



## Surgery

## STUDY OF LIMB LENGTHENING IN OLD POLIO WITH SINGLE STAGE ILIZAROV FIXATION

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**ABSTRACT** From September, 2010 to December, 2013 all the old polio patients attending our patient department were screened and total 16 patients with limb length discrepancy were selected for limb lengthening procedures. The femoral lengthening for 4 patients and tibial lengthening was done for 12 patients. All the patients were skeletally matured and in age group from 18-26 years. The shortening of femoral, tibial or both was from 4.4 cms to 7 cms. Among the 16 patients one was female and rest were male patients. Modified Ilizarov ring fixation surgery was done for all the patients. After achieving the required length the fixator was kept *in situ* till maturation and consolidation of callus (Bone regenerate). Additional procedures like plating, bone grafting and I.M. nailing were not done in all the cases. All the patients were successfully achieved the desired results and there was functional improvement assessed by Functional Mobility Score (FMS).

**KEYWORDS :** Post polio residual sequelae, Limb length discrepancy, Ilizarov ring fixation.

### INTRODUCTION

The incidence of poliomyelitis has gradually decreased and it has been completely eradicated in developed countries. In developing countries like India, the new polio cases were not seen after intensive supervised polio vaccination. The old cases are still suffering from the sequelae of polio, like deformities due to contracture of fibrosed muscles, flail joints due to paralysed muscles and limping due to shortening of limbs. We have to apply the advanced modern orthopaedic technology to treat these musculo-skeletal sequelae of poliomyelitis. Ilizarov fixation is one of these modern techniques.

### MATERIAL AND METHODS

All the old polio patients, attending our patient department during the study period from September, 2010 to December, 2013 were screened for presence of deformities, flail joints and shortening. All the patients were undergone surgeries for release of contracture, tendon transfers and arthrodesis for stabilization of foot and ankle. Appropriate calipers were advised after these preliminary surgeries and advised to bear weight and perform all possible daily activities for 6 months to 1 year. This is to strengthen the hypoplastic, osteopenic bones before planning for limb lengthening surgery. The study consists of 16 patients (15-Males and 1-Female), the age groups at the time of presentation were from 18-26 years and mean age was 22 years. All the patients were evaluated and the inclusion criteria were skeletally mature patients with unilateral limb length discrepancy and should be able to move around with the help of orthosis like above knee/below knee calipers with sole raise to compensate for shortening. Presence of limp was not a contraindication. The exclusion criteria were presence of contracture, deformities, flail joints and opposite limb was severely affected. Mild polio sequelae like gluteus medius paralysis with trendelenburg gait, mild foot drop due to tibialis anterior paralysis in the opposite limb were not contraindications for limb lengthening. The final diagnosis was based on clinical evaluation, plain radiographs and CT-orthoscanograms. The average limb length discrepancy was from 5.7 cms (Range 3.5 to 8 cms). Among the 16 patients, femoral lengthening was done for 4 patients and tibial lengthening was done for 12 patients. Functional mobility scale (FMS) was followed to assess the pre-operative status of all the patients and at final follow up.

### SURGICAL PROCEDURE

The modified technique of Ilizarov fixation was advocated and the number of rings were kept at minimum two to three rings and drop wire techniques were used for transcortical fixation. This allowed the reduction of weight of the fixator and old polio patients with weak musculature can be mobilized with less pain during post operative period. The graduated threaded rods with auto locking at ¼ round was used for distraction. The corticotomy site was at junction of proximal 1/3 and distal 2/3 for both femur and tibia. Corticotomy was done through a small 3-5 cm incision without disturbing the endosteal and periosteal blood supply. The gap of corticotomy was kept at 1 mm

during surgery. The distraction was started from 14<sup>th</sup> day by 1 mm/day at four increments (0.25 mm x 4), rest day after 4 days. On average distraction process was 22 days in a month. The regular x-rays were checked for early callus at monthly intervals. For patients with delayed callus formation the distraction was slowed down further to 1 mm in 2 days. The patients were advised to walk with the support of walker or crutches and followed up at out-patient unit. Passive ankle dorsiflexion was encouraged. The pin-tract sites were cleaned with 70% alcohol solution daily. After the desired length (1cm shorter than the contralateral lower extremity) was achieved distraction process was stopped patients were advised to continue weight bearing with fixator *in situ* till the maturation and consolidation of callus.

