

Management of severe/neglected clubfoot deformity using Ilizarov technique

Enemudo R.E¹, Emina B.K¹, Nwokike O.C², Onyeokweanwa C.E.²

¹Department of Orthopaedic and Trauma, Delta University Teaching Hospital, Oghara, Delta State, ²Department of Orthopaedic and Trauma, Irrua Specialist Teaching Hospital.

Abstract

Severe clubfoot deformity of the foot and ankle poses a serious challenge to every practicing orthopaedic surgeon. We present an article on some severe clubfoot managed by the use of Ilizarov technique. Five patients with severe club foot deformities were treated. The mean age was 13.2years (range 1-26years). Progressive correction of the deformities was achieved through the use of Ilizarov device. After correction in 2 months, a below knee scotch cast was applied for a period of 4 months. The mean follow-up period was 21.4 months (18-26 months). The duration of the fixator was 2 months and scotch cast was 4 months. At the end of this period, a plantigrade foot was achieved in all the feet. Out of 5 patients, 1 was excellent and the rest good using the Reinker and Carpenter scale. Excellent and good were considered satisfactory while fair and poor were considered unsatisfactory. The outcome of severe clubfoot deformity correction with Ilizarov technique is very good and therefore provides a better treatment option than conventional surgical methods currently used.

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Key words:

Introduction

Clubfoot is the most common deformity of the foot. It occurs in 1:1000 live births with a male: female ratio of 2:1. It may be congenital or acquired with the congenital type being more. Amongst the congenital variety, idiopathic factor as a cause accounts for most.

Clubfoot is graded into mild, moderate and severe. The mild and moderate types can be easily corrected by conservative method of treatment like that of Ponsetti while the severe forms are amenable to surgery. The aim of treatment whether conservative or surgical, is to achieve a stable plantigrade foot that is painless.^{1,2}

Several surgical methods have been used to correct resistant or relapsed clubfoot deformity. However, they have been associated with several setbacks such as small rigid foot, skin loss, neurological and painful feet. The use of Ilizarov technique has helped to overcome these problems in the management of resistant/relapsed clubfoot.

In this article we present five cases of severe clubfoot managed with Ilizarov technique in Delta State University Teaching Hospital, Oghara, Delta State, Nigeria: looking at aetiological factor, sex, age, and outcome.

Patients and Method

A retrospective cross-sectional study of patients with severe club foot deformity managed using Ilizarov technique over a 3 year period in orthopaedic unit of DELSUTH, Oghara was done. In this period, a total of 15

Correspondence to:

patients with severe clubfoot deformity were seen. 5 patients were treated using Ilizarov technique while 3 were offered corrective osteotomy and triple arthrodesis. The rest declined for financial reasons. Only the five patients managed by Ilizarov technique were included in this study.

Method

Examination of the leg and foot was done to determine the presence of features of severe club foot deformity such as rigid relatively smaller foot when compared to opposite normal foot in unilateral cases, presence of callosities on the dorsum and lateral aspect of the foot with marked cavus at the midfoot. Other features of clubfoot like forefoot adduction, midfoot supination, heel varus and equinus ankle joint were sought for (Fig 1a-1b). Pirani scoring of the foot was done.³

X-ray of the foot anteroposterior and lateral views was done and the talocalcaneal angle was measured.

Patients were counseled to have surgical correction using Ilizarov technique and consent obtained. The demographic data of the patients is as shown in table 1.

Procedure

At surgery, under general anaesthesia, a tourniquet was applied on the right thigh. Two complete Ilizarov rings were applied on the distal leg and held in place by k-wires that passed through the tibia bones. Two wires per complete ring. Two half ring for the foot. One for the metatarsal heads and another attached to the calcaneum. These were attached by 2 k-wires each to the bones. A horizontal incision was made below the medial malleolus extending to the navicula anteriorly to expose the talus. A V-shaped osteotomy was made on the talus and calcaneum for the 26 year old patient only. Two kirschner wires each were inserted into the heads of the metatarsal bones and calcaneum. These were attached to Ilizarov rings while another k-wire was passed through the middle of the talus (Fig 2a

-2b). This was the fulcrum of correction of the cavus and heel varus like in Ponsetti. Tarsal tunnel was decompressed.

