Section: Orthopedics

Original Research Article

MANAGEMENT OF NEGLECTED AND RESISTANT CTEV BY JOSHI'S EXTERNAL STABILIZATION SYSTEM

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ABSTRACT

Background: Idiopathic clubfoot is one the oldest and commonest congenital deformities of mankind, ever since man has adopted the posture. It occurs in variable severity and some of the mobile feet are corrected well with manipulation and stretching. Nearly half the feet are rigid and do not show full correction conservative management. The treatment of relapsed, neglected and rigid varieties of club foot is based on corrective operation in the hind foot by posteromedial release and correction of varus heel by calcaneal osteotomy as in metatarsal region by extensive medial release and cuboid osteotomy. However, results are unsatisfactory. Dr. B. B. Joshi advocated a method of controlled, differential distraction which is semi-invasive, more physiological in comparison to any other technique which is more superior. The goal of the study was to analyse the potential outcome of JESS in resistant and neglected CTEV cases.

Materials and Methods: We included all the patients of age 1-8 years with resistant and neglected CTEV cases presenting to Bapuji Hospital and Chigateri government hospital attached to J.J.M. Medical College, Davanagere over the period of 1/12/2022 to 15/1 2024- treated with JESS post-operative clinical and radiological correction during the follow up was retrospectively analysed.

Results: During the observed time period, 20 feet in 20 patients (mean age: 2 years(range:1-8), male: female:16:4) were treated. Most of them were unilateral (n=17, 85%) followed by bilateral (n=3,15%). Most common type was resistant (n=17,85%) followed by neglected (n=3,15%). Most prevalent post-operative complication was temporary edema (n=13,65%), followed by superficial pin tract infection (n=3, 15%) and loosening of the pins (n=3, 15%) followed by flexion contractures of the toes (n=1, 5%). Clinical and radiologically all the patients were followed up. The average period of follow up was 13.3 months. 35% of the follow up cases had excellent results and 45% of the patient had good outcome. Only 1 patient had poor results. Temporary edema was reduced with anti edema measures. Superficial pin tract infected patients were treated with systemic antibiotics.

Conclusion: This procedure is ideally suited for children in whom the club foot deformities remain uncorrected by POP casts and manipulation, as well as recurrent clubfoot.

Keywords: Club foot, Neglected and resistant CTEV.

INTRODUCTION

Idiopathic club foot is one of the oldest and commonest congenital deformities of mankind, ever since man has adopted the erect posture. It occurs in variable severity and some of the mobile feet are connected well with the manipulation and stretching. Nearly half of the feet are rigid and do

not show full correction with conservative management. Neglected CTEV is defined as the patient has nor received the treatment for a period of 1 year of age. Resistant CTEV is defined as the no correction after conservative management. Relapse case is defined as deformities are corrected but appear again in later years, partially or totally. Recurrent CTEV is defined as relapse dur to muscle imbalance. In the earliest times there has been no limit to the indigenous devices that have been used to correct the clubfoot. To date the 20th century has been marked by the classification of two concepts in the management of club foot. The first is the general acceptance of the principles of manipulation, strapping and serial correction plaster cast advocated by Kite and Dennis browne. An impressive assay of clinical evidence was accumulated in support of their methods. Although in the idiopathic clubfoot soft tissues are at fault and the bony changes are secondary to the soft tissue changes but a forceful manipulation may be unphysiological especially in rigid and neglected varieties.[1]

There are numerous surgical procedures described for correction of club foot. The comprehensive soft tissue release of turco. Mukhypadhyay procedure with its variants and circumferential release as described by McKay, Carrole and Simons, etc are some of more than hundred surgeries described. The treatment of neglected and resistant varieties of club foot is usually based on corrective operation in the hind foot by posterior medial release and correction of varus heel by calcaneal osteotomy (Dwyer 1959-69) as in metatarsal region by extensive medial release and cuboid osteotomy (Evans 1961). But none of the described method can completely achieve goal of functional, painless and cosmetically acceptable foot. The unsatisfactory situation prompted scientists seek a method which does not involve soft tissue trauma, bony resection etc. Since the basic aim of the treatment is to balance the discrepancy in the length between the lateral and medial side of the foot, it was achieved by lengthening the medial side by continuous distraction by external fixator. This external fixator has many theoretical advantages like avoiding the fibrous tissue formation, absence of further shortening unlike bony procedures, proper control of all the components of corrections, actual lengthening and histogenesis of the soft tissue. A simple versatile and light fixator system with tremendous potential was developed by Dr. B. B. Joshi of India in 1988. This method is proved successful in almost all the age groups ranging from 4 months to 19 years. Dr. B.B. Joshi advocated a method of controlled, differential distraction which is semi-invasive more physiological in comparison to any other technique, using Ilizorov's principle. Out of these children who have club foot, their need is for today. They need our immediate attention because it is in their childhood that the deformity can be fully, accurately and conventionally corrected.[2,3]

