



Ilizarov external fixation for management of severe relapsed clubfoot in older children



Mohamed El-Sayed^{1,2,*}

Tanta University, Egypt

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ABSTRACT

Background: Although the standard treatment of clubfoot deformity is conservative by serial casting techniques, relapses are not uncommon. Management of relapsed clubfoot deformity in older children is an orthopedic challenge. There is a growing interest in management of such complex deformities using the Ilizarov technique.

Methods: In this study, the Ilizarov frame was used to correct severe relapsed clubfoot deformities in older children, whom underwent previous surgical interventions. 42 relapsed clubfeet were included. The Dimeglio classification was used for clinical assessment of the relapsed feet pre-operatively as well as post-operatively.

Results: After an average follow-up period of 4.6 years, and according to the Beatson and Pearson numerical assessment, favorable results (excellent or good) were found in 37 feet, while poor results took place in only five feet.

Conclusion: Based on the final clinical and radiographic results, the Ilizarov technique could be considered as a good management alternative for such severe deformities.

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1. Introduction

Clubfoot is a general term used to describe a group of deformities of the foot that are usually present at birth. It is a complex foot deformity that consists of equinus of hindfoot, varus of the hindfoot and heel and forefoot adduction. It is best thought of as displacement of the navicular, calcaneum and cuboid bones around the talus [1]. Although nowadays, there is a universal agreement that the initial treatment of all clubfeet should be non-operative [2–5], relapses and recurrence of the deformity are recorded and occur in about 20% of the cases [6–8]. In such cases, the Ilizarov technique is considered as a good alternative to bony procedures in older children [6,9,10].

This study was designed to evaluate the results of management of severe, resistant, relapsed or recurrent clubfoot deformities after initial surgical treatment in children older than 3 years using the Ilizarov method.

2. Patients and methods

Between October 2004 and November 2009, there were 38 patients with 42 relapsed clubfeet treated at an academically supervised Referral University Hospital. Only severe resistant cases were included in this study (Dimeglio [11] grade II deformity was a minimum for inclusion) (Fig. 1a and b). Patients younger than 3 years, with virgin feet with no history of previous surgical intervention, and non-idiopathic deformed feet were excluded from this study. The age of the included patients ranged between 3 and 13 years with an average of 6 years. There were 30 males (71%) and 12 females (29%). The right foot was affected in 19 patients, while in 15 cases the left foot was affected and bilateral affection took place in only four children. The follow-up period ranged from 25 months to 5.6 years, with an average of 4.6 years. All the included patients underwent previous surgical interventions (1–4 previous surgeries), as shown in Table 1. All the performed surgeries were soft-tissue release surgeries, and none of the patients had had any previous bony procedures. The interval between last surgical procedure and correction by the Ilizarov frame ranged between 1 and 9 years with an average of 2.76 years. During this period, all children except three were subjected to trials of closed manipulation and casting (average 1.7 times). The Dimeglio score was used to initially assess the condition of the relapsed feet, and according to this classification, nine feet (21%)

* Correspondence address: 96, Hasan Radwan Street, 3111 Tanta, Gharbia, Egypt. Tel.: +2 0100 6632628.

E-mail address: mhosney2012@hotmail.com

¹ Member of EPOS, AAOS, SICOT, ASAMI and EO.

² Fellow of LMU, Deutschland and UNT, USA.

