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Univalve Split Plaster Cast for Postoperative Immobilization in Foot and Ankle Surgery

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ABSTRACT

Casting is an important part of the postoperative treatment in foot and ankle surgery. Applying a split plaster cast allows for swelling while maintaining surgical correction and alignment. Resecting approximately a 1-in. portion of the plaster cast dorsally and anteriorly maintains stable structural support of the cast while relieving the pressure caused by swelling. We describe a technique for applying a plaster below the knee cast, with a univalve dorsal split, to provide support, while allowing for edema and access to anterior postoperative dressings.

Postoperative casting, essential to a successful outcome after surgical correction, is a commonly overlooked aspect of foot and ankle surgery. The soft tissue and osseous correction is enhanced when proper immobilization and limb support is provided. Casting also protects the soft tissue from injury and allows the skin to relax and heal in an environment free of stressors that can lead to dehiscence and infection. However, postoperative casting can also cause complications resulting from soft tissue swelling within the immobilized area. Severe complications such as compartment syndrome and complex regional pain syndrome can result from edema constrained by a tight-fitting cast (1–4). Posterior splinting is frequently used to allow for swelling after a surgical procedure; however, it is vulnerable to poor patient compliance and increased motion at the injury site (2). Although fiberglass can be used postoperatively, it is more expensive and less pliable. Thus, plaster immobilization is the first choice when a well-molded cast is crucial to maintaining the reduction. The life span of each cast is short owing to frequent wound inspection (2,5).

A plaster cast can be split and spread to relieve pressure by 65% and is an established method that allows for the expansion of soft tissues after injury or trauma (3). Splitting the cast dorsally allows for the structural stability to be maintained while lowering the risk of complications from swelling by reducing the pressure. The patient must be counseled regarding the risks of cast immobilization and the possibility of neurovascular compromise.

We describe a method of applying a dorsally split cast that provides the benefits of access to the anterior postoperative dressing and allowing some postoperative edema while providing structural support for protection of the foot and ankle and minimizing motion to the osteotomy site.

Technique

After closure of the surgical wounds, a nonadhesive sterile gauze, followed by cotton gauze, is applied to the site. Two 4 × 4 gauze pads should then be folded in half lengthwise and placed in the first interdigital web space. One 4 × 4 gauze pad, again folded in half, should be placed in each of the remaining web spaces. This padding will aid in preventing maceration between the toes and swelling of the digits. The foot should be held at a 90° angle to the leg, and woven gauze dressing should be applied to allow for cushioning and drainage absorption. The dressing should be rolled on with a 50% overlap to provide 2 layers of coverage as it is applied from the level of the metatarsal heads to the tibial tuberosity. Care must be taken to prevent wrinkling of the bandages, possibly causing the skin to abrade. A stockinette is applied, leaving approximately 10 cm beyond the intended limits of the cast (1). Cotton undercast padding is then applied over the stockinette. This should be placed in the areas of bony prominence and other potential areas of rubbing, including the heel, first and fifth metatarsal heads, the base of the fifth metatarsal, malleoli, and the anterior ankle. Using Specialist® Extra Fast Setting plaster-of-Paris (BSN Medical, Charlotte, NC), a cast is fashioned using approximately 4 rolls of 6-in. plaster applied circumferentially in a figure-of-8 motion, with a 50% overlap, beginning at the foot and continuing to the level of the tibial tuberosity. Once the plaster

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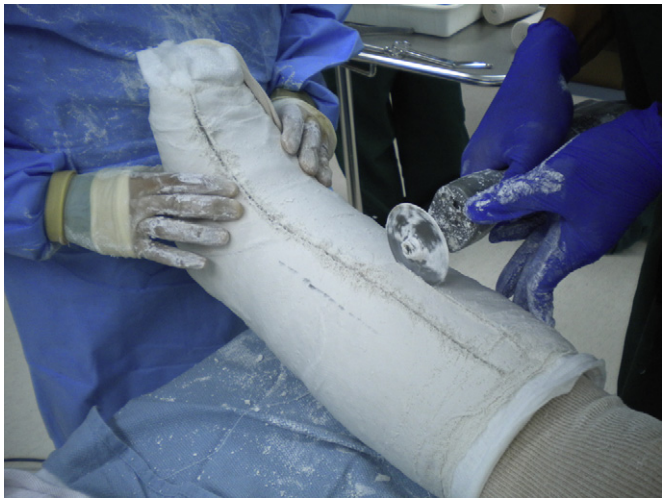

Fig. 1. Second parallel cut approximately 1-in. wide made on anterior portion of cast.

