



EVALUATION OF RESULTS OF JESS DISTRACTOR AND POSTERO MEDIAL RELEASE IN NEGLECTED AND RESISTANT CLUBFOOT : COMPARATIVE STUDY

Orthopaedics

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ABSTRACT

BACKGROUND: The present study was undertaken to compare the results of PMSTR and JESS fixator among children presenting with neglected, resistant and relapsed or recurrent club foot and compare these procedures.

METHODOLOGY: This was prospective comparative study conducted on 38 children with club foot during a period of 6 months at our institute. All the children fulfilling the inclusion criteria were divided into 2 groups- children of Group 1 were managed with PMSTR using Turco's Approach. Whereas children of group 2 were managed using JESS. All the cases were examined clinically and were followed up regularly.

RESULTS: Of the 28 feet subjected to PMSTR procedure it was observed that 17 feet (60.7%) were in the category of satisfactory rating whereas out of 22 feet subjected to Differential Distraction Method using JESS FIXATOR it was observed that 20 feet (90.9%) were in the category of satisfactory rating.

CONCLUSION: Surgical correction using JESS is suited for a cases with neglected, resistant and relapsed or recurrent CTEV and when the child presents late. However JESS yield better results if treatment is initiated before two years of age. Though even in those presenting late at 2 to 4 years of age, correction using JESS offers good clinical and radiological outcome.

KEYWORDS

Neglected Ctev , Pmstr , Jess Fixator

INTRODUCTION:

Talipes Equino Varus or club foot is one of the most common congenital deformities occurring in 1 to 2 per thousand live births and is seen more commonly among males. This condition is a hereditary foot deformity which involve ankle, subtaloid and metatarsal joints and is bilateral in approximately 50% of the cases.^{1,2} This deformity is a complex deformity with four major components i.e. equinus, varus, adduction and cavus. It is a hereditary foot deformity. The exact cause of club foot remains elusive, however there are multiple factors such as genetic factor, histologic anomalies, vascular anomalies and intrauterine factor which give some clue about aetiology.³ Though the deformity presents since birth, but children with club foot often report late for treatment either due to lack of medical facilities or due to ignorance especially in developing countries.

Goal of management of CTEV is to achieve a functional, pain free, callous free, mobile, normal looking plantigrade, and normally shoeable foot and if possible to eliminate all elements of the clubfoot deformity. But in developing countries, since the child present late, the management of such

neglected or relapsed clubfoot is challenging because as the time to treatment is elapsed, the deformities becomes fixed and the foot develops secondary adaptive bony changes. Such foot with delayed presentation cannot be corrected by soft tissue release procedures alone and thus need additional procedure to reduce associated bone deformity as well.

Conventionally, Posteromedial Soft Tissue Release procedure (PMS TR) is the procedure of choice for most clubfeet that need soft tissue surgical correction.^{4,5} As the CTEV already is associated with small foot, bone procedure (such as closing wedge osteotomy, arthrodesis) leads to further shortening of an already smaller foot of CTEV. To overcome such problem, a simpler construct for the correction of clubfoot deformities known as JESS (Joshi's external stabilizing system) has been developed by Fractional Distraction Histogenesis.⁶ The advantage with this procedure is that it can be conducted even in children below 3 years of age as this procedure does not include the use of tensioned wires.⁷ Literature suggest that with JESS, club foot can be successfully managed from the age of 3 months to adulthood.⁸ The present study was thus undertaken to compare the results of PMSTR and JESS fixator among children presenting with neglected, resistant

and relapsed or recurrent club foot and compare these procedures.

MATERIAL AND METHOD:

The present study was conducted as a prospective comparative study on a total of 38 children presenting with club foot during a period of 6 months from 1st April 2019 to 30th September 2019 at tertiary care Centre, Bhopal. All the children belonging to less than 6 years and presenting with idiopathic club foot of neglected, resistant, relapsed or recurrent type during the study period were included in the study. However children presenting with club foot with associated secondary causes such as arthrogryposis, meningomyelocele etc were excluded from study.

After obtaining clearance from Institutional ethical committee, informed consent from parents or guardian of children were obtained. All the children fulfilling the inclusion criteria were thoroughly assessed clinically and findings thus obtained were recorded in semistructured questionnaire. The children were divided into 2 groups :- Group 1: comprised of 28 feet in 20 children who were managed with PMSTR using Turco's Approach. Children who failed to respond to conservative management or those presented with moderate to severe deformity, at about 6 – 15 months of age.

Group 2: comprised of 22 feet in 18 children who were managed using differential distraction method with JESS fixator. Children presenting with resistant or rigid type of CTEV at about

1– 6 year of age were managed using JESS. Children with neglected or recurrent deformities, relapsed or recurrent deformities after previous unsuccessful soft tissue release were also included in this group.

