Correction of Lower Limb Deformities Using Ilizarov's Technique

Maj Gen VP Pathania, ^{vsm*}, Col AK Sharma⁺, Lt Col GR Joshi[#], Dr John T John^{**}

Abstract

Background: India accounts for approximately 10 million orthopaedically handicapped children and adults with limb deformity. Ilizarov ring fixator could treat most of these deformities.

Methods: Twenty cases of deformities of lower limb managed with Ilizarov technique during period between March 2001 and February 2003 were studied.

Results: 55% were in the age group of 11-30 years. Out of the 20 cases studied, 6 were congenital talipes equino varus, 8 were fixed flexion deformity of knee, 4 were equinus deformity of the ankle and 2 were malunited fracture shaft of tibia. 4 patients who had recurrence were operated for fixed flexion deformity of the knee. The main complication encountered was pin tract infection, which was seen in 15(75%) cases. In 16(80%) cases, the results were excellent with no recurrence of deformity and patients were able to walk independently. In 4 (20%) cases, recurrence was mild to moderate (10 to 20) but all of them were able to ambulate independently and carry out their routine activities.

Conclusion: Ilizarov ring fixator is a superior compared to conventional methods for correction of deformities of lower limb.

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Key Words: Ilizarov method; Ligamentotaxis; Distraction

Introduction

It is estimated that in India there are about 10 million orthopaedically handicapped children and adults with limb deformities. Most of these deformities can be treated by Ilizarov ring fixator. The principle of compression-distraction histiogenesis of bone and soft tissue is the basis of treatment of the Ilizarov ring fixator. Distraction histiogenesis generates new bone and soft tissue under gradual distraction. Although distraction is important for maturation, which includes neocorticalisation and remodeling, the apparatus is removed once the newly formed bone achieves adequate strength to resist physiologic loading [1].

The modalities of treatment used in deformity correction are physiotherapy, splintage, corrective devices, capsulotomy, corrective plaster cast and traction. Ilizarov ring fixator which allows flexibility and adjustment at one or more levels for correction of multidirectional, multiplanar, and multilevel axial deformities is superior to other conventional methods.

Material and Methods

20 limb deformities reporting to a referral service hospital managed by Ilizarov method during the period March 2001 and February 2003 were included in this study. They included 6 congenital talipes equino varus, 8 fixed flexion deformity of

knee (Below knee amputation 3, Post traumatic contracture-2, Post polio residual paralysis-2, Post tubercular contracture of knee-1), 4 Equinus deformity of the ankle and 2 malunited fracture of shaft of tibia.

When planning correction, a multitude of factors were considered, including patient's age, etiology and extent of deformity. The management modality was explained to patient and family so that they were prepared for the prolonged treatment. The technique involved frame design and application, subperiosteal corticotomy and pin and wire insertion. Pre-operatively, number and type of rings and position of hinges were determined. Ilizarov ring fixator was prepared 48 hours before surgery and was autoclaved.

The rate and rhythm of ring distraction varied according to patient tolerance. The patients underwent weekly review during correcting phase and monthly visits during consolidation phase. Physical therapy and graded return to normal function were continued throughout the treatment. The fixators were removed on an outpatient basis, once consolidation phase was over.

The results were taken as excellent in those with no recurrence of deformity and who were able to ambulate independently without joint pain at the end of correction, good in those with mild to moderate recurrence of deformity, but were able to ambulate independently with/without mild joint pain and poor in those with severe recurrence of deformity and were unable to ambulate independently without

*Addl DGAFMS (E&S), Office of DGAFMS, AHQ 'M' Block, New Delhi, ⁺Professor and Head (Orthopaedics), [#]Associate Professor(Orthopaedics), ^{**}Ex-Resident in Orthopaedics, Armed Forces Medical College, Pune-40.

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the help of crutches and those with severe joint pain after correction of deformity (Fig 1-8).

Results

55% were in the age group of 11-30 years. Male to female ratio was 3:2. In 10(50%) equines deformity at ankle was seen and in 8(40%) there was involvement of knee. In all cases, full correction of deformity was achieved but there was recurrence of deformity of mild to moderate degree in 4(20%) cases. All patients who had recurrence were operated for fixed flexion deformity of the knee. Majority of patients (65%) were not ambulant independently due to deformities. After correction of deformity, all the patients were able to ambulate independently and were able to carry out their day-to-day activities.

The main complication encountered was pin tract infection, in 16 (75%) cases. All resolved with oral antibiotics, daily dressings and adjustment of tension in wires. There was no neurovascular involvement during the intra-operative period or during the corrective/consolidation phase.

In 16(80%) cases, the results were excellent with no recurrence of deformity and patients were able to walk independently. In 4 (20%) cases, which had recurrence, the recurrence was of mild to moderate nature and patients were able to ambulate independently and carry out routine activities. The recurrence of flexion deformity varied from 10 to 20

degrees. The maximum deformity of 20 degrees was seen in one patient with fixed flexion deformity of 100 degrees preoperatively.

