A Comparative Analysis of Posteromedial Soft Tissue Release and Differential Distraction with JESS Fixator in Neglected and Resistant CTEV

Ashwani Sadana¹, Karuna Shankar Dinkar¹, Chandra Prakash Pal¹, Rajat Kapoor¹, Yajuvendra Kumar¹

Abstract
Club foot is amongst the most common of congenital deformities. CTEV is a complex three dimensional deformity having four components- equinus, varus, adduction and cavus. The present study was conducted to compare the results of PMSTR and JESS fixator in neglected, resistant and relapsed or recurrent club foot. This prospective study comprising of 36 children, was conducted in the department of orthopedics, S.N. Medical College Agra. Preoperative none of the feet in either group had a clinical satisfactory rating but after surgery a significant improvement was seen. Of the 25 feet subjected to PMSTR procedure it was observed that 16 feet (64%) were in the category of satisfactory rating where all the 9 clinical criteria were in satisfactory range (36%) had unsatisfactory result. Of the 22 feet subjected to Differential Distraction Method using JESS FIXATOR it was observed that 19 feet (77.3%) were in the category of satisfactory rating, where all the 9 criteria were in satisfactory range, unsatisfactory result were seen in 5 feet (22.7%).

Introduction
Club foot is amongst the most common of congenital deformities. CTEV is a complex three dimensional deformity having four components- equinus, varus, adduction and cavus. Talipes Equino Varus ("Club Foot") has continued to plague the medical profession since before the days of Hippocrates[1]. It is a hereditary foot deformity. Its incidence is 1–2 per 1000 live births[2]. In developing countries, these children often report late for treatment either because of lack of medical facilities or due to ignorance. The management of such neglected or relapsed clubfoot unlike that of virgin cases is challenging because with time the deformities becomes fixed and the foot develops secondary adaptive bony changes. These feet usually are not amenable to correction by soft tissue release procedures alone and often need some bony procedures as well. In bony procedures (like closing wedge osteotomy, arthrodesis) there will be further shortening of an already smaller foot of CTEV. Fractional Distraction Histogenesis[3], has developed a simpler construct for the correction of clubfoot deformities known as JESS (Joshi’s external stabilising system). It can be used even in small children below three years of age because tensioned wires are not used in JESS[4]. The present study was conducted to compare the results of PMSTR and JESS fixator in neglected, resistant and relapsed or recurrent club foot.

Material and Method
This prospective study comprising of 36 children, was conducted in the department of orthopedics S. N. Medical College Agra.

Inclusion criteria: Only idiopathic clubfeet of neglected, resistant relapsed or recurrent type, in children less than 6 years

Exclusion criteria: Patients associated with secondary causes like arthrogryposis, meningomyelocele, and so forth were excluded from study. Patients were thoroughly assessed clinically including podograms and radiologically. Radiological assessments were done in AP and lateral view in stress dorsiflexion in all cases. X-rays were studied for talocalcaneal angle, talo-first metatarsal angle, talo-Vth metatarsal angle (all in AP view), talocalcaneal angle, Tibialcalcaneal angle. This prospective study comprising of 36 children, was conducted in the department of orthopedics S. N. Medical College Agra. Only idiopathic clubfeet of neglected, resistant relapsed or recurrent type, in children less than 6 years, were included in this study. The children were randomly divided into 2

¹Department of orthopaedics S. N. Medical College, Agra, India.

Address of Correspondence:
Dr. Karuna Shankar Dinkar,
Department of orthopaedics S. N. Medical College, Agra, India.
E-mail: drkdsdinkar27@yahoo.in
groups

Group 1: It comprised of 25 feet in 18 children who were subjected to PMSTR using Turco’s Approach. These children were those who either failed to respond adequately to conservative treatment or had moderate to severe deformity when they reported 1st time for treatment, at about 6 – 15 months of age.

Group 2: It comprised of 22 feet in 18 children who were subjected to differential distraction method by using JESS fixator. These children had either resistant or rigid type of CTEV at about 1 – 6 year of age. Children with neglected or recurrent deformities, relapsed or recurrent deformities after previous unsuccessful soft tissue release were also included in this group. All the cases selected for study in both the groups were subjected to a thorough general examination and a detailed local examination of foot. All the routine investigations were done as a part of pre-operative anesthetic check up. Before surgery pre operative radiological assessment was done. On the basis of pre-operative assessment, the surgical procedures were planned. One dose of I/V Antibiotics was given prior to the surgery and I/V antibiotics were continued for forty eight hours post operatively.

