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A STUDY OF OUTCOME OF B.B.JOSHI'S EXTERNAL FIXATOR FOR MANAGEMENT OF NEGLECTED AND RELAPSED CASES OF CONGENITAL TALIPES EQUINO VARUS

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ABSTRACT
Congenital Talipes Equino Varus is the commonest deformity of the foot and affects males 10:7 more often than females. Bilateral deformities are noted in 78.5% of the cases. Rehabilitation of such cases depends upon the age of starting the treatment and severity of the deformity. Objective to study the outcome Joshi's external fixator for management of neglected and relapsed cases of Congenital Talipes Equino Varus. This case series study was conducted at the Department of Orthopaedics at the Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, India, between January 2010 and December 2011 where in 28 feet belonging to 17 patients aged between 1 to 26 years, Neglected clubfoot (n=11) and Relapsed clubfoot after previous surgery (n=17) were included in this study. Majority of the patients underwent JESS procedure (24 feet) and 3 cases underwent Triple arthrodesis and only 1 case underwent Ilizarov technique of correction. Using the Hospital for Joint Diseases Orthopaedic Institute functional rating system for clubfoot surgery, excellent results were obtained in 5 (17.8%) feet, good results in 19 (67.8%) feet, fair result in 2 (7.1%)and poor results in 2 (7.1%) feet. The common complication being loosening of assembly (35.7%), flexion contracture of toes (28.6%) followed by pin-tract infections (21.4%). B.B. Joshi's external fixator gives faster correction i.e., within 6 weeks to 8 weeks and it is simpler, faster, cosmetically more acceptable and with lasting results without any relapse.

INTRODUCTION

Clubfoot is one of the most common congenital orthopedic anomalies and was described by Hippocrates in the year 400 BC [1]. However, it still continues to challenge the skills of the pediatricorthopedic surgeon as it has a notorious tendency to relapse, irrespective of whether the foot is treated by conservative or operative means. Part of the reason that the foot relapses is the surgeon's failure to recognize the underlying pathoanatomy. Clubfoot is often automatically assumed to be an equinovarus deformity. Congenital talipesequinovarus is the commonest congenital anomaly with an incidence of one to two per 1000 live births. Over the centuries it has been treated by various modalities, but the dilemma facing the surgeon has been a strong tendency to relapse [1]. Talipesequinovarus is the most common congenital deformity of the foot and is known since ancient time. There are many obscure and puzzling features about the nature of Talipesequinovarus, which need detailed study. The word Talipes is derived

from the Latin talus (ankle bone) and pes (foot) and is generic term used for deformities of the foot that cause the patient to walk on ankles. Talipes Equino Varus is a disease of multiple etiologies characterized by several deformities in varying severity and combinations. Intense debate continues with regards to the causes, specific pathoanatomy and management of this common and fascinating disorders [2].

Over the years numerous hypothesis have been expanded in the literature implicating such factors as mechanical forces, arrested embryological development, myelodysplasia, muscle imbalance, local dysplasia, muscle imbalance in the foot, nutritive, hormonal and infectious causes in the etiology of clubfoot [3].

Congenital Talipes Equino Varus is totally correctable if the treatment is started at the proper time. Our institute is tertiary referral center. We come across lot of cases, which are Neglected and Relapsed. It is a challenge to rehabilitate such cases because correction of deformity is not only the aim, but in addition prevention of relapse is also very important. There are different modalities of treatment but in our institute we are managing cases using Ilizarov technique, JESS and Triple arthodesis.

OBJECTIVE

To study the outcome B.B.Joshi's external fixator for management of neglected and relapsed cases of Congenital Talipes Equino Varus.