Distraction was commenced one week after surgery to correct the deformity by means of callotaxis and ligamentotaxis. The medial distracting rod on the foot was turned 180 degrees 6hourly(2mm per day) to correct the cavus and heel varus while lateral distracting rod was turned 90 degrees 6 hourly(1mm per day). This allowed the foot to increase in size. The compressing rod connecting the ring attached to the metatarsal heads and the distal ring on the leg was turned 180 degrees. This stretched the plantar fascia to correct the equinus. The connecting rod between the calcaneal ring and the distal ring on the leg posteriorly was distracted at 90 degrees 6 hourly. This caused the archilles tendon to increase in length. The toes were supported with splints during the correction to prevent clawing deformity of the toes. The mothers were taught how to turn the nuts on the distractors and compressors as well as care for the pins and pin sites. The patients were discharged 2weeks after surgery when the mothers had mastered the procedure. They were seen in out-patient clinic every week to monitor the process, treat any problem or complication and correct any mistake made by the mothers. By 2 months, a plantigrade foot was achieved. The device was removed and foot put in a boot cast to maintain the plantigrade position and patient commenced partial weight bearing until the foot became stable. This was achieved in 4 months. The scotch cast was removed and patient ambulated freely (fig 3a-3d).

Results

Patient was monitored for a long period between 18 to 24 months. The outcome of the correction and function were assessed and the result graded by Reinker and Carpenter⁴ scale; 1. Excellent: painless plantigrade foot with no functional limitations. 2. Good: plantigrade foot in a patient able to ambulate long distances with mild pains. 3. Fair: mild

residual deformity requires bracing with or without some functional limitation but an active life. 4. Poor: significant residual deformity, pain and activity limitations.

(20%), 4 had good outcome (80%). Excellent and good score were considered to be satisfactory outcome while fair and poor were considered as unsatisfactory. The average time in fixator and scotch cast was 6 months.

Out of 5 feet, 1 had excellent outcome

Table 1: DEMOGRAPHIC DATA OF THE STUDIED PATIENTS

Case/side	Age/Sex	No of previous Operation	Mid-tarsal osteotomy	Time of fixator	Follow-up (months)	Score
1. R	26yr/F	None	Yes	6months	26	good
2. R	11yr/M	None	No	6months	24	good
3. R	1yr /M	None	No	6months	19	excellent
4. R	23yr/F	None	No	6months	20	good
5. R	5yr/M	None	No	6months	18	good

Abbreviations; R=right, yr=year, M= male, F= female

All had a Pirani score of 6

All the deformity were congenital in origin with 4 being idiopathic and 1 due to Type 2 Tibia hemimelia (in the 1 year old child)