MATERIAL AND METHODS

This study includes management of 20 feet in 20 patients with Neglected CTEV and Resistant CTEV cases by JESS. Between December 2022 to January 2024 admitted to Chigateri Hospital and Bapuji Hospital attached to J.J.M. Medical college, Davanagere.

Inclusion Criteria

1. Age 1-8 years.
2. Type of club foot: Resistant and Neglected cases.

For the general data and patient characteristics (e.g. age, gender, co morbidities) a retrospective review of patients electronic database system was done. The patients were then assessed clinically using Caroll assessment which includes calf atrophy, posterior displacement of fibula. Posterior and medial creases, curved lateral border, cavus, fixed equines, navicular fixed to medial malleoli, os calcic fixed to tibia, no mid tarsal mobility and fixed forefoot supination was performed. Each features scores 1 point when present or 0 point when absent.

Radiological evaluation includes evaluation of ankle and foot AP and stress dorsiflection views.

1. Talocalcaneal angle in AP and stress views.
2. Talo first metatarsal angle in AP view
3. Talo- calcaneal angle in lateral view.
4. Talo calcaneal index.

Patient was taken to major OT after all the necessary blood investigation was done.

Surgical technique

The patient was positioned in supine position. General anaesthesia is preferred. Parts were scrubbed, painted and draped. Two parallel k wires were passed into the tibial diaphysis, perpendicular to the longitudinal axis from lateral to medial. Z bar is placed and placement of the 2nd wire is marked. 2nd wire was passed parallel to the 1st k wire just below it at the previously marked site. One transfixing wire is passed from the 5th to the 1st metatarsal through the neck of 5th and 1st metatarsal. Two separate wires, one from the medial and the other from the lateral aspects are inserted parallel to the first wire. The distance between the transfixing wires and these wires should correspond with the distance between the holes in the block in the distractor to be used. 2 k wires are passed through the calcaneal tuberosity. The distance between the k wires is determined by the holes in the distractor to be used. Z and L rods to be attached. 2 small L rods are attached to the metatarsal k wires and 2 large L rods are attached to the calcaneal k wires. Connecting rods are attached using the clamps. Tibomatatarsal and tibiocalcaneal attachments are done using Z rods. Thorough dressing is to be done under aseptic sterile precautions.

Post-operative Follow up

Differential distraction of medial side is to be done twice as the lateral side. Distraction on the lateral side prevents crushing of the articular cartilage and permits the normal growth of the epiphysis which may be affected due to the compression. In hospitalized patient, distraction od 0.25mm/hr can be done and in discharged patients who are at home distraction of 1mm/day is optimal. Distractors which are attached between the inferior limbs of the Z rods and posterior calcaneal L rod limbs. Distractors lie parallel to tibial shin and just posterior to calcaneal k wires. Distraction in this position corrects varus of hindfoot and the equines to some extent. The tibiocalcaneal distractors are placed posterior and connected above to the transverse bar connecting the Z rods (posterior limbs) and below to the posterior calcaneal bars connecting the L rods and calcaneal pin which is connected to axially. The distractors are present on the either side of the calcaneal axial k wire. Distraction in this position provides thrust force to stretch posterior structures and corrects hind foot equines at the ankle and subtalar joints. Correction can be expected at the end of 5-6 weeks. X rays are taken before the removal. Following the correction, the assembly is kept in static phase for 3-6 weeks. After removal below knee cast is applied for 3-4 weeks. Orthotic device is used for maintenance.

