



Case Report

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Novel Ankle Brace for Rapid and Ambulatory Recovery from a Distal Fibular Evulsion Fracture in a 68 YO Man



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Abstract

This is a case report of a lateral evulsion fracture of the distal fibula of the left foot. A novel lightweight brace is described that enables normal ambulation, normal weight bearing, normal healing, and good compliance since it can be worn with normal shoes under the pants. The results suggest that complete immobilization with a cast or CAM walker and extensive non-weight bearing and time off work is not necessary for some patients with non-displaced, distal fibular fractures and that prolonged periods of immobilization and more sophisticated braces are not cost and do not result in superior recovery.

Introduction

Distal fibula fractures are the most common fracture of the ankle and are usually the result of an inversion injury with or without rotation [1]. They are the extension of a lateral collateral ligament injury. Treatment depends on the type of distal fibula fracture which is a reflection of the severity of the fracture and the surrounding ligamentous structures. Classification of distal fibula fractures attempts to split fractures into groups by severity [2,3]. One classification is the Weber classification that uses the position of the fracture relative to the syndesmosis to group fractures:

- Weber A: below the syndesmosis (stable).
- Weber B: at the syndesmosis (may be unstable).
- Weber C: above the syndesmosis (unstable).

The majority of Weber A, and some of Weber B, injuries are relatively simple avulsion injuries from the fibular pole and only require immobilization with a cast. However, more severe injuries with ligamentous injury and ankle instability may require operative reduction and internal fixation. The commonly prescribed casts are heavy and involve full immobilization for 6-10 weeks for healing. During which time, patients' daily activities are severely restricted and they are unable to effectively perform exercise training to facilitate recoveries. Here, we

describe the use of an innovative lightweight aluminum brace to avoid complete immobilization during rehabilitation for a Weber A joint fracture. The patient exhibited complete pain and swelling amelioration within 2 weeks, no cane assisted walking in 4 weeks, and full recovery in 6 weeks.

Case Presentation

Complaint

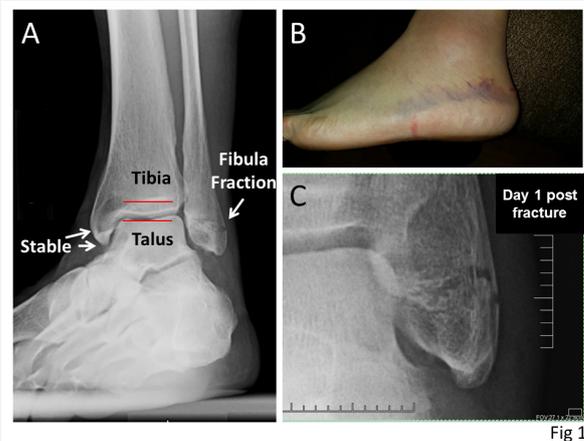


Figure 1: Radiograph confirming a Weber A distal fibula inversion injury without rotation.

A 68 YO man suffered an inversion injury of his left foot while walking on an uneven cement road in the dark and minimized the extent of injury by immediately reducing weight on the left foot by a parachute landing fall (PLF) which he practiced extensively. The injury of the fall was limited to a non-displaced evulsion fracture at two locations at a distal left fibula. The patient kept his left ankle elevated tightly wrapped with ice until the next day following the RICE method (Rest, Ice, Compression, and Elevation). The following day, he was seen in the ER where an X-ray was taken confirming a Weber A distal fibula inversion injury without rotation (Figure 1) and was prescribed a CAM walker.

Past medical history

Revealed no history of previous fractures, normal calcium and Vitamin D levels. No present medications. The patient is a pilot with excellent night and day vision (20/20). No history of previous dizziness, CNS disease or falls. The patient exercises routinely and hikes 3-4 miles per week on uneven terrain. He has a busy schedule as a physician and scientist.

Treatment



The patient was unable to use the controlled ankle motion (CAM) boot walker due to its awkward tendency for extreme hyperextension of the foot, bulky design and difficulty in ambulation. The tight fit of the CAM walker was also encumbered due to the pressure of the lateral upright bar that pressed directly on the left lateral malleolus. The patient constructed a novel lightweight aluminum brace consisting of horizontal and vertical aluminum pieces stabilized with 45 degree bars welded to the upper and lower plate (Figure 2). The stabilization bars were positioned to not press on the lateral malleolus which allowed comfortable tightening of the brace. The CAM walker had the disadvantage of considerable elevation of the left foot making even gait impossible, whereas the low profile of the thin aluminum brace allowed normal placement of the foot or shoe on the floor. The CAM walker was heavy to lift, whereas the lightweight-aluminum brace added no significant weight while

walking. The aluminum brace could be adjusted to accommodate wearing a normal shoe and the upright portions were small enough to be worn under the pants. The lightweight, small, yet sturdy modified brace increased patient compliance and could be worn during routine work schedule or to scheduled meetings either in town or out of town with no decrease in schedule or recovery outcome.