Fig. 1: Showing deformities of patients before surgery

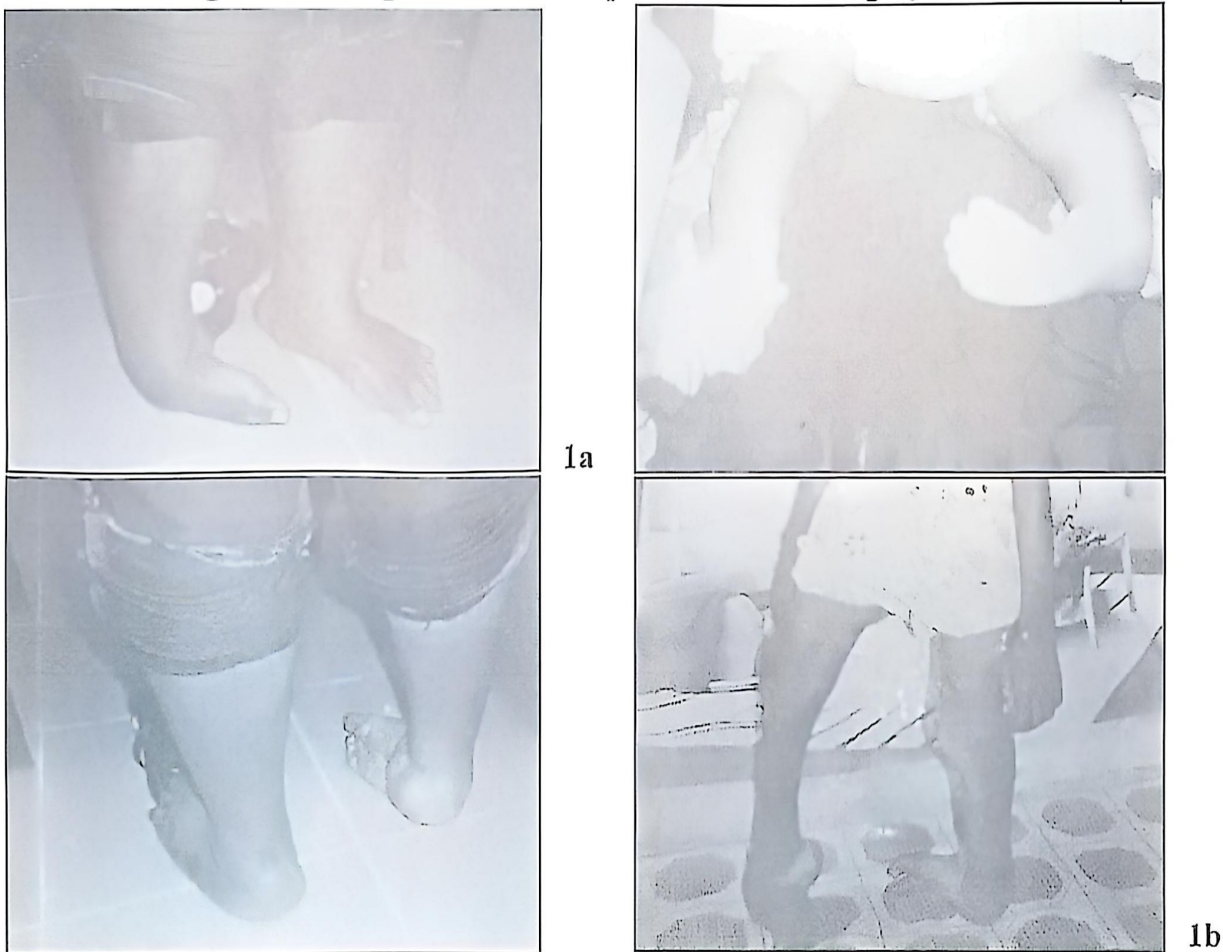


Fig. 2a-2b: Shows pictures of patients' leg and feet in Ilizarov device.

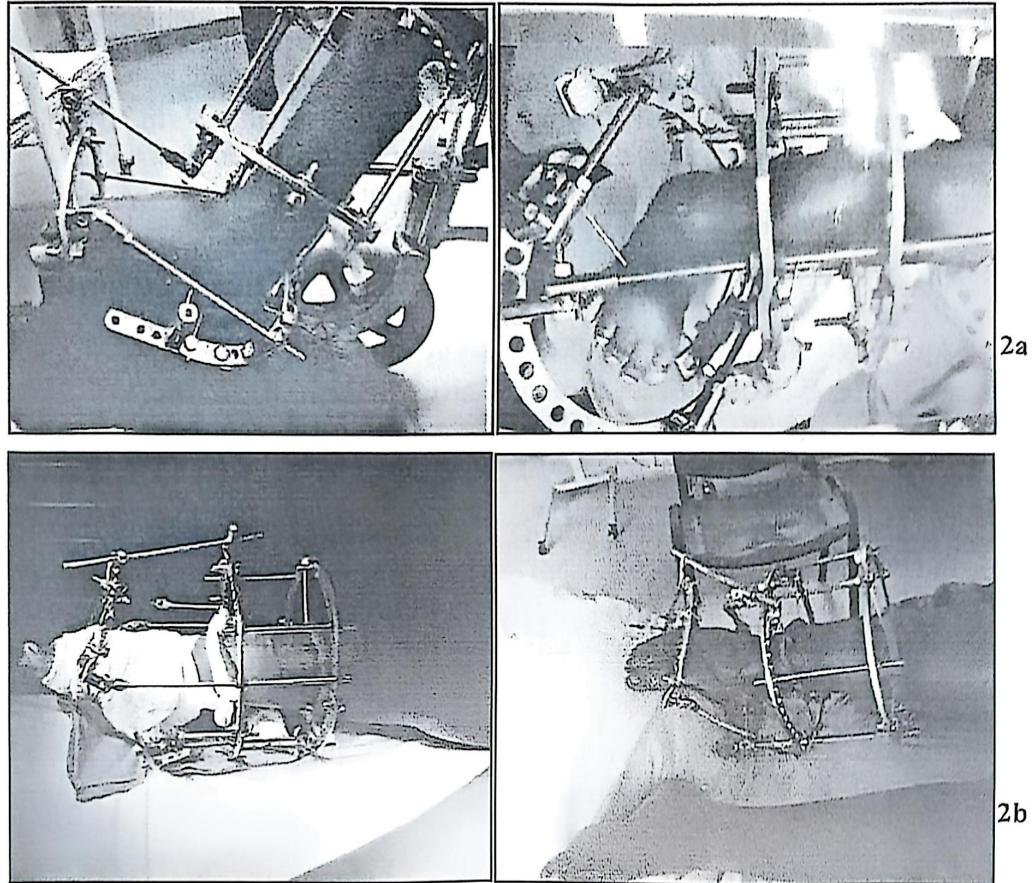


Fig. 3a-3c: Showing patients' feet after correction with Ilizarov device



Discussion

The use of Ilizarov technique for the correction of clubfoot is not new in the developed world. The device was first used by Russian surgeon Gavril Ilizarov since the 1950s (hence the name Ilizarov technique) for so many years before it was introduced to Western Europe and later to US in the 1980s. It is even commonly used in India today.⁵

However, from available literature it is only being used in few centres in Nigeria like National Orthopaedic Hospital, Dala, Kano and University of Benin Teaching Hospital, Benin for limb lengthening. Its use for clubfoot deformity correction in this article is novel in this country as there is no known record of it ever used for clubfoot correction. At present the conventional treatment for severe clubfoot entails tendon lengthening, tendon transfer, corrective osteotomy and triple arthrodesis by various surgical approaches such as Dilwyn Evans, Carrol, Turco and Cincinnati.^{6,7,8} Clubfeet managed this way end up being smaller and rigid as several foot joints are excised and fused viz subtalar, calcaneocuboid and talonavicular.