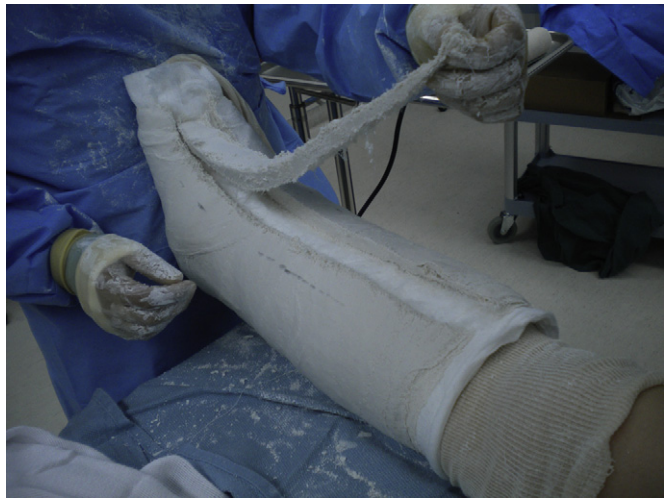

Fig. 3. Removal of 1-in. resected cast portion from anterior portion of cast.

becomes hard enough to split using a cast cutter, a split is made, with 2 parallel longitudinal cuts forming a 1-in. side strip along the dorsal midline (Figs. 1 and 2). The strip is removed, leaving access to the padding and gauze (Figs. 3 and 4). The cast is manually spread apart 3 to 4 in. and then pushed closed again to the original configuration (Figs. 5 and 6). The spreading of the cast weakens the construct enough to accommodate postoperative edema while maintaining enough rigid support. The excess stockinette is folded back on each end, and a 4-in. elastic bandage is wrapped around the foot and ankle with a 6-in elastic wrapping used on the leg (Fig. 7). The patient must be instructed to keep the cast dry, because a wet cast can lead to skin breakdown, infection, and, possibly, deep venous thrombosis (2). Instructions should be given to seek urgent care if the patient experiences signs of vascular compromise such as worsening pain, tingling, numbness, delayed capillary refill, or a dusky appearance of the exposed toes (1).

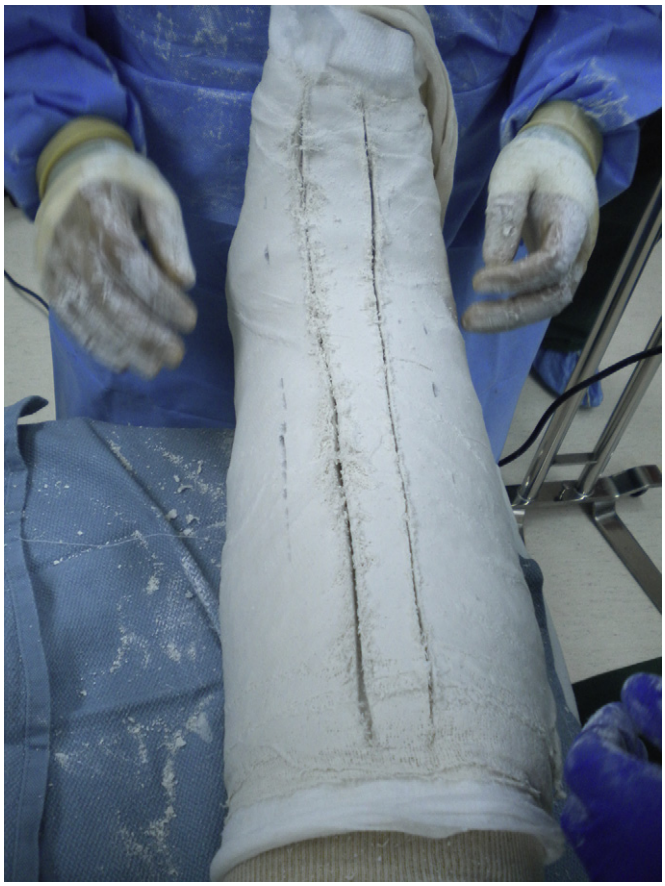

Fig. 2. View of 2 parallel cast cuts made on anterior portion of cast before removing 1-in. section.