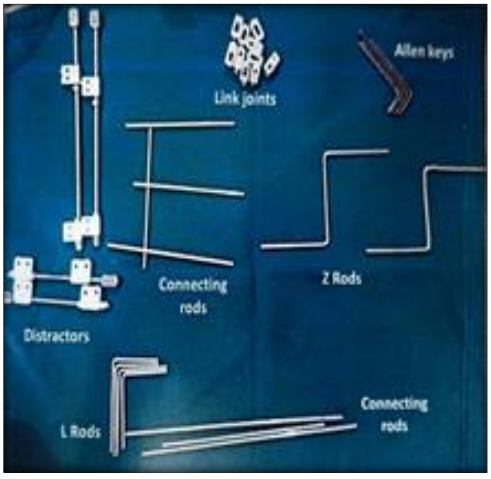

Figure 1: Showing the Standard Procedures to fix clubfoot

RESULTS

The present study includes treatment of 20 feet in 20 patients with old neglected resistant foot treated with Joshi`s external stabilization system between December 2022 to January 2024. The following observation was made from date collected from the study. Age distribution of (mean age: 2 years(range:1-8), male: female:16:4) were treated. Most of them were unilateral (n=17, 85%) followed by bilateral (n=3,15%). Most common type was resistant (n=17,85%) followed by neglected (n=3,15%). Of the 20 feet treated by JESS 7 (35%) were excellent, 11 (55%) were good, 1 (5%) was fair and 1 (5%) was poor.

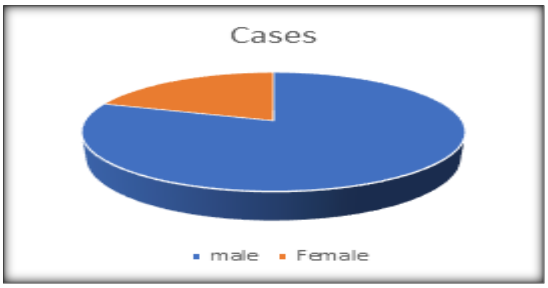

Figure 2: Showing table and graphs – distribution of gender

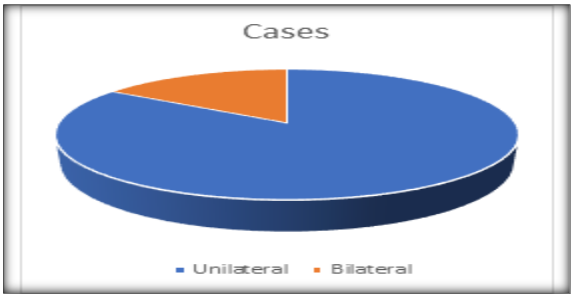

Figure 3: Showing table and graphs about unilateral and bilateral

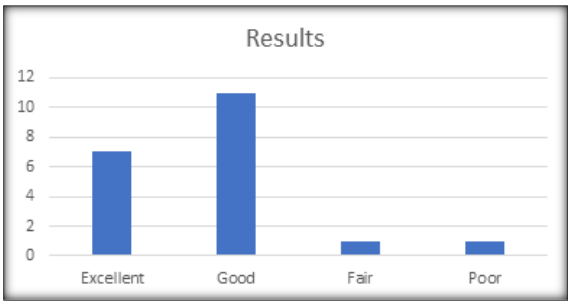

Figure 4: Showing the graph and table of classification after treatment

EXCELLENT: Foot was normal in shape and appearance, with well-maintained arches. The child could dorsiflex and evert foot. There was full range of movements with squatting. There were no complications such as osteomyelitis or skin necrosis due to over permanent flexion deformities of toes. Routine activities could be performed.

GOOD: Same as above but the range of movements of the foot was more than 50% but not full range.

FAIR: The foot was not normal in shape and some residual deformity persisting with partially corrected cavus. Active dorsiflexion and eversion of foot was possible but only up to plantigrade position.