### RESULTS

All the 12 patients with tibial lengthening and 4 patients with femoral lengthening were followed up for an average of 3 years (range 1.4 to 4.6 years). There was no mal-union or non-union. The average limb length discrepancy before surgery was 5.7 cms (range 4.4 to 7 cms). The lengthening of femur in all four patients average 5 cms (range from 4 to 6 cms) and lengthening of tibia in 12 patients was average in 6 cms (range 5 to 7 cms). The final limb length discrepancy after surgery was 2.2 cms (range 1.8 to 2.6 cms). All the frames were maintained *in situ* until full consolidation of the distracted callus. The average duration of ring fixation was 7 months (range 6.5 to 14 months). The FMS scale scores were compared with the preoperative state and at final follow up which is done at average 1 year 7 months (range from 1 year 3 months to 3 years). All the patients were happy with the surgery as the function and ambulation were improved. The frequent complications in tibial lengthening like delayed consolidation, recurrent equinus deformity due to tendoachilles contracture were not noticed in our study. Aggressive physiotherapy, early weight bearing are followed to prevent these problems. The pin/wire site infection can be avoided by regular wound care. The infrequent complications like peroneal nerve palsy and compartment syndrome were not noticed in our study.

### DISCUSSION

The Ilizarov (1951) principle is based around a general biological principle of stimulation of tissue growth and regeneration during distraction. In 1975 Vilarubias recognized the soft tissue tension as a rate limiting step in lengthening. In 1986 DeBastiani developed a technique of callostasis which involves division of the cortex of the bone in the metaphyseal region (Corticotomy) with preservation of periosteal envelop. Slow distraction at 1 mm/day was commenced after a delay two weeks to allow recovery of the medullary blood supply. In the Ilizarov fixation the bone regenerate is formed by intramembranous ossification and thus formed longitudinal callus requires shorter time for remodeling. This produced an environment conducive to early and spontaneous callus formation without the need for bone grafting.

A combination of ring fixator and biological principles developed by Ilizarov, DeBastiani and Vilarrubias are the basis for current lengthening techniques. Various surgical procedures are advocated for post polio residual sequelae patients like deformity correction, tendon transfers, joint stabilization and limb lengthening. Circular frames have the advantages that they can provide correction of deformity in the sagittal, coronal and transverse planes as well as lengthening. The callus formation and maturation is slow in old polio patients and chances of developing contractures are there despite physiotherapy and bracing.

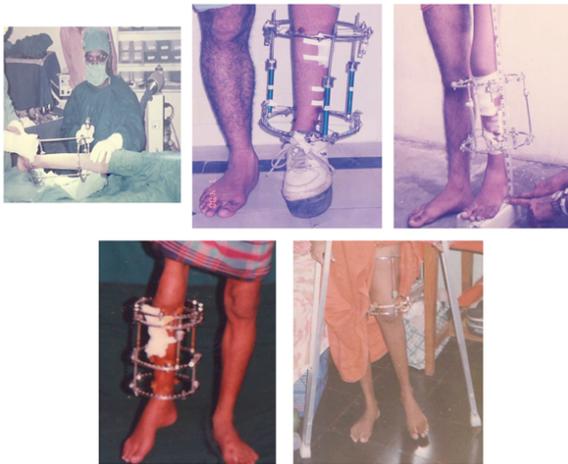
There are many drawbacks in using conventional approaches such as monoplane external fixators and LRS. There will be increased risk of neurovascular injury and infection with large diameter pins.

**CONCLUSIONS**

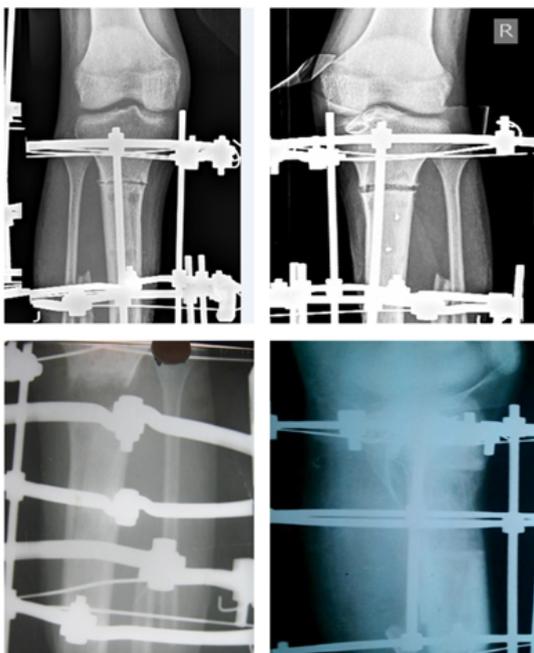
- The limb lengthening surgery using ilizarov fixator is convenient and acceptable to old polio patients.
- The limp and necessity of wearing cumbersome orthotics (Calipers and braces) which were believed as social stigma to move with the society can be avoided after surgery.
- All the patients were accepted the lengthy procedure of limb lengthening with a hope for better function.
- The socio economical status of patients improved after surgery
- All the patients at final follow up were doing useful activities and earning their lively hood.

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**FIGURE 1. Per-Operative and clinical photographs**



**Figure 2. Post-Operative radiographs**