Discussion

Casting provides definitive treatment of fractures and postoperative immobilization. It is important to prevent movement of unstable bone across the fracture or osteotomy site and to maintain good alignment after correction to enhance bone healing. However, soft tissue injury, commonly caused by edema, can result in serious complications when confined in a rigid tightly fitted cast. Several studies have proved that the use of the split cast reduces the pressure on the extremity without loss of cast stability. Garfin et al (3) studied the intracompartmental pressures of split plaster casts and showed

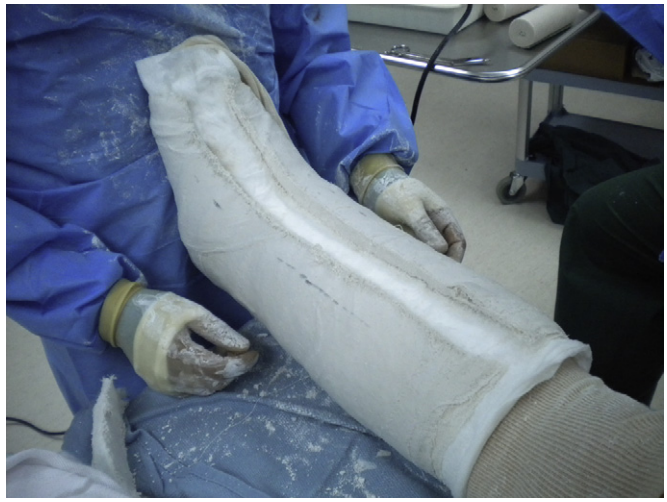

Fig. 4. View of cast after complete removal of 1-in. section of anterior portion of cast.

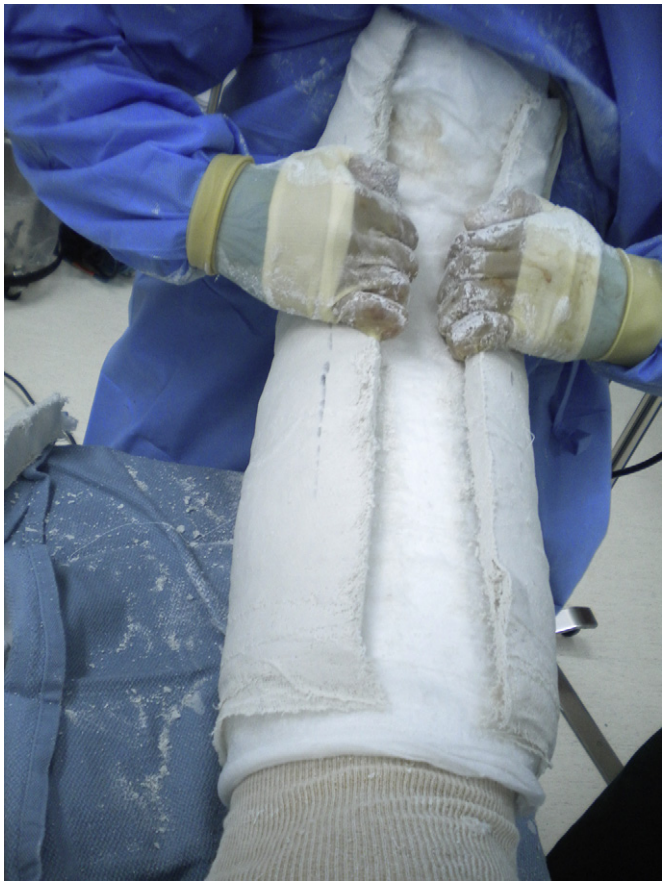

Fig. 5. Spreading of cast to allow for "decompression of cast" pressure.