POOR: Incomplete correction or over correction giving rise to flat foot. Difficulty in squatting with some complications like osteomyelitis, pin tract loosening and infection, etc

Table 1: Showing table and graphs – distribution of gender

Gender	Cases
male	16
Female	4

Table 2: Showing table and graphs about unilateral and bilateral

	Cases
Unilateral	17
Bilateral	3

Table 3: Showing the graph and table of classification after treatment

	Cases
Excellent	7
Good	11
Fair	1
Poor	1

DISCUSSION

The basic principle of external fixation (JESS) is similar to that of the principles of Ilizorov's. Physiological tension and stress applied to the tissue stimulates histogenesis of tissues, while controlled differential distraction gradually corrects the deformities and realigns the bones. The major difference between the fixators that was used in this study (JESS) and circular fixators described by Ilizarov was that the wires in this study were not tensioned but only prestressed to prevent them from cutting through the soft bones.[1] As it does not require any open or percutaneous surgical procedure for the deformity correction, it has been labelled as "extended conservative management. Most of the patients had their age from 5-10 years while the average age was 7.5 years. Amongst 20 patients in the study most of the patients were male i.e., 13 patients while 7 were female patients. This bears with other series. F. Grill,[2] 11 boys and 7 girls; N S Lauds, 10 boys and 3 girls; B B Joshi11, 14 males and 6 females. Khan and Kumar,[3] evaluated the efficacy of Ponsetti's technique in 25 neglected club foot in children more than 07 years of age (mean age 8.9 years). Most of the patients had unilateral deformity of about 17 patients (85%) followed by 15% of the patients had unilateral deformity in contrast to V. J. Turco,[4] treated 100 patients with Bilateral involvement out of 273 clubfeet treated (36%). Majority of the patients were corrected less than 4 weeks. 60% of the patients required less than 4 weeks of distraction. The mean duration of distraction was 28.4 days. Cantin and Fassier,[5] reported that the patients required 7 weeks distraction on an average. More the age of the patients, duration of the treatment was observed to be more. Other studies showed more duration for the correction probably due to the older age group. The fixator was maintained in static phase for minimum of double the time required for distraction of

'deformity. Average duration of static phase in our study group was around 6 weeks. The duration of static phase ranged from 1 month to 3 months. 50% of cases required less than 6 weeks of static phase. B B Joshi et al,[6] recommended maintaining the fixator on static phase for double the period of distraction. D Paley,[7] recommended maintaining the static phase for at least for 6 weeks. Walking plaster cast was applied to hold the correction and it was maintained for 6 weeks. But in cases with severe deformity, walking plaster was applied for more than 6 weeks to maintain correction for longer period. B B Joshi,[6] kept his patients in walking cast for 6 weeks and later changed it to a boot allowing ankle movements and maintained it for another 6 weeks. Major drawback was acceptance of assembly by the children. Another complication was the rod displacement to the children and their attendants while nursing. In total the results were quite encouraging yielding good correction in much short period. We also observed that correction continued even after the fixator removal. It is due to the post distraction neo-osteogenesis occurs at the site which similar to the normal tissue. Our controlled differential distraction assembly differs from the classical Ilizarov technique in significant aspects.[1] Axially tensioned wires are not used in our frame.[2] Clubfoot is a multiplanar, multi apical deformity. It is very difficult to plan the location of an external hinge for deformity correction. Our frame is unconstrained and relies on correction occurring at the natural joints. Differential distraction is used to correct the deformity.[3,8] This achieves deformity correction without compressing the child's foot.

CONCLUSION

Goal of the surgery in club foot patient aims at functional, painless, cosmetically acceptable, pliable and plantigrade foot. It also aims at relief of parent and child from the hospitalization and prolonged treatment with casts and braces. The procedure suits young children whose clubfoot deformities remains uncorrected even after prolonged cast application and manipulation. And also effective in recurrent clubfoot. If the surgery is performed at around 9 months of age, child will be able to walk with plantigrade foot by the time the child walks. Functional distraction by external fixator does not require any sophisticated instrumentation or any image intensification. Parents can themselves learn the distraction method and comply with the procedure easily. Proper pin tract care must be taken to avoid infection and chronic risk of osteomyelitis. Adequate period of static phase should be maintained before removal of external fixator. Differential distraction has better results in younger children when compared to older children. It is more effective only in neglected, resistant and recurrent CTEV.in relatively mild and moderate cases soft tissue surgery is preferred. Although the technique has lot of advantages, one should not forget unsupervised and injudicious distractions which may lead to adverse effects in developing foot which may be catastrophic.

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