METHODOLOGY

This study was conducted at the Department of Orthopaedics at the Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, India, between January 2010 and December 2011. 32 feet belonging to 20 patients aged between 1 to 26 years were initially included in the study (mean age of patients, 2.8 years). Three patients (1 bilateral case and 2 unilateral cases) were lost for follow-up, leaving 17 patients with 28 treated feet: 10 in girls' and18 in boys (Table 1). Only cases of Neglected clubfoot (n=11) and Relapsed clubfoot after previous surgery (n=17) were included in this study.

Neglected clubfoot was defined as a case in which either no treatment course was taken or the patient dropped out of POP cast treatment and started walking on the deformed foot. Recurrent clubfoot was defined as a case in which deformity recurred after soft tissue release and deformity correction, either because the patient failed to return for follow-up or to follow postoperative instructions. Preoperative and postoperative clinical, radiological, and functional evaluations were performed using the Hospital for Joint Diseases Orthopaedic Institute functional rating system for clubfoot surgery [4].

The fixator is available in 3 sizes: small (for children aged 1.5 years or younger), medium (for those aged between 1.5 and 3 years), and large (for those older than 3 years). The components of the fixator and the surgical technique were followed according the guidelines [5]. Postoperatively, the limb was elevated on a pillow to reduce the oedema. From postoperative day 3 onwards, medial distraction was started at the rate of1 mm/d (4 x 0.25 turns per day) and lateral distraction at the rate of 0.5 mm/d (2 x 0.25 turns per day). Toes were passively manipulated at regular intervals. Patients were discharged on postoperative day 7, after having been taught proper distraction and care of the fixator. Patients were followed up at twice-weekly intervals until slight over correction was achieved. Distraction was stopped and the feet were maintained in the frame for 6 to 12 weeks in the fixator to allow tissues to adapt to the changed posture. Fixators were removed under anaesthesia, and another POP cast was fitted for 3 months, followed by pronator shoes as recommended by Joshi et al [5], Galante et al [6] and Oganesian and Istomina [7].

Triple arthrodesis and talectomy are salvage procedures for uncorrected clubfoot in older children and adolescents. In CTEV there is bone hypertrophy to varying extent of the antero-lateral aspect of the calcaneus, the cuboid and the head and neck of talus. When stabilizing a varus foot the head of the talus is replaced slightly to the medial side of the midline of the foot. The arthrodesis is between the talocalcaneal, calcaneocuboid and talonavicular joints. Different type of triple arthrodesis are – Naughtons-Dunn's technique, Lambrinudi's technique and Hoke's technique [8].

RESULTS

The Median age of patients was 3 years (range, 15 months to 24 years). Nearly 50% of the patients were in the age group of 1 – 4 years and 30% of them in the age group of 5 – 12 years.

The right limb alone was involved in 2 cases, whereas the left limb alone was involved in 4 cases. The remainders of the cases were bilateral. More than half of the cases were relapsed cases (60%) and remaining was neglected cases (Fig no. 1 and 6). Nearly two third of them had severe deformity and 28% of them had moderate deformity and remainder 7% had mild deformity. (Table 2).

Majority of the patients underwent JESS procedure (Fig no. 2 and 6) and 3 cases underwent Triple arthrodesis and only 1 case underwent Ilizarov technique of correction. In patients who underwent JESS procedure the mean duration of external fixator treatment was 10.4 weeks (range, 6–12 weeks). The mean duration of follow-up was 3.1 years (range, 2.2–3.9 years).

Using the Hospital for Joint Diseases Orthopaedic Institute functional rating system for clubfoot surgery, excellent results were obtained in 5 (17.8%) feet, good results in 19 (67.8%) feet, fair result in 2 (7.1%) and poor results in 2 (7.1%) feet. The common complication being loosening of assembly (35.7%), flexion contracture of toes (28.6%) followed by pin-tract infections (21.4%) and few cases there was skin necrosis (7.1%) and local oedema

(14.3%), which recovered after administration of oral antibiotics and regular changes of dressing. Those feet which developed cellulitis and pin loosening near tibial and calcaneal pin-tracts, necessitated removal of fixator at 5to 7 weeks after insertion. These healed completely after administration of oral antibiotics and POP treatment. Superficial skin necrosis healed after distraction. Encouragement of active and passive toe movement while the external fixator was in place prevented stiffness of the toe joint to a large extent.