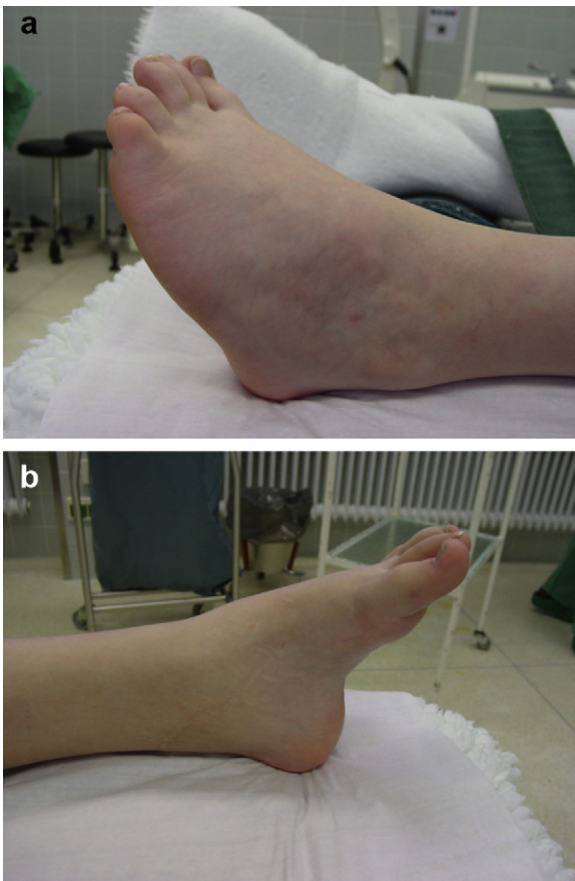


Fig. 1. Male child 10 years, with relapsed left clubfoot. Pre-operative Dimeglio grade III. History of two soft tissue surgeries. Interval between last surgery and Ilizarov application 6 years.

were grade IV, 25 feet (60%) were grade III and eight feet (19%) were grade II (soft–soft feet “grade I” were excluded from this study). Full weight-bearing, antero-posterior and lateral radiographs were taken for all the studied cases. The talo-calcaneal and talo-first metatarsal angles were measured in the lateral and anterior–posterior view. The talo-calcaneal index (the average of the antero-posterior and lateral talo-calcaneal angles) was calculated. (Fig. 2) The cases were subdivided into three groups: 13 cases were $<20^\circ$, 25 cases were $20\text{--}40^\circ$ and four cases were $>40^\circ$ (Table 2).

All the cases received general anesthesia; systemic antibiotics were given 8 h before surgery; pre-assembly of the frame was done in all but nine cases. In bilateral cases, both feet were done simultaneously. A simple standard frame was used for patients in this study formed of: (A) a tibial ring: one ring was applied to the tibia in 12 limbs, while two rings were used in older children to

Table 1
Previous surgical treatment for the included patients.

| No. of previous operations | No. of feet | |
|----------------------------|-------------|-------|
| | N | % |
| One operation | 2 | 4.76 |
| Two operations | 19 | 45.24 |
| Three operations | 16 | 38.1 |
| Four operations | 5 | 11.9 |
| Total | 42 | 100 |



Fig. 2. Plain X-ray of the foot in lateral view showing a talo-calcaneal angle of 10° .

Table 2
The preoperative talo-calcaneal index.

| Index before | No. of feet | |
|-----------------------|-------------|--------|
| | N | % |
| $<20^\circ$ | 13 | 30.95 |
| $20\text{--}40^\circ$ | 25 | 59.52 |
| $>40^\circ$ | 4 | 9.52 |
| Total | 42 | 100.00 |

add to the stability of the frame (30 limbs). (B) A half ring for the calcaneum. (C) A half or $5/8$ ring for the forefoot according to the size of foot. An olive wire was inserted under image into the neck of the talus and was connected to the distal tibial ring in order to fix the talus and assist talo-navicular reduction. In 20 feet, soft-tissue release was used (excision of the previous surgical scar, or plantar fascia release) (Fig. 3a and b). After application of the frame, intra-operative antero-posterior and lateral radiographs were taken to assure the position of the wires and the half pin screws. Parental antibiotics were given for 4 days. After that, the child was given oral antibiotic for 1 week. Children were discharged from the hospital 1 week after operation after being sure that the parents were well trained in cleaning of the wire sites and the program of correction. Daily active and passive exercises of the toes and using a foot-board were recommended during the distraction period to avoid flexion contractures of the toes. Follow up was made every 2 weeks to check the degree of correction and if there was any pin tract infection. At the end of correction, antero-posterior and lateral radiographs were taken. (Fig. 4) After being sure that the deformity was corrected, the frame was left for 4–6 more weeks (to avoid relapse), then it was removed under general anesthesia. Time needed to achieve correction was between 3 and 8 weeks. The total period of frame application ranged between 7 and 13 weeks (average 9.8 weeks). The total end result was assessed according to the numerical assessment system of Beatson and Pearson (1966) [11], with exclusion of modification of Ghali. This system evaluates the results according to the clinical and functional appearance. Up to 4 points were given to each of the function, movement and morphology. Children with more than 9 points total score were considered excellent, 7–9 points were considered good while less than 7 points were considered poor (Fig. 5a–c). Statistical presentation and analysis of the present study was conducted, using the mean, standard error, Student's *t*-test [unpaired], analysis of variance [ANOVA] test, and Chi-square by SPSS V. 13.

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