Group I protocol

All children's were operated under general anaesthesia by the TURCO’s method. Post-operatively, a cast was applied extending from the high groin to the toes with the foot in neutral position and the knee flexed 90 degrees. The capillary circulation of toes was checked. The limb was kept elevated on a pillow postoperatively to avoid any swelling. All the patients were generally discharged within 8 to 10 days after the surgery. Stitches were removed 10 days after surgery. First cast was changed after 2 weeks of surgery. The second cast was changed after three weeks. After that the patient was called at a weekly interval & cast was changed. Usually 6 - 7 casts are applied. After the cast removal patient were put on night splint and corrective shoes. All patients were put on physiotherapy dorsiflexion / planter flexion exercise and inversion / eversion exercises. After two weeks of physiotherapy, when the foot had become pliable and mobile, a combined clinical & radiological assessment was done.

Group II protocol

All the children were operated under general anaesthesia. In JESS the basic assembly consists of 3 sites of pin holds (Tibial, calcaneal, Metatarsal) and three pairs of connections of which tibiocalcaneal and calcaneometatarsal were distractors and tibiometatarsal were connecting rods. After putting all the K-wires (i.e., 3 each tibial, calcaneal, and metatarsal), we tried to reduce the deformity by Ponseti method and then by connecting the tibial, calcaneal, and metatarsal attachments we tried to maintain the reduction. After that distracters were placed on both sides between tibial-calcaneal and calcaneal-metatarsal attachments.

Distraction Protocol: Pin tract dressing was performed on 3rd post operative day and distraction were started that is, 0.25 mm 6 hourly on the medial side while 0.25 mm 12 hourly on the lateral side in hospitalized patients. After discharge of the patients from hospital their parents were instructed to do the distraction at the rate of 1 mm on medial side and 0.5 mm on lateral side once a day for convenience. The first phase ends after clinical and radiological correction of forefoot adduction. Visual correction of deformities were noted during the distraction phase. Weekly x-rays were taken to see correction while in distraction phase. Differential distraction on medial side is performed twice the rate than that of lateral side. Distraction on lateral side not only prevents crushing of the articular cartilage but also permits normal growth of epiphyseal plate on lateral side which may be affected if compression is done on the lateral side.

After this initial distraction phase of approximately 3-6 weeks the assembly were held in static position for further 3 weeks to allow soft tissue maturation in elongated position. After that assembly were removed and plaster cast were applied in a position of maximum correction. The child were allowed to ambulate full weight bearing in plaster. Three weeks later, more plaster cast were applied. After that appropriate orthosis and/or splint were applied
and patients were followed up regularly.

Follow-up: In group I, two cases were lost after 12 weeks of follow up. Minimum follow up of cases in this group was 12 weeks and maximum being 84 weeks. The mean follow up was 36 weeks. In group II, minimum follow up was 30 weeks and maximum was 90 Weeks with mean follow up of 48 weeks.

**Results**

There were 14 males and 4 females in group I. Of the total 25 feet in this group, twenty four feet were operated between the ages of 6 month to one year. In Group II out of the 18 children, 10 (%) were male and the remaining 08(%) were female. Of the total 22 feet in group II, 21 feet (%) were operated between the age of 1 year to 6 year of age. One case of failed previous surgery was operated at 11 months of age. It was observed that unilateral deformity was more common than bilateral deformity in both the groups. Left side has slightly greater predominance than the right side in group I whereas right side was more commonly involved in group II. Associated congenital anomalies were not seen commonly. One case had Cleft Lip and Cleft Palate with excess Hairy Growth over the body. This patient had bilateral club feet; right side was operated using JESS FIXATOR and left side by TURCO's procedure. The average duration of plaster cast treatment was 29.75 weeks for group I, and 20.67 weeks for group II. Preoperative none of the feet in either group had a clinical satisfactory rating but after surgery a significant improvement was seen. Of the 25 feet subjected to PMSTR procedure it was observed that 16 feet (64%) were in the category of satisfactory rating where all the 9 clinical criteria were in satisfactory range (36%) had unsatisfactory result. Of the 22 feet subjected to Differential Distraction Method using JESS FIXATOR it was observed that 19 feet (77.3%) were in the category of satisfactory rating, where all the 9 criteria were in satisfactory range, unsatisfactory result were seen in 5 feet (22.7%).

**Complications**

In group I superficial wound infection and minimal wound sloughing were regarded as minor complications, and were seen in a total of 2 feet (%) in group I. However deep wound infection in 5 cases and major wound dehiscence were seen in 4 feet. Results of these 9 feet were rated as unsatisfactory. In group II superficial wound infection / pin tract infection, swelling of the foot and pain with fixator were regarded as minor complications, and were seen in a total of 3 feet.

