# Slow, Gradual External Fixator Distraction in Acquired Ankle and Foot Contracture

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## ABSTRACT

***Background:*** *External fixators have been noted to have a place in the orthopaedic management of problems involving the ankle and foot. We here report a case of ankle and foot contracture managed by soft tissue release and slow, gradual external fixator distraction.*

***Method:*** *A case report of a patient with acquired ankle and foot contracture and discussion of relevant literature.*

***Results:*** *A 9-year old female presented to our out-patient clinic with features of right ankle and foot contracture following treatment by traditional bone setters 6 years earlier. The contracture was fixed at $30^0$. She had soft tissue release and slow, gradual external fixator distraction which corrected the foot to a plantigrade position. Subsequently she had skin grafting for the skin defect. After removal of the external fixator she was placed on a below knee cast and commenced weight bearing. The cast was removed after three weeks and the patient has continued to bear weight on a plantigrade foot.*

***Conclusion:*** *External fixators have a definite place in contracture release and should be widely utilized.*

**KEYWORDS:** External fixators; Soft tissue release; Contracture.

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## INTRODUCTION

Contracture associated with the maturing of a scar is one of the sequelae of wound healing. Contractures occur across joints and flexural areas. Depending on the joint across which the contracture occurs, it could be disabling causing decreased mobility and limb length discrepancy[1,2]. Though no joint is exempted, the common joints affected are the elbow, knee and ankle[2]. Contractures could be due to congenital causes like arthrogryposis, multiple pterigium syndrome, spina bifida or acquired as in inflammatory conditions such as juvenile rheumatoid arthritis, haemophilia, pyoarthrosis, trauma, burns, polio, immobilization amongst others [1-3].

Various treatment modalities are available for the treatment of contractures. These include nonsurgical methods, soft tissue procedures, osteotomies and mechanical distraction using external fixators with or without open soft tissue release [1-5].

The non-surgical methods include serial casting, reverse dynamic slings and inflatable splints [1,2]. Dynamic splinting in combination with intensive physical therapy is a modification of this technique. Soft tissue procedures include tendon lengthening (Achilles, flexor and extensor digitorum etc) and may also include a capsulotomy. Soft tissue procedures are often not sufficient to gain full correction [1,2]. The chronically contracted vessels and nerves prevent full correction. Though the nonsurgical methods are generally successful in only mild contractures, these methods can be used as adjuncts after soft tissue release to stretch gradually the tight neurovascular structures[2].

External fixators have been noted to have a place in orthopaedic management of problems of the ankle and foot[3]. Mechanical distraction using external fixators with or without open soft tissue release has been utilized by a number of workers for contractures across various joints including the ankle [1-8]. The utilization of external fixators for tissue lengthening and gradual joint distraction has been popularized by Russian investigators[1,2,6]. These fixators represent a more efficient way to apply forces to the skeletal deformity[2]. The versatility of these techniques and minimized risk of neurovascular complication are advantages of these techniques[2].

The aim of this paper is to report a case of severe ankle and foot contracture managed by soft tissue release and slow, gradual external fixator distraction.

## CASE REPORT

E.C. a 9-year old primary school female presented to our out patient clinic at the University of Port Harcourt Teaching Hospital in March 2005 with a 6-year history of upward bending of the right foot. She was noticed to have swelling of the right foot 6-years earlier with no preceding history of trauma. The swelling burst creating

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a wound which was managed initially by the patent medicine dealer and later by a traditional bone setter. The bone setter's treatment involved tying the foot and leg together and applying native herbs to the wound. The wound subsequently healed 2-years later with the toes pointing upwards and her foot remained bent upwards. She walked on her heel.

Essential findings in the musculoskeletal system were wasting of the right lower limb with a limb length discrepancy (real length 3cm) in the right leg. The right foot was fixed in dorsiflexion with a scar across the foot and ankle with the mid foot fixed to the anterior aspect of the distal third of the right leg. There was surrounding area of hypo pigmentation and callosity of the right foot (heel). The foot was fixed at about $30^0$ (Figure 1 a and b). The posterior tibial pulse was present and the sensation was intact. A diagnosis of acquired soft tissue contracture of the right ankle and foot was made.

Plain radiograph of the right leg and foot (Fig 2 a and b) showed osteopenia and dorsiflexion of the forefoot and mid foot with subluxation of the midtarsal joints. The full blood count revealed a packed cell volume of 31%, white blood cell count of $3.0 \times 10^9$/L and differential count as follows: neutrophil 54%, lymphocyte 40%, monocyte 3% and eosinophil 2%. Her genotype was AA and the urinalysis was normal.