However, any residual finger stiffness was rectified after the fixator was removed and normal weight bearing started. No cases of osteomyelitis or pin breakage were encountered.

Figure 1. Preoperative photograph of moderate CTEV of right foot

Figure 2. Postoperative photograph showing B. B. Joshi external fixator in situ

Figure 3. Six weeks after removal of fixator showing good range of dorsiflexion.

Figure 4. Six weeks after removal of fixator showing full correction of adduction and inversion.

Figure 5. Corrective splints given to maintain the correction

Figure 6. Postoperative photographs showing B. B. Joshi's external fixator applied in relapsed case.

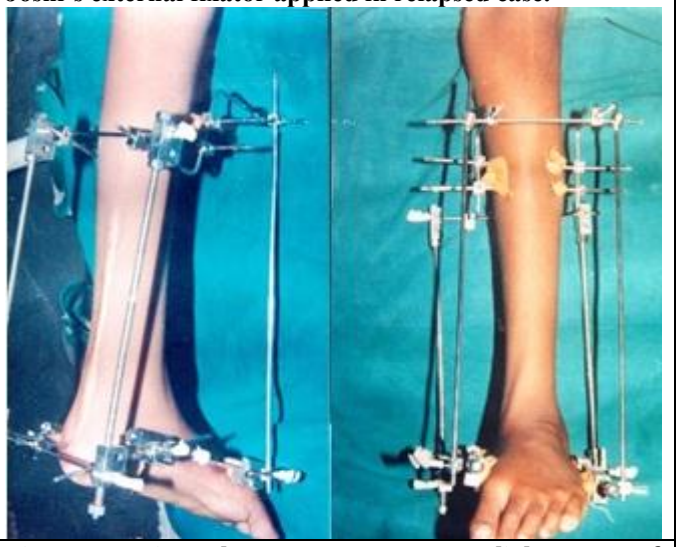

Figure 7. Six weeks after removal of fixator showing range of dorsiflexion.

Figure 8. Big ugly scar on posteromedial aspect of previous operation and both the feet size is almost equal.

Figure 9. X-ray of lateral view showing preoperative minus talocalcaneal angle as compared to improved talocalcaneal angle postoperatively.

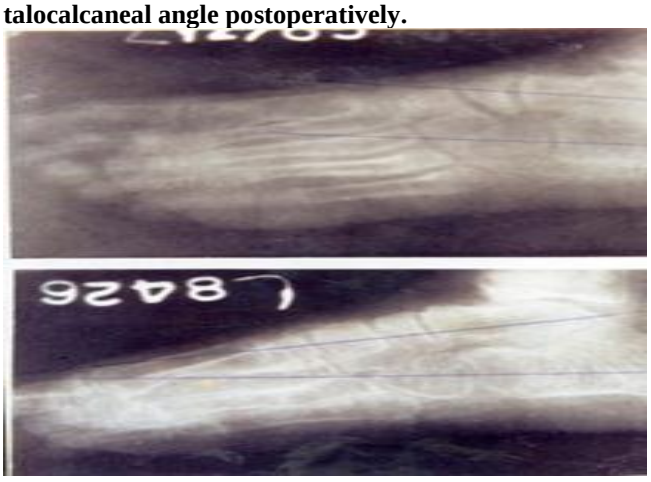

Figure 10. X-ray of left club foot A.P. view preoperatively talocalcaneal angle is decreased as compared to improved talocalcaneal postoperatively.

