TIPS & TECHNIQUES:

Early Ambulatory Treatment of Ankle Fractures Utilizing Surgical Fixation and Semi-Rigid Short Leg Walking Cast

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Postoperative management of ankle fractures in athletic patients presents a unique challenge for the foot and ankle surgeon. Since the 1850's, bandages impregnated with Plaster of Paris have been used to stabilize and support fractured bones. It has been widely recognized that early weight bearing and mobilization after ankle fracture surgery vastly decreases rehabilitation time and decreases the time of return to activity. This article describes the case of a patient who presented with a pronation-external rotation type 3 ankle fracture, which occurred while playing basketball. The patient was an elite high school athlete aspiring to play college basketball and was treated with open reduction and internal fixation consisting of two 1.5mm Kirschner wires medially and a syndesmotic screw laterally. The patient began ambulating with the use of a short leg walking cast 12 days postoperatively and was able to return to full activity at 7 weeks postoperatively, 1 week after removal of the syndesmotic screw.

Key Words: Ankle fracture, early ambulation, semi-rigid short leg walking cast

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The Dutch army surgeon Anthonius Matthijsen first described the impregnation of bandages with plaster of Paris in 1852 as a way to support and stabilize the broken bones of his comrades. The last 155 years have offered many changes regarding fracture immobilization, both in the development of new materials as well as the development of a new process of thinking in terms of fracture treatment itself. This new concept of fracture management suggested earlier weight bearing following a fracture rather than long periods of non-weight bearing.

Early mobilization following internal fixation of a fracture is one of the principles which ASIF (Association for the Study of Internal Fixation) has advocated.⁷ It is based on the principle of early active pain free mobilization of muscles and joints adjacent to the fracture for the prevention of "fracture disease." Weber did not advocate plaster immobilization, but preferred to mobilize patients with an orthosis in which weight was partially transmitted to the lower leg with a spring, preventing pes equines.¹² Meyer and Kumler used plaster for initial fracture immobilization.⁶

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Figure 1 Preoperative anterior posterior radiograph of pronation-external rotational ankle injury.

Case Report

An 18 year-old Caucasian female originally presented to the University of Louisville Hospital approximately 4 hours after injuring her right ankle while playing basketball. The patient is a senior in high school where she is a basketball player currently working towards obtaining a college scholarship.

Figure 2 Lateral preoperative radiograph of injury.

Radiographs taken of her injured ankle revealed a high fibular fracture along with a transverse medial malleolus fracture with syndesmotic widening, corresponding with a pronation external rotation type 3 injury as classified by the Lauge-Hansen classification system.⁵ (Figures 1 and 2)

The patient was taken to the operating room on the day of presentation and the medial malleolus was repaired with one each of 1.5mm and 2.0mm k-wires and a 5.0 fully threaded syndesmotic screw was placed across the fibula to repair the syndesmosis (Figures 3 and 4). Postoperatively, the patient was placed in a posterior splint and made non-weight bearing with the use of crutches.

Figure 3 AP postoperative radiograph following open reduction and internal fixation of ankle fracture.

The patient was seen on postoperative day 3 for a routine post-operative follow-up at which time she had no complaints. On postoperative day 12, her sutures were removed and she was placed in a short leg walking cast as detailed above and made weight bearing as tolerated. The remainder of the patient's postoperative course was uneventful and the syndesmotic screw was removed 6 weeks post-operatively and was made full weight bearing using an active ankle brace.

Figure 4 Lateral postoperative radiograph showing reduction of ankle fracture.

At the most recent follow-up, the patient was 7 weeks post-op, doing well, and had been playing basketball with no complaints. The patient stated that she was able to return to her previous level of play, winning the sectional championship and moving into the state playoffs.

Discussion

Many studies have been performed advocating the usage of early weight bearing and mobilization over plaster casting and immobilization. Port, et al., realized that immediate weight bearing and mobilization resulted in earlier rehabilitation than immobilization for four weeks in a plaster cast.⁸

Sondenaa, et al., found that plaster cast immobilization reduced the ankle joint range of motion initially and took upwards of a year to normalize with the early mobilization group.¹⁰ The immobilized group also had a temporary increase in pain, swelling, and loss of the loaded dorsal range of movement, justifying the ASIF principles of early active exercises.

Ahl, et al., showed that early weight bearing in a plaster cast had a tendency to display better clinical results in bimalleolar and trimalleolar ankle fractures.¹ Ahl, et al., also found that the addition of active ankle movements using an orthosis also had a tendency to show better clinical results than the late weight bearing group. Egol, et al., were further proponents of these principals and recommended usage of functional bracing and early exercises after operative treatment of ankle fractures.⁴ This study was able to demonstrate that these early weight bearing patients had higher functional outcome scores, earlier return to work, decreased medical cost, and decreased complications.

In contrast, Van Laarhoven, et al., found that the application of an early walking plaster cast did not result in an increased rate of complications such as wound dehiscence, superficial wound infection, arthritis, osteitis or secondary dislocation.¹¹

We have found that we are able to decrease rehabilitation time with an earlier return to work and preoperative activity levels by using appropriate operative treatment (if indicated) along with a semi-rigid walking cast in ankle fractures in a select population.

This type of short leg walking cast is also indicated with other fractures of the lower extremity where a below-knee cast is needed in order to maintain the ankle joint in a fixed position (usually 90 degrees).

In the postoperative period following suture removal, a semi-rigid walking cast combined with a fiberglass splint is placed on the affected extremity. At this time, early weight bearing and ankle joint mobilization is begun, carefully progressing to preoperative conditioning.

Materials:

- 30" stockinette
- 1 roll of 3" fiberglass cast material
- 2 rolls of 3" or 4" semi-rigid cast material
- One 1.5" x 24" strip of 1/4" felt
- Two 2" squares of 1/4" felt

Technique of Cast Application

The cast is applied with the patient either supine on an examination table or sitting on the edge of the table with their leg dependent. It is important to maintain the patients' ankle at 90 degrees while applying the semi-rigid cast. Apply the stockinette so that excess length remains proximally at the knee and distally at the toes. The 1.5" strip of felt is then applied over the anterior tibial crest and extending over the ankle joint over the first metatarsal dorsally. Two pieces of felt are then placed over the medial and lateral malleoli distally. The felt is usually self-adhesive, but in cases where it is not, a short length of webril can be used to secure it in place.

Next, the first roll of semi rigid casting material is applied in such a way so that two layers encircle the foot and leg where the fiberglass reinforcement will be placed. The toes are left free distally and the fibular head is left free proximally. Additional semi-rigid casting material can be rolled twice across the plantar forefoot to further support the metatarsal heads. The fiberglass splint is now fashioned into a "U" shape and placed on the center of both malleoli, extending equidistant proximally at least 8" above both malleoli.

The second roll of semi-rigid cast material is then applied and covered with a wet elastic bandage to ensure good lamination between its' layers. The elastic bandage is removed after a period of 3 – 5 minutes.

If the cast is to be functional as a walking cast, the patient should stand immediately after the wet bandage is applied to ensure that the Scotchcast splint is set in a more anatomic position with the soft tissue plantarly on the foot.

In conclusion, semi-rigid short leg walking cast combined with appropriate internal fixation and a regimen of early weight bearing and ankle mobilization is an effective way to decrease rehabilitation time and increase the functional outcome of ankle fractures in healthy individuals while minimizing time away from activities.

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