- Mold the cast above the medial and lateral epicondyles. This molding technique causes posterior bulging, which creates a channel for the hamstring tendons. Proximally, mold the cast over the anterior and lateral surfaces to produce a quadrilateral socket. This molding produces a snug fit over the greater trochanter and femoral triangle, which creates a channel for the adductor and hamstring tendons.
- Trim the ends of the cast, reinforce the foot, and apply a walker or walking boot.
- In acute fractures where swelling is a risk, place a single longitudinal cut along the full length of the anterior aspect of the cast over the muscle of the anterior compartment and spread the cast as needed. Reseal when the swelling resolves.

Application of a Sarmiento-type Cast

- After applying the below-knee cast as just described, carry the padding and plaster 5 cm proximal to the patella. Mold the leg portion of the cast and extend the knee to 45° of flexion.
- Mold the plaster to the flares of the tibia and over both femoral epicondyles. Mold the cast to gently grip the epicondyles, thereby creating an anterior channel for the patella and patellar tendon and a posterior channel for the hamstrings. Flatten the popliteal fossa to keep the leg against the anterior aspect of the cast.
- Trim the cast ([Fig. 24.11](#)). Notice that it is above the patella to avoid patellar impingement and give good support. Trim out the popliteal fossa to allow the amount of flexion desired. You may choose to limit flexion to 45° initially and then gradually increase it as fracture stability increases.



Figure 24.11. Sarmiento type cast. (From Chapman MW. *Fractures of the Tibial and Fibular Shafts*. In: Evarts CM, ed. *Surgery of the Musculoskeletal System*. New York: Churchill-Livingston, 1983, with permission.)

Postoperative Care

Provide crutches or a walker and encourage the patient to be out of bed within 1–2 days and to bear weight as tolerated. The typical patient requires at least 3 weeks and up to 6 weeks to achieve full,

unsupported weight bearing. The patient should strive to be independent of crutches by 6 weeks. Begin isometric exercises for all muscle groups immobilized in the cast. It is important to follow the patient at weekly intervals for the first 4–6 weeks when weight-bearing methods are used. Loss of reduction must be corrected early to avoid malunion.

Change casts at 4- to 6-week intervals, depending on the stability of the fracture. Stable fracture patterns and those that gain stability early may be converted to a Sarmiento cast or fracture-brace as early as 4 weeks. Protect tibial fractures for at least 12 weeks. The average healing time is 16–24 weeks. Fracture instability after 24 weeks is considered a delayed union.

FRACTURE BRACING

Fracture bracing, popularized by Sarmiento et al. ([126](#)), is very useful, particularly with prefabricated braces ([Fig. 24.12](#)). Although the description of this technique is beyond the purview of this text, it is fully described in the literature ([120-126](#)).



Figure 24.12. Sarmiento type fracture brace with free ankle hinge. (From Chapman MW. Fractures of the Tibial and Fibular Shafts. In: Evarts CM, ed. *Surgery of the Musculoskeletal System*. New York: Churchill-Livingston, 1983, with permission.)