**Discussion**

Congenital Talipes Equino Varus is a common orthopaedic problem in children, which have a bulk of the congenital anomalies. The complex three dimensional deformities can be treated by various surgical procedures. Surgery is mainly advocated for late, neglected, and relapsed feet yet many of them including Lehman et al have stated that so called resistant variety of club foot can usually be diagnosed even on first examination of child. These children have a short heel and less pliable foot. These resistant variety always needs some form of operative intervention. In our series, pre operatively, ankle motion and hind foot appearance was unsatisfactory in all cases in both the groups. After operation both these parameters showed marked improvement in both the groups but still fell short of normal. Hind foot appearance was satisfactory in 89% feet in group II, as compared to 78% feet in group I. Patients treated by JESS had better clinical results (77.3% satisfactory) than those treated by PMSTR (64%), even though the mean age in JESS group was much higher than PMSTR Group. The results of other study are comparable with the results obtained by other authors. Turco[5] (1979) used clinical criteria and reported 83.8% excellent and good results using PMSTR. Mc Kay[6] (1983) used clinical criteria and reported 81.8% excellent and good results. Yamamoto[7] (1988) used clinical criteria and reported 70.4% excellent and good results after TURCOS Procedure. Grill and Frankie[8] (1987) achieved plantigrade foot with satisfactory clinical and radiological results in all 10 feet treated using Ilizarov technique. S Suresh et al[9] used clinical criteria and reported 91% excellent and good results using Jess fixator. Sudmannet al[10] (1983) stated that equinus is the most resistant component of clubfoot deformity and that tendoachilles and tibialis posterior are the main dynamic factors responsible for resistance to correction. The anterior talocalcaneal angle was taken as an indicator of hindfootvarus. Following surgery it was satisfactory in all feet (100%) in group I and group II. Calcanews– first metatarsal arch (which is an indicator of cavus deformity) was in satisfactory range in both the groups, group I (84.375%) and group II (83.33%). Calcanews – second metatarsal angle (which is an indicator of forefoot adduction) was in satisfactory range in 22 cases of group II) as compared to 25cases of group I. However it was observed that all angles were corrected to a greater extent in group II as compared to group I. In both the groups, the deformity most commonly left unsatisfactory, both clinically and radiologically(calcaneo second metatarsal angle) was forefoot adductions. As stated by most of authorsthat forefoot adduction was most common residual deformity eg. Cohen –Sobelet al[11] (1993) 60%, Ponseti I V[12] (1992) 48%. In group I the results were
clinically and radiologically not satisfactory in any of the case when the age for carrying out PMSTR was more than 12 months whereas it was satisfactory in 72.51% cases if the surgery was performed before 12 months of age. This suggested that ideal time for carrying out PMSTR is before 12 months of age. Various authors have reported better results if soft tissue surgery is done at a younger age. Turco (1979) reported that best results are seen in the age group of 1-2 years. In group II the youngest child was 11 months old and the oldest was of 6 years of age. It was found that patients undergoing JESS surgery with age less than 2 years had a very low complication rate compared to patients who were more than 2 years of age. Common complications in this group were: pin tract infections 2 cases (pressure sore (due to foot plate) causing superficial necrosis of plantar surface of toes in 1 case (23.33%); and excessive valgus in 1 patient. Thus, JESS procedure offers significantly better results if surgery is done before two years of age in such cases. Our results are slightly lower as compared to other authors [5,8,9] probably because all of them used mainly clinical criteria and talocalcaneal index to assess result after surgery, while we used a much more rigid clinical and radiological criteria.

**Conclusion**

The best treatment for neglected, resistant and relapsed or recurrent clubfoot remains controversial. In absence of a universally acceptable method of deformity assessment, results of various studies cannot be compared. Based on our experience we recommend that PMSTR offers best results in rigid or relapsed cases of CTEV when the surgery is performed within 1 year of age as there are good chances of achieving the goal of obtaining a cosmetically acceptable, pliable, functional, painless, and plantigrade foot. After the age of 1 year, results are compromised, as adequate reduction is difficult to achieve due to soft tissue and bony changes. However, JESS is ideally suited for a case of neglected, resistant and relapsed or recurrent clubfoot when such a child reports late. Better results are obtained if Jess treatment is initiated before two years of age. JESS is technically a bit complicated procedure and requires motivated parents to adhere strictly to the distraction protocol and subsequent follow up for good results.

**References**

12. Ponseti, I.V.: Treatment of congenital clubfoot; J. Bones Jt

Conflict of Interest: Nil.
Source of Support: None

How to Cite this Article