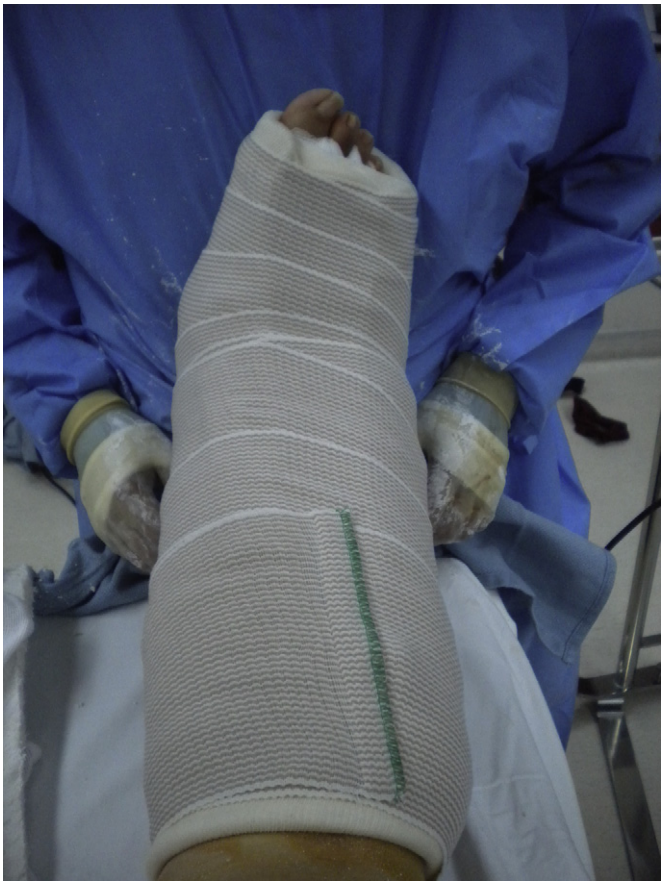

Fig. 7. Postoperative cast with 1-in. resected area and a 4- and 6-in. elastic bandage wrapped circumferentially around cast.

that by splitting and spreading a lower extremity cast, the pressure was reduced by 65%. They also noted that splitting the undercast padding only reduced the intracompartmental pressure by an additional 10%. Thus, it should be sufficient to only split the plaster in most cases (3). Walker et al (6) reported that splitting the cast allowed for relief of pressure, regardless of the axis that was split. A study by Nielson and Ricketts (4) showed that casts split dorsally resulted in a significantly stiffer plaster cast, owing its mechanical properties to leaving the tension surface of the cast intact. In our practice, we have found that the use of the univalve split cast is preferable in most cases and allows for edema while providing increased immobility compared with the bivalve system.

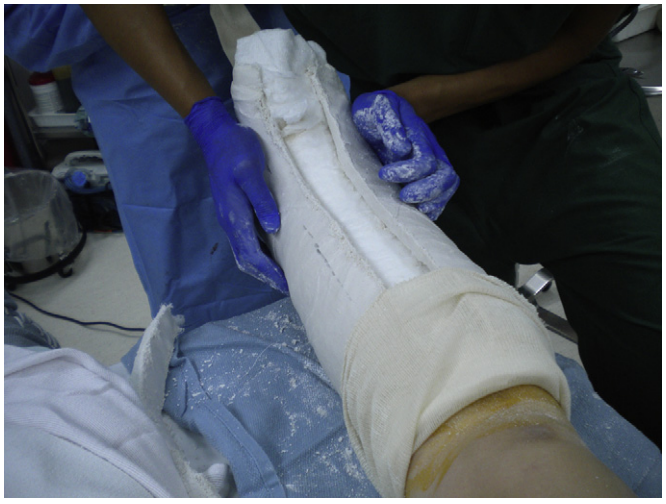

Fig. 6. Reapproximation of cast to original pressure after cast "decompression."

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