Table 1: Number Of child and feet in either group:

Group	Child	Feet
1	20	28
2	18	22

All the cases selected for study in both the groups were subjected to a thorough general examination and a detailed local examination of foot. Podograms were obtained for all children and further children were subjected to radiological assessment using AP and lateral view in stress dorsiflexion in all cases. The radiographs were then utilised for obtaining talocalcaneal angle, talo-first metatarsal angle, talo- Vth metatarsal angle (all in AP view), talocalcaneal angle, Tibiocalcaneal

angle. On the basis of pre-operative assessment, the surgical procedures were planned. Apart from this all the routine investigations were done as a part of pre-operative anaesthetic check up. One dose of I/V Antibiotics was given prior to the surgery and and I/V antibiotics were continued for forty eight hours post operatively.

GROUP I PROTOCOL:-

Under general anaesthesia, all the children of group 1 were managed by the TURCO's method and then postoperatively, a cast was applied extending from the high groin to the toes with the foot in neutral position and the knee flexed 90 degrees. To avoid any swelling in the operated limb, the limb was kept elevated using a pillow postoperatively and also the capillary circulation of toes was checked. Patients were then discharged within 8 to 10 days following surgery and they were followed up on 10th day for removal of stitches. Following this 6 to 7 casts were applied to each patient; the first cast was changed at

1 weeks after surgery and then the patient was followed at weekly interval & cast was changed. Once the cast was removed, the patient was managed using night splint and corrective shoes. All patients were advised physiotherapy exercises which included dorsiflexion / plantar flexion exercise and inversion / eversion exercises. Further the child was subjected to a combined clinical & radiological assessment after 2 weeks of physiotherapy.

GROUP II PROTOCOL:-

Under general anaesthesia, all the patients of group 2 were managed using JESS procedure which consists of 3 sites of pin holds (Tibial, calcaneal, Metatarsal) and three pairs of connections of which tibio calcaneal and calcaneometatarsal were distractors and tibio metatarsal were connecting rods. First, K wires (i.e., 3 each tibial, calcaneal, and metatarsal) were inserted first and then the deformity was reduced by Ponseti method. Then the tibial, calcaneal, and metatarsal attachments were connected to maintain the reduction.

Following this, the distractors were placed on both sides between tibio calcaneal and calcaneal- metatarsal attachments.

DISTRACTION PROTOCOL:-

Pin tract dressing was performed on 3rd day postoperatively. Distraction was started on medial side i.e. 0.25 mm 6 hourly while it was started at 0.25 mm 12 hourly on the lateral side in hospitalized patients. Once the patients were discharged, the parents were instructed for conducting the distraction procedure at the rate of 1 mm on medial side and 0.5 mm on lateral side once a day as per their convenience. Thus, 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. The first phase ends after clinical and radiological correction of forefoot adduction. During distraction phase which last for 3 to 6 weeks, visual correction of deformities and thus Xray were taken every week.

Following this distraction phase, the JESS assembly was held in static position for another 3 weeks so as to allow soft tissue maturation in elongated position and then this assembly was removed and plaster cast were applied in a position of maximum correction. The child was allowed to ambulate full weight bearing in plaster. After 3 weeks, more plaster cast were applied; then, appropriate orthosis and/or splint was applied and patients were followed up regularly.

RESULTS:

There were 15 males and 5 females in group I. Of the total 28 feet of 20 children in this group, twenty seven 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. (Table 2) Of the total 22 feet in group II, 21 feet were operated between the age group of 1 year to 6 year of age. One case of failed previous surgery was operated at 11 months of age.

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.

Table 2: Males and Females in Either Group:

Group	Males	Females
1	15	5
2	10	8

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 weeks for group I, and 20.67 weeks for group II. (Table 3)

Table 3: Duration of plaster in both Groups:

Group	Duration Of Plaster (weeks)
1	29.75
2	20.67

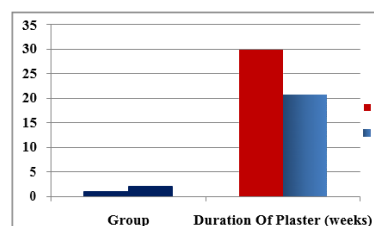


Figure 1: Duration of plaster in both Groups: Preoperative none of the feet in either group had a clinical satisfactory rating but after surgery, significant improvement was seen. Of the 28 feet subjected to PMSTR procedure it was observed that 17 feet (60.7%) were in the category of satisfactory rating where all the 9 clinical criteria were in satisfactory range and 11 feet (39.3 %) had unsatisfactory result. Of the 22 feet subjected to Differential Distraction Method using JESS FIXATOR it was observed that 20 feet (90.9%) were in the category of satisfactory rating, where all the 9 criteria were in satisfactory range, unsatisfactory result were seen in 2 feet (9.1%). (table 4)

Table 4: Clinical Results in Either Group

Group	Satisfactory	Unsatisfactory
1	17 feet (60.7%)	11 feet (39.3 %)
2	20 feet (90.9%)	2 feet (9.1%)

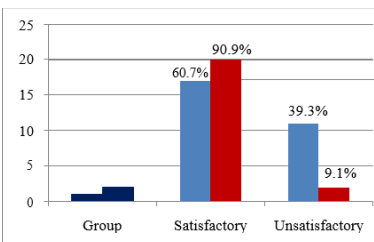


Figure: 2 Clinical Results in Either Group

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 (7.1%) in group I. However deep wound infection 0 in 5 cases and major wound dehiscence were seen in 4 feet (14.3%). 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 (13.6%).