Discussion

Prevalent methods of deformity correction have limitations in terms of severity of deformity, condition of soft tissue and magnitude of surgery. The Ilizarov method is a minimally invasive procedure; where correction can be done in presence of infection, with poor soft tissue cover and when other methods of correction have failed. Majority of patients treated had post-traumatic deformities (50%). 5 cases had fixed flexion deformity of the knee, 3 had equines deformity and 2 had valgus mal-union of tibia.

Eight cases of fixed flexion deformity of knee were treated. Fixed flexion contracture of knee, which could not be corrected by soft tissue release was considered for wedge correction of plaster cast. The flexion contracture varied from 60 to 100 degrees. All the fixed flexion deformities were corrected by ligamentotaxis. Complete correction to functional position (10 to 15 degrees of flexion at knee) was achieved in all cases in 14 to 22 weeks (Average: 18 weeks). Follow-up of these

Fig. 1 : CTEV pre-operative

Fig. 2 : CTEV after correction

Fig. 3 : BK amputation stump - immediate post-operative

Fig. 4 : BK amputation stump - after correction

Fig. 5 : Fixed flexion deformity knee - pre operative

cases at the end of one year showed recurrence in 4(50%) cases. The recurrence varied from 10 to 20 degrees. As the deformity was progressive in one patient he was operated for hamstring release at one and half years of follow-up and in the rest of the cases deformity was static.

Haung had 80% recurrence in his study of ten cases of fixed flexion deformity of knee [2]. Jean Paul et al had recurrence of 31% in 13 case studied [3]. John

Fig. 6 : Fixed flexion deformity knee after correction

Fig. 7 : Fixed equinus deformity of ankle - immediate post-operative

Fig. 8 : Fixed equinus deformity of ankle - after correction

Hertz et al had recurrence in 13 cases (93%) out of 14 in his study [4]. He attributed this to omission of osteotomy in case of severe deformities and not carrying out hamstring release pre-operatively. They noticed some rebound phenomenon in all cases on removal of fixator.

Normal gait was possible in all patients with less than 30 degrees contracture. Recurrence rate was 50% in the present study. It may be due to avoiding hamstring tenotomy pre-operatively, avoiding over correcting the deformity and omission of osteotomy in case of severe deformities.

Out of the 8 cases of fixed flexion deformity of knee, 1 case had posterior subluxation of tibia. Correction was attempted by altering the position of the hinge proximally. In this case only partial correction could be achieved. Haung had posterior subluxation in 3 cases out of 10 [2].

Four cases of equines deformity of ankle were studied. In 3, it was due to trauma and in 1 due to post polio residual paralysis. In all cases, complete correction was achieved by ligamentotaxis without osteotomy. There was no recurrence. However 3 cases developed claw toes (75%) which could be corrected by physiotherapy. Moens et al had recurrence in 1 case (7.6%) and claw toes in 11 cases (84%) out of 13 cases of equinus deformity of ankle [5]. Haung stated that better results were obtained using Ilizarov ring fixator in correction of equines deformity than fixed flexion deformity of knee. He had 2(10%) cases of recurrence of deformity and claw toes in 14(73%) out of 19 cases of equines deformity of ankle managed by Ilizarov method [2].

Six cases of congenital talipes equino varus (CTEV) were treated in the age group of 5-13 years. One of these patients had arthrogryposis multiplex congenital. 'V' osteotomy of talus was done in 01 case. Rest of the 5 were treated by ligamentotaxis alone. Dorr Paley showed older patients with CTEV were likely to have fixed bony abnormalities that require osteotomy for correction [11].

In all cases, full correction was achieved and deformities were corrected. There was no recurrence upto one and half years of follow-up. Fernando et al corrected 7 cases of CTEV and achieved full correction of all deformities in all the cases. There was no recurrence on 1-year follow-up. In his study, none of the patients underwent any previous surgery. He attributed his excellent result to lack of introgenic scar tissue[12]. Wallander et al corrected 10 cases of idiopathic clubfoot. Full correction of all deformities was achieved and there was no recurrence after a follow-up of 2 to 3 years [8]. Rezzouk et al reviewed 17 patients with CTEV treated with Ilizarov ring fixator at 6 years

of follow-up. They had no recurrence of deformity [9].

Pin tract infection of mild to moderate severity was seen in 15 cases. In all the cases it subsided with oral antibiotics and daily pin track dressings. In a study of 36 cases treated with Ilizarov fixator, 19 (53%) had pin tract infection of mild to moderate severity and all settled with local treatment, adjustment of the tension of wires and oral antibiotic [5]. Ring in his study of 6 cases had pin track infection in 4 (66%) and all subsided with conservative treatment [10]. Theis et al reviewed complications from correction of lower limb deformities in 30 patients and pin tract infection was observed in all cases and all responded to oral antibiotics [11].

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