Application of a Constrained External Fixator Frame for Treatment of a Fixed Equinus Contracture

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Ankle equinus can result from congenital, traumatic, neurological, and pathological etiologies. Corrective methods have been described in the literature using a combination of soft tissue releases or osseous procedures with reported complications. We present a case report of a patient with a post-traumatic fixed equinus deformity of 28° at maximum dorsiflexion, treated successfully through gradual correction using a modified constrained external fixator. The patient maintained a rectus foot and was able to perform all daily activities at the final follow-up. Fixed equinus deformities can be difficult to manage. Gradual correction with an external fixator is a reasonable treatment option. Level of Clinical Evidence: 4 (The Journal of Foot & Ankle Surgery 47(5):468–475, 2008)

Key Words: ankle equinus, external fixation, post-traumatic

Equinus contractures develop from a number of different etiologies including congenital, traumatic, neurological, and pathological (1–3). Acquired equinus contractures, which evolve over a period of time, can advance into a fixed deformity because of soft tissue contraction and bony adaptation. Scar contracture and neurological damage are often seen in post-traumatic cases. Acquired equinus can be encountered as a single deformity, however it is often accompanied with other forefoot and/or hindfoot misalignments including pes equinovarus (4).

Osteotomies and acute soft tissue releases have been described for the treatment of complex foot and ankle deformities (5, 6). Complications relating to neurovascular structures and skin may develop with acute reduction of severe deformities (7). The Ilizarov apparatus was designed and modified to correct deformities in all 3 orthogonal planes using gradual correction (1, 4, 6–8). Herzenberg and Paley (6) described the use of the Ilizarov application for soft tissue deformity correction. Acquired cases of contraction after skeletal maturity could be realigned without the need for an osteotomy (6).

An external fixator can be used as a constrained or unconstrained hinge system. A constrained hinge system uses the center of rotation of a joint as the location for the placement of the hinges. The external fixator is then manipulated or adjusted daily to rotate around the joint axis in a calculated manner. This is usually used for large joints with identifiable centers of rotation. Unconstrained systems use a distraction technique to rotate around the center of the joint. This technique uses the natural rotation of the joint and is usually used with smaller joints or deformities with multiple joint axes.

Melvin and Dahners (5) described the use of a dynamic tension system with an unconstrained Ilizarov frame for correction of equinus with various etiologies. The constrained hinged method has been described to have a high level of technical difficulty for the patient and physician and has proven to be unreliable in obtaining accurate correction around the ankle joint axis (5). This manuscript describes a patient with a traumatically induced fixed equinus deformity with residual peroneal motor and sensory neuropathy. A detailed description on the application and use of a modified constrained rotating hinged frame is presented. Challenges included a retained prograded tibial rod from previous surgery for a tibial shaft fracture as well as postsurgical scar formation. The modification of the frame for creation of an appropriate ankle joint axis and motor are discussed. The use of adjunctive procedures including peroneal and tarsal tunnel release along with a gastrocnemius recession is also discussed.

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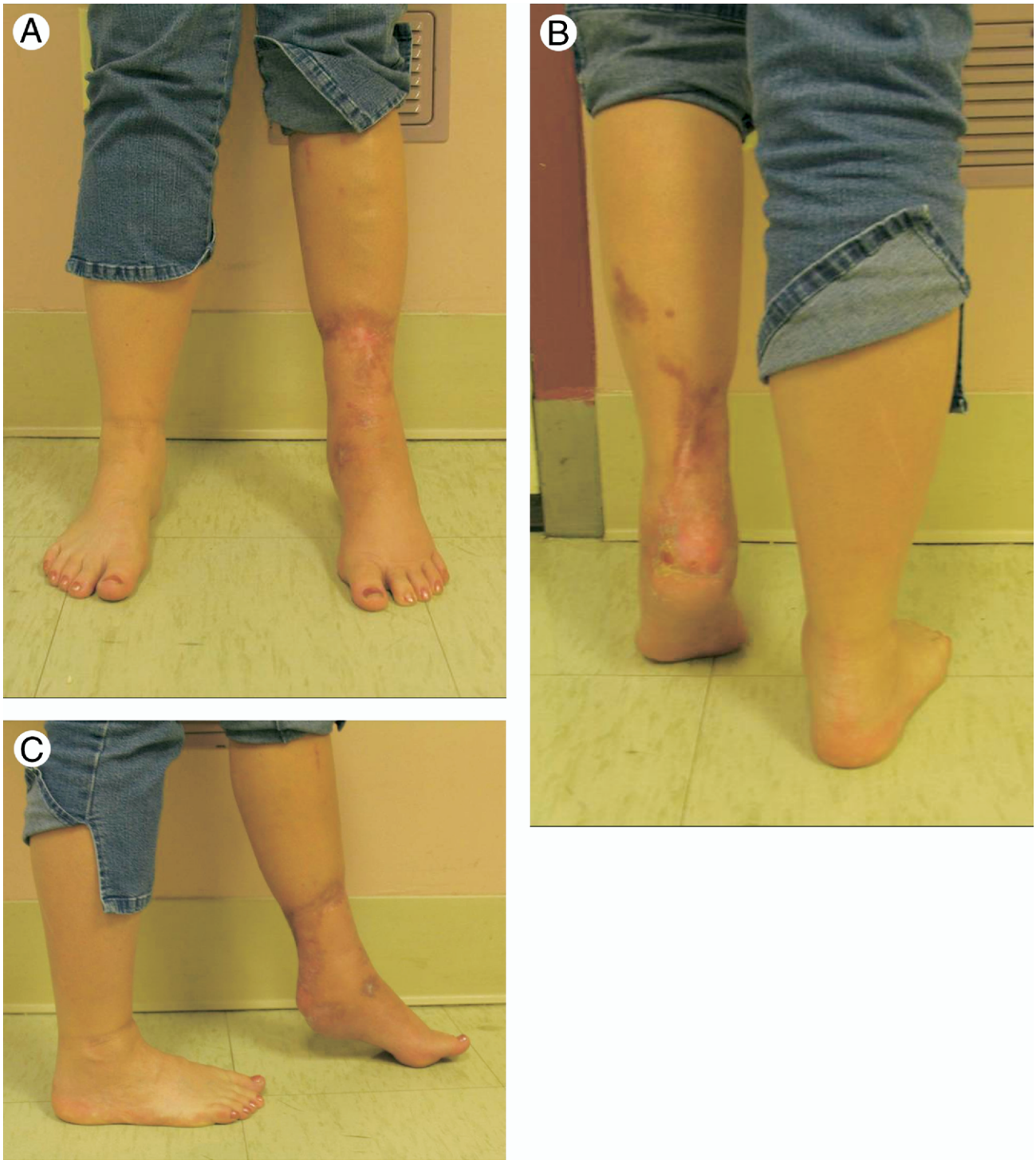

FIGURE 1 (*A, B, C*) Pre-operative photographs of a post-traumatic fixed equinus deformity with a maximum dorsiflexion of 28° in a plantarflexed position.

Case Report

A 35-year-old female patient was referred to the Foot and Ankle Institute of Western Pennsylvania in October 2005 with complaints of a painful fixed equinus contracture of her left lower extremity. The patient had been involved in a severe motor vehicle accident in February 2005 resulting in a lacerated spleen, liver, and kidney along with a left-sided pelvic