For financial reasons she had surgery five months later. The surgery consisted of soft tissue release with lengthening of the extensor tendons of the foot which were tight and application of a Centrifix external fixator. The half pins were placed in the tibia, calcaneum and fifth metatarsal. The fixator was distracted and the ankle fixed at $60^0$ when the capillary refill was noticed to be sluggish (Fig 3 a and b). Post operatively the wound was made wet every six hours with normal saline because of the exposed lengthened tendons. She was placed on intravenous augmentin and genticin for 48 hours after which the augmentin was converted to oral preparation, analgesics and haematinics.

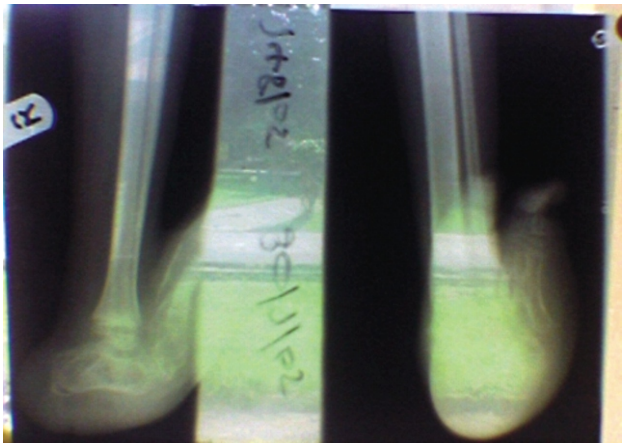
On the 10th post operative day the external fixator was further distracted getting the ankle to $80^0$ (Fig 4). On the 20th post operative day the external fixator was further distracted getting the foot to $90^0$ (plantigrade position) (Fig 5).

A wound swab done two weeks after the surgery showed scanty growth of *Pseudomonas spp* which was sensitive to genticin and ceftriaxone. She had a five day course of genticin. With the defect filling up with healthy granulation tissue, a full and split thickness skin grafting was done four weeks post soft tissue release and external fixation. The full thickness graft was placed over the ankle and the split thickness graft over the distal third of the leg and the forefoot and part of the midfoot (Fig 6 a and b). The initial graft take was 90% and by two week after the grafting the wound had completely healed (Fig 7a, b and c). The external fixator was removed 10 weeks post soft tissue release and external fixation. There was no pin tract infection. A below knee cast was applied and she commenced weight bearing. She is being followed up in the out-patient clinic. Presently, the cast has been removed and she continues weight bearing on a plantigrade foot.