DISCUSSION:

CTEV is one of the commonly encountered orthopaedic problem amongst children contributing to bulk of congenital anomalies. Early and timely diagnosed cases can be managed with conservative management alone, however, surgery is the procedure of choice for late, neglected, and relapsed club foot cases. Lehman et al¹ stated that children presenting with resistant variety of club foot can even be

diagnosed on first examination and these children present with short heel and less pliable foot. Such children always needs surgical management for correction of their deformity.

In our study, at presentation, ankle motion and hind foot appearance was unsatisfactory in all patients belonging to either group whereas post operatively, marked improvement in respective parameters were observed in cases of 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. Laaveg et al in their study also observed similar findings i.e. in majority of patients, foot and ankle motion was limited after surgery.⁹ Adelaar et al also noted that post operatively in cases with club foot, dorsiflexion is difficult to achieve.¹⁰

In present study, patients treated by JESS distractor had better clinical results (77.3% satisfactory) than those treated by PMSTR (64%), even though the mean age in JESS group was much higher as compared to children treated with PMSTR. The results of other study are comparable with the results obtained by Turco et al in which the author reported excellent and good results in 83.8% using PMSTR. Similar findings were reported in a study by McKay et al in which clinical criteria was used and excellent and good results were documented in 81.8% cases.¹¹ Yamamoto et al reported excellent and good results after TURCOS Procedure in 70.4% cases.¹² However Suresh et al reported excellent and good results using JESS fixator in much higher patients i.e. 91% similar to present study.¹³

Preoperatively radiological assessment in present study revealed that lateral talocalcaneal angle (indicator of hindfoot varus) and tibiocalcaneal angle (indicator of hindfoot equinus) were unsatisfactory in all feet. Attenborough et al in their study documented that manipulation and cast treatment is associated with poor outcome in terms of correction of deformity.¹⁴ Sudmann et al in their study however reported equinus to be most resistant component in patients of clubfoot deformity and tendoachilles and tibialis posterior are the main dynamic factors responsible for resistance to correction.¹⁵

In present study, following surgery, hindfoot varus as revealed by anterior talocalcaneal angle was in satisfactory range in all feet (100%) in group I and group II. Calcaneus – first metatarsal angle which indicate cavus deformity was satisfactory in 83.4% and 83.3% cases in group I and group II respectively. However forefoot adduction as evidenced by calcaneus – second metatarsal angle was in satisfactory range in 22 (100%) cases of group II as compared to 25 (89.3%) cases of group I.

I. Also tibiotalar angle which suggest equinus at hindfoot was satisfactory in 22 cases (100%) of group II and 21 cases of group I (75%). Thus the present study documented significant reduction in deformity as depicted by various angles in both the groups but more so in group II as compared to group I. In both the groups, forefoot adduction was the deformity which was most commonly left unsatisfactory both clinically as well as radiologically (calcaneus second metatarsal angle). Similar findings were documented by various authors i.e. forefoot adduction as most common residual deformity.^{16,17}

Also the results were clinically and radiologically unsatisfactory in cases of group I 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. Thus ideal time for carrying out surgical correction of club foot using PMSTR is before 12 months of age.

Various authors have reported better results if soft tissue surgery is done at a younger age as less time lapse is associated with less deformity. Turco et al reported that best results are obtained if the correction is performed in the age group of 1-2 years.

In our study, in group II, the youngest child was 11 months old and the oldest was of 6 years of age. The present study observed that patients undergoing JESS surgery under 2 years of age 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 in 2 cases (9%), pressure sore due to foot plate causing superficial necrosis of plantar surface of toes in 1 cases (4.5%); and excessive valgus in 1 patient (4.5%). Thus, JESS procedure is associated with significantly better outcome in case the surgery is performed before

two years of age. Our results are slightly lower as compared to those depicted by other studies.^{9,10,12,13} 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 the results of present study, PMSTR offers best results in cases with rigid or relapsed CTEV and when the surgery can be performed within 1 year of age as chances of achieving a cosmetically acceptable, pliable, functional, painless, and plantigrade foot are very good. In children. The results are often compromised if the surgery is performed after the 1 year of age as adequate reduction is difficult to achieve due to soft tissue and bony changes. JESS is little complicated procedure and requires motivated and dedicated parents to adhere strictly to the distraction protocol and subsequent follow up for good results. Surgical correction using JESS is suited for a cases with neglected, resistant and relapsed or recurrent CTEV and when the child presents late. However JESS yield better results if treatment is initiated before two years of age. Though even in those presenting late at 2 to 4 years of age, correction using JESS offers good clinical and radiological outcome.

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