Outcome

Immediate weight-bearing as tolerated (IWBAT), even after ankle surgery allows patients to return to ambulation and activities of daily living faster and may facilitate rehabilitation and has been shown to not be detrimental [4-6]. Thus, the major goal of any postoperative regimen is to shorten the time of convalescence and to attain full weight bearing as soon as possible. Early functional and weight bearing treatment strategy after ankle surgery would allow earlier full weight bearing, return to work, and return to normal daily activities without jeopardizing the surgical and functional outcome [7]. Conservative functional treatment of ankle fractures has been studied in patients suffering from an isolated Weber B fracture with a dislocation of less than 1mm [8].

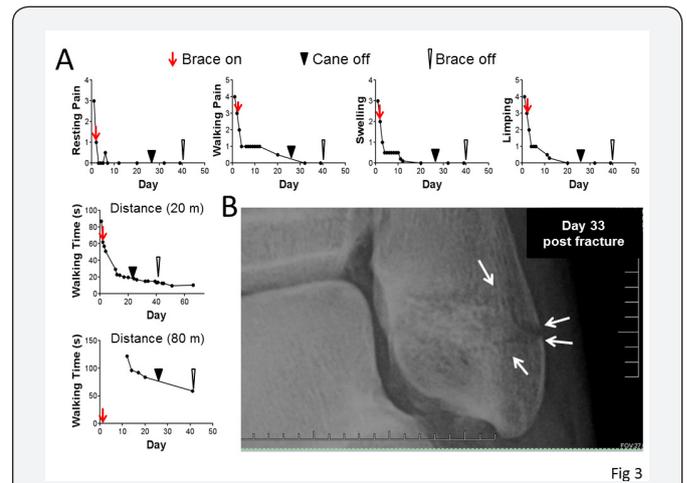


Figure 3. Post fracture recovery at different times. (A) Recovery rate was determined by pain (resting and walking), swelling, limping, walking time (20 and 80 meter) at different times after ankle fracture. (B) X-ray radiograph showing early stages of primary bone healing by direct union on day 33.

A major question is whether total ankle immobilization, such as provided by a CAM walker boot, was needed or whether a more lightweight and convenient brace was sufficient for a complete recovery from an uncomplicated fracture [9]. A CAM walker boot is often uncomfortable and is difficult to achieve normal ambulation. As it is recommended that the CAM walker, boot or cast should be worn for 2-3 months at which time the fracture is fully healed, it was important to determine if the lightweight and ambulatory nature would impede recovery by either slowing or result in incomplete recovery. Therefore, the recovery rate was determined by pain (resting and walking), swelling, limping, walking time (20 & 80 meter) at different

times after ankle fracture (Figure 3) [10]. The results show that recovery determined by walking time was nearly normal in four weeks using the lightweight aluminum brace and the patient going about normal daily activities without interruption. The lightweight brace could be easily removed for sleeping or showering, and could be reapplied quickly with the tightening of only 2 or 3 straps.

Rehabilitation

To regain full function of the ankle, rehabilitation was started after 3 weeks. Four sets of three standard exercises were carried out two times a day. The sets of exercise focused on internal muscles of the foot (scrunching), external muscles (inversion, eversion and rotation, writing letters), leg muscles (toe rises) and balancing muscles (balancing on feet and picking up balls on the floor). The patient accomplished all the tasks with gradual improvement over a two-week period to complete recovery by Week 6 (Figure 3).

Conclusion

This is a case report of a lateral evulsion fracture of the distal fibula of the left foot. A novel lightweight brace is described that enables normal ambulation, normal weight bearing, normal healing, and good compliance since it can be worn with normal shoes under the pants. The results suggest that complete immobilization with a cast or CAM walker and extensive non-weight bearing and time off work is not necessary for some patients with non-displaced, distal fibular fractures and that prolonged periods of immobilization and more sophisticated braces are not cost effective in terms of time and money and do not result in superior recovery.

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