**Fig. 1a**

**Fig. 1b**

**Fig. 1a and b. Preoperative photograph of the patient. Note the limb length discrepancy**



a b

**Fig. 2a and b. Plain radiographs of the right leg and foot of the patient.**

**Fig 4. Adjustment of the external fixator getting the foot to 80$^0$.**

**Fig. 3a**

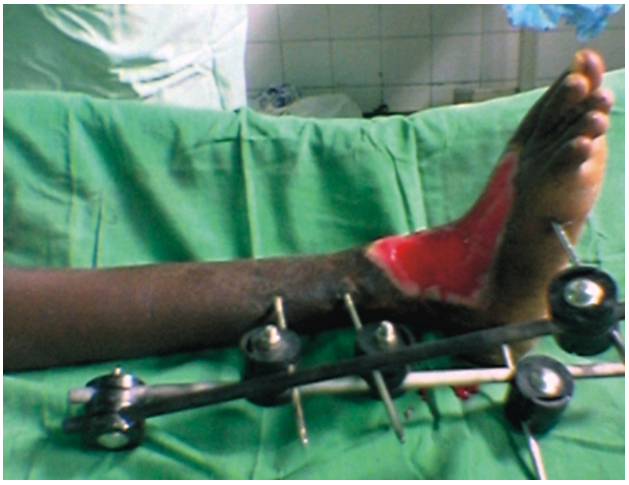


**Fig. 5. Adjustment of the external fixator getting the foot to a plantigrade position (90$^0$)**

**Fig. 3b**

**Fig. 3a and b. Immediate postoperative photographsNote the skin defect**

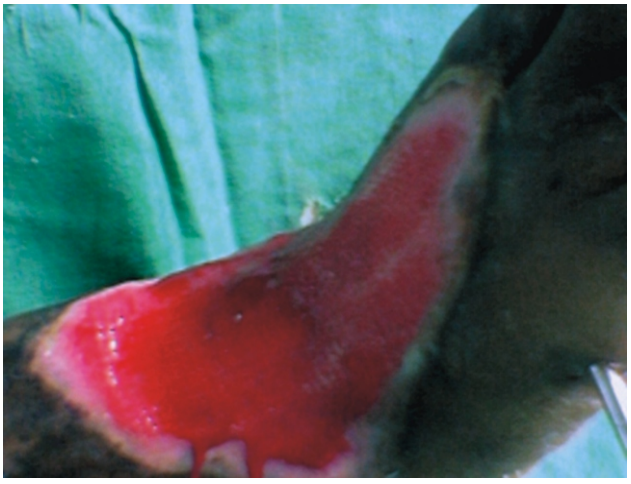


**Fig. 6a. Good granulation tissue covering the defect**

**Fig. 6b. After full/split thickness graft**

**Fig. 7a**

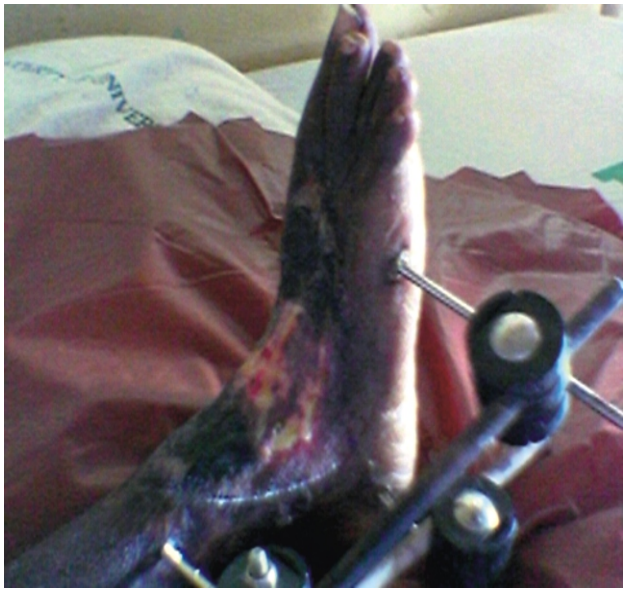


**Fig. 7b**

**Fig. 7c**

**7a and b. Skin graft has completely taken**
**7c. Comparing the right and left foot Note the hypoplastic right foot**

## DISCUSSION

Ankle and foot contractures can be a challenging problem as this can be disabling giving rise to gait abnormalities and limb length discrepancy[3]. Children are particularly prone to limb length discrepancy due to asymmetric epiphyseal growth arrest and inability of the contracted skin to grow normally with the skeleton[3]. As was noted in this patient there was a real limb length inequality of 3cm which was noted in the right leg (Fig 1a).

One of the initial treatments of this patient was by a traditional bone setter who tied both the foot and leg together in order to heal the wound. In the process the bone setter may have subluxed the midtarsal joints which were further aggravated by the maturing of the scar. There is a need to limit the practice of these bone setters.

In joint contracture there is chronic contraction of the neurovascular structures [1,2] and this could be compromised in the bid to completely get the foot to a plantigrade position in one stage. Hence there is a need to gradually stretch these structures, as was done in this patient.

Ilizarov recognized that bone and soft tissue could be influenced by gradual distraction or compression which he termed the tension stress effect[3]. The biologic principle of slow, gradual distraction has been applied in treating numerous types of injuries and orthopaedic diseases and this includes joint contractures[6].

Soft tissue procedures which involve tendon

lengthening can be combined with external fixator distraction though external fixator distraction can be carried out without open soft tissue procedures [2,3,4,6]. Gradual soft tissue distraction avoids undesirable changes within the elongating soft tissue[6].

Though the concept of gradual external fixator distraction was popularized by Russian investigators utilizing the ring fixators [2,3,7,8], other frames such as the AO/ASIF, and Orthofix frames have been utilized[6]. We utilized the Centrifix fixator in our patient for the gradual distraction.

The wetting of the wound with normal saline prevented desiccation of the exposed lengthened extensor tendons and allowed healthy granulation tissue to cover the defect created before the full and split thickness skin grafts were applied.

Though there are problems with the external fixators, these are minimized with proper care for the pin sites and the frames. Pin tract infection which is a complication of external fixation was avoided in our patient by proper care of the pin tract sites.

## CONCLUSION

External fixators have a definite place in contracture release with or without open soft tissue procedures. Though the ring fixator devices have been popularized other external fixator devices can be utilized for this purpose and we advocate their wide utilization.

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