Table 1. Age and sex wise distribution of the patients

Variable		No. of patients (n=17)	Percentage
Sex	Male	10	58.8
	Female	7	41.2
Age group	1 to 4 years	8	47.1
	5 to 12 years	5	29.4
	13 to 26 years	4	23.5

Table 2. Clinical Profile of the patients

Variable		No. of feet (n=28)	Percentage
Side	Bilateral	22	78.5
	Right	2	7
	Left	4	14.5
Deformity Grading	Mild	2	7.2
	Moderate	8	28.6
	Severe	18	64.2
Type of foot	Neglected	11	39.2
	Relapsed	17	60.8

Table 3. Outcome of the surgery among the patients

Variable		No. of feet (n=28)	Percentage
Type of Surgery	JESS*	24	85.8
	Ilizarov	1	3.6
	Triple arthodesis	3	10.6
Time required for correction	Upto 6 weeks	5	17.8
	6 - 8 weeks	18	64.2
	8 -12 weeks	5	17.8
Outcome of surgery	Excellent	5	17.8
	Good	19	67.8
	Fair	2	7.1
	Poor	2	7.1
Complications	Skin necrosis	2	7.1
	Pin tract infection	6	21.4
	Oedema	4	14.3
	Lossening of assembly	10	35.7
	Flexion contracture of toes	8	28.6
	Rocker bottom foot	nil	
	Jamming of distraction	nil	

*Joshi's External Stabilization System

DISCUSSION

External fixators offer a versatile method of correcting complex 3-dimensional deformities of the foot such as clubfoot [9] more so in cases with rigid, deformed, previously operated feet those are scarred and in cases in which feet have big callosities, when chances of skin breakdown are quite high, such as following a soft tissue procedure. The basic principle of external fixation in this study was the same as that advocated by Ilizarov [10] where in physiological tension and stress applied to the tissue stimulates histogenesis of tissues, while controlled differential distraction gradually corrects the deformities and realigns the bones [6].

Preoperative assessment revealed a poor score for all cases, but the postoperative rating among the patients in the age group of 1-12 years yielded results that were comparable to those of Suresh [11], Oganesian and Istomina [7], and superior to those reported by Galante et al [6], Bethemand Weiner [12], and Turco [13]. The outcome results in patients aged more than 12 years were poor compared to other series because the majority of patients in other studies were younger than 3 years (n=34; 77.27%). In these children, it is expected that the tissues will respond in a much better way to applied stress. In addition, the younger the patient, the better is the remodeling potential, as compared with the older patient's rigid bony and soft tissue deformities. The major difference between the fixators that we used and circular fixators described by Ilizarov is that the wires in our

fixators are not tensioned but only pre-stressed, to prevent them from cutting through the soft bones. Furthermore, this fixator is an unconstrained device, using soft tissues as a hinge.

A variety of surgical procedures have been described ranging from soft tissue release to extensive bony procedures for causes not responding to conservative treatment. In spite of this there are number of cases which are either untreated, inadequately treated or dropouts during treatment. In our institute we are managing cases in many modalities namely Ilizarov, JESS and Triple arthrodesis. Over the past decade, various modifications of compression distraction and hinged distraction apparatus have been used. This method permits accurate force application to individual parts of the foot using any combinations of compression and distraction forces to gradually correct the deformity. Distraction of the soft tissues and joint corrects the deformity [14].

Dr. B.B. Joshi of Bombay has modified the Ilizarov method by simple wires and simple distractors. Various components and assemblies are devised which are suitable for different age groups ranging from 3 months to adulthood. The principle of controlled differential fractional distraction is applied to correct all the aspects of the deformity by gradual sequential stretching of soft tissues [11].

CONCLUSION

Joshi's external stabilization system fixator being a semi-invasive method should be tried prior to formal surgical release in all cases. This method has a promising future and will be additional method to our armamentarium in the management of the deformity of clubfoot even at a perambulatory age. This procedure is ideally suited for children in whom the clubfoot deformities remain uncorrected by POP casts and manipulation, as well as for recurrent clubfoot.

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