

Bivalve AFO for the Treatment of Charcot Osteoarthropathy

Treatment Protocol: The bivalve AFO has been used on both the acute and chronic phases of charcot arthropathy with tremendous success. The device has also been used for the management of diabetic ulcers associated with high pressure over bony prominences. The treatment protocol has been to apply a total contact cast on the extremity for edema management and bony stabilization. After one week or longer, a plaster impression is made of the patient's leg between cast changes for the fabrication of the AFO. This method insures that the foot and ankle are not too edematous thereby maximizing the intimate fit of the orthosis due to the accuracy of the negative impression. This progression from a total contact cast to the bivalved orthosis allows the foot and ankle to move from the unstable phase to the consolidation phase without interruption in support.

The early use of the AFO decreases physician office time required for treatment of this pathology due to the decreased need for multiple total contact casting visits. In those patients that have ulcerations, the orthosis is easily removed for optimum wound inspection, dressing changes, and debridement as required. The length of time the patients are required to remain in the orthosis, varies from patient to patient. In some cases, the severity of the deformity may dictate that the patient remain in the orthosis indefinitely, while others eventually wean themselves from the orthosis once bony consolidation and stabilization has been achieved. Even then, patients elect to continue to use the orthosis during periods of high activity or when navigating difficult terrains.

All of the individuals that successfully wean themselves from the orthosis are using some sort of total contact foot orthoses, appropriate footwear, and modifications based upon their need. This progression from the cast, to the bivalve, and subsequently to the inserts and shoes, has proven to be highly successful in the difficult management of this patient population.

Impression and Fabrication Techniques: The orthosis is designed to stabilize and partially unweight the foot and ankle to speed the healing process. This is achieved through the proper impression and fabrication techniques utilized when fitting this type of ankle foot orthosis. Most of the devices that have been fit on patients with significant bony deformation of the foot and ankle. These deformities are rarely reducible during the impression process and require accommodation rather than correction. With that in mind, a partial weight bearing impression technique is recommended. In order to capture the often irregular plantar surface anatomy, a six inch block of medium density cellular foam is utilized for the for the foot to be placed upon once wrapped in plaster or fiberglass. If there are open wounds involved, a small sterile dressing is applied just over the perimeter of the wound and the entire area is enclosed in clear cellophane wrap to protect the area from contamination. It is also important to recognize if there is excessive edema present in the extremity being casted. If the foot and ankle are excessively swollen, an extremity pump has been utilized prior to the impression to reduce the excessive fluids.

Stockinette is applied to the extremity in the usual manner enclosing the toes up to the proximal border of the patella. All bony prominences and landmarks are labeled distal to the patella for patellar weight bearing modifications. A circumferential wrap (plaster or fiberglass) is applied with a cut off strip running anteriorly. The patients foot is placed upon the foam block and the patient is instructed to stand with the use of a walker for stability and weight reduction. It is important to try and get the talocrural joint to 90 degrees if possible, but in some cases that may be unobtainable. Once set, remove, seal, and fill the impression in the normal fashion.

The modification of the positive model is similar to that of a PTB design AFO except that a toe box must be applied to the cast with adequate room distally and dorsally to safely enclose the toes without impingement. A multi-density foot orthosis is first molded to the positive model with a rocker effect sanded into the bottom of the orthosis. Then 1/4 inch soft foam liners are molded over the foot orthosis and cast both anteriorly and posteriorly with the seams running midline. Copolymer is then molded over the liners with the anterior being molded over the posterior shell with approximately one inch overlap. Four circumferential straps are then applied, with a rocker sole sanded into the crepe soling added at this point to the bottom of the orthosis.

Fitting Criteria: Once ordered by the managing physician, the patient is removed from the total contact cast and the bivalve AFO is applied. Polypropylene ski socks are recommended to be worn under the orthosis due to their superior wicking action and extra long length. If this is too restrictive due to poor vascular status or hypersensitivity, athletic cotton tube socks can worn under the orthosis as long as their length is sufficient

Once the patient has donned the device, the rocker action of the orthosis should facilitate fairly normal ambulation. It is extremely important at this time to recognize and correct any leg length discrepancies noted, normally requiring a small elevation to the uninvolved side. A physical therapy consultation may be advisable if the patient shows signs of instability on their feet. Some patients have elected to use a cane for added stability, but most are quite stable without any walking aids.

The patient is required to wear the orthosis continually only removing it for bathing, sleeping, and wound care or inspection. In some cases of extreme instability, physicians have ordered the device to be worn while sleeping as well. Due to the neuropathic status of the patients wearing the orthosis, it is imperative that it is frequently removed (every 2 hours) for the first few days, to inspect the leg for any pressure related problems.

Results of Use: Once the patient becomes adjusted to wearing the orthosis, most find it comfortable and easy to manage. A follow-up study was preformed to determine the efficacy of this treatment protocol for the management of charcot osteoarthropathy with the results presented this year at the American Orthopaedic Foot and Ankle Society summer meeting in Vail, Colorado. The retrospective paper reported a high rate of patient compliance and comfort with a high number of wounds healed simultaneously. The most important aspect of this treatment rationale

is that the use of the bivalve ankle foot orthosis not only reduced the need for surgery and subsequent hospitalization, but saved several compromised limbs as well. Overall this has reduced the cost of managing this difficult pathology, which is definitely in line with the health care climate today.

Written by: Roger Marzano, C.P.O.,C.Ped.