Other complications include skin loss following acute correction and possible damage to neurovascular structures.^{6,7,8} With Ilizarov device these complications are avoided and the foot actually increases in size to almost equal the normal foot size. Ilizarov seems not to have any limit in its ability to correct severe deformity, rigid or relapse. Its draw back is that the process is complex, cumbersome and learning curve takes time to attain⁵. There could be impalement of neurovascular tissues. This is avoided by knowing the neurovascular planes and avoiding them during insertion of the k-wires. In addition, patient selection is very important as it requires a very cooperative and willing patient and a relation that is intelligent enough to understand the adjustment of the device and care of the pin sites for the treatment to be successful. Lastly the device is expensive and difficult to procure.

Our patients did well after the parents/relations had mastered the manipulation and care of the device. The weekly visit to the clinic helped to check any mistake made by

the parents and we were able to address the complications that occurred during the process. The complications were pains, sores from pins tearing through the skin during distraction and pin sites infections. The pain was addressed by giving tramadol 6hourly and usually an hour before turning the distractors. Tramadol was complimented with diclofenac sodium. For the child, ibuprofen 100mg 6 hourly suffixed. They did well with this analgesic regimen. Pin site infection has been reported to be as high as 95% in some studies⁹. To control pin site infection, the pins and the entry point of it on the skin was cleaned twice daily with methylated spirit lotion by the patient mothers using cotton wool. In addition, the wound was dressed twice weekly with povidone iodine at a nearby clinic close to them. Wound swab microscopy and culture of pin tract discharge was done at regular interval and antibiotics prescribed based on sensitivity. This effectively controlled infection and kept the wound clean. Other authors have used different methods for pin site care. Ogbemudia in his article on pin tract infection advocated the use of combined chlorhexidine and sulphadiazine cream in the dressing of pin site to reduce pin tract infection¹⁰.

At 2 months, a plantigrade foot was achieved. The Ilizarov device was removed and the foot was put in a scotch cast in plantigrade position for 4 months to allow the regenerate to consolidate and the soft tissues to mature. At the end of 4 months, the scotch cast was removed and patient had achieved a plantigrade foot that is almost the same size as the normal foot.

Our study had 5 patients with 5 feet with the age range of 1-26yrs (mean of 13.2 years). Four patients had soft tissue distraction only while one patient had mid-tarsal osteotomy in addition to the soft tissue distraction. All patients had satisfactory outcome (1 excellent and 4 good scores on the Reinker scale). The same evaluation of the feet for all the patients was done using Reinker and Carpenter scale as the same Ilizarov distraction principle was used for all the patients. It is believed that mid-tarsal osteotomy did not affect the outcome. It does

not affect the short term follow-up but may influence the long term follow-up by decreasing the rate of recurrence of forefoot adduction. Our result was comparable to Grant et al¹¹, who analyzed 4 feet in 3 children. He achieved a plantigrade foot in all patients by soft tissue distraction alone after an 11- to 24-month follow-up period.

De La Huerta¹² reported on 12 feet in 7 adults with the achievement of complete correction in all patients except 3 in whom mild adduction of the forefoot reoccurred.

El Barbary et al¹³ achieved satisfactory correction using an Ilizarov fixator for treatment of 66 relapsed or neglected club feet (40-month follow-up).

Prem et al¹⁴ followed 19 feet managed by Ilizarov soft tissue distraction for 5 to 10 years postoperatively. They reported on 14 of 19 feet graded good or excellent and 13 of 14 children satisfied with the results of the

treatment.

Utukuri et al¹⁵ treated 26 resistant club feet in 23 children using Ilizarov technique. They reported unsatisfactory results of soft tissue and bony distraction with a recurrence rate of 70% for soft tissue distraction and 55% for bony distraction after a longer period of follow-up (47 months) but found that functional results (patient-based outcomes) were better despite a poor surgical outcome.

Conclusion

This study supports the findings in the literature that proved the success of Ilizarov method in the management of severe clubfoot deformity. We recommend the use of Ilizarov technique with or without osteotomy depending on the age of the patient for the management of neglected or relapsed resistant clubfoot.

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