

Role of Jess in Management of Neglected, Relapsed And Resistant Ctev

Sachin Yadav¹, Dharmendra Yadav¹, Ravi Prakash Sahai¹, Manish Shukla¹

¹Department Of Orthopedics, M.L.N Medical College, Allahabad, U.P, India.

Abstract

Aim: To evaluate the role of Joshi's external stabilization system in the management of neglected, resistant and relapsed CTEV, in the age group of 1-10 years.

Methods And Material: Total 18 patients (20 feet's) underwent JESS fixation surgery at Department of Orthopedics, S.R.N.Hospital, M.L.N. Medical College Allahabad, from January 2012 to July 2015. This prospective study was conducted on every third patient coming with neglected, relapsed or resistant CTEV in OPD of Orthopedics

Results: The clinical correction of the deformity was assessed using Dimeglio's classification system. The maximum clinical correction was seen in equinus deformity, followed closely by calcaneo-forefront block deformity. The deformities, which responded least, were varus and forefoot adduction deformities. 95% of the patients were in grade I or grade II.

Conclusion: Correction by JESS fixator has distinct advantage of fractional distraction which appears to be effective method of management irrespective of the severity of the deformity.

Keywords: neglected, relapsed, resistant, distraction

I. Introduction

Understanding the patho-mechanics of clubfoot and treating it successfully has always been a daunting task for modern medicine. The present day recommendations are of starting gentle passive manipulations of the deformed foot soon after birth and applying corrective cast at about 2-3 weeks. The cast is changed every 1-2 week and at each cast change, the foot is gently and gradually manipulated till full correction is achieved. The foot is subjected to soft tissue corrective surgery as soon as it becomes clear that the deformity is not responding to a fair trial of this conservative treatment.

The management of relapsed or neglected clubfoot unlike that of virgin cases is even more challenging because with time the deformities become fixed and the feet 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. However, bony procedures (closing wedge osteotomy, arthrodesis) lead to further shortening of an already smaller foot of CTEV.

Especially for these cases presenting late or after relapse, which constitute quite a major proportion of clubfoot patients in developing countries like India, another treatment option has emerged from bony procedures towards ring external fixator system based on principle of fractional distraction histogenesis of G.A. Ilizarov¹. However in order to successfully use the tensioned wires required of Ilizarov fixator, child must have attained the age of 3 years because prior to this age there is insufficient strength in cartilaginous analogue of tarsal bones. Dr. B. B. Joshi² of Mumbai based on this principle has developed a simpler construct for the correction of clubfoot deformities known as JESS (Joshi's external stabilizing system), which can be used even in children below three years of age because it doesn't use tensioned wires.

The present study was taken up to assess the results of JESS fixator in correction of deformities in neglected, resistant or relapsed cases of CTEV.

II. Material And Methods

This study was conducted after taking the clearance of ethical committee of M.L.N. Medical College & associated hospital. The present study included patients coming with neglected relapsed and resistant CTEV in OPD of department of Orthopedics, M.L.N. Medical College & associated hospital between January 12 and July 2015.

Inclusion criteria:

- a) Idiopathic CTEV of neglected, resistant or relapsed type in age group 1 to 10 yrs.
- b) Patients with no neurological deficit.
- c) Patients with no vascular compromise in affected foot.

Exclusion criteria:

- a) Major medical/neuropsychiatric illness altering the modality of treatment and affecting post-surgery after care.
- b) Patients with neurovascular compromise in affected limb.
- c) Patients not giving consent and not coming for sequential follow up.

A total of 20 feet (of 18 patients) suffering from neglected, resistant or relapsed clubfoot were included in the study.

Pre-Operative Workup A clinical assessment of the clubfoot with special attention towards the following was done:

- 1. Various components of club foot deformity and their quantification by Dimeglio scoring system³.
- 2. Range of movements and correctability of deformities.
- 3. Length of foot (both medial and lateral borders).

Preoperative x- ray of both feet were taken in two planes.

Various angles were calculated from pre op x – rays.

Pre-operative investigations, Hemogram and Chest x-ray were obtained as a part of pre anesthesia check up, and once fit for anesthesia, were taken up for application of JESS fixator.

According to the age of the patient and size of the foot appropriate size of the JESS fixator was chosen



Pre Operative Foot

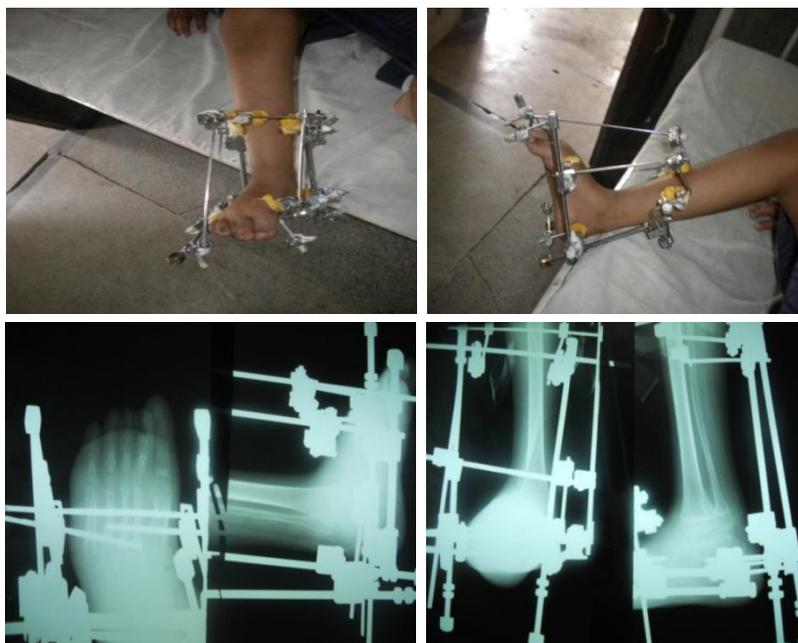
Operative Procedure

Operation was done under general anesthesia in supine position. A hand drill, preferably, was used to insert the tibial wires and for the metatarsal and calcaneal wires a T-handle was used two transfixing K wires were passed in the tibia perpendicular to the long axis of the leg .Next the metatarsal wires were passed. The wire was passed from the fifth to first metatarsal at the level of the neck or the distal shaft. Two separate wires, one from the medial and other from the lateral side of the foot were inserted next, parallel to the transfixing wire, engaging three metatarsals on each side. The course of the posterior tibial artery was palpated and two transfixing parallel wires were passed into the calcaneum from medial to lateral side avoiding the artery again using the holes in the block of distractor as a jig. The axial calcaneal wire was passed along the long axis of calcaneum from posterior to anterior.

The tibial wires were attached to the middle segment of the "Z" rods by link joints on the medial and lateral sides. Two small "L" rod were attached to the metatarsal wires on medial and lateral sides of the foot with one limb projecting planterwards. Two "L" rods were attached to the transfixing calcaneal wires on either sides of the heel. A pair of appropriate size distractors was attached to the calcaneal and, metatarsal wires on either side of the foot. One distractor was mounted on each side of the axial calcaneal connecting, the transverse rod between the posterior limbs of the "Z" rod, and a transverse rod spanning between the hind limbs of the "L" rod.The anterior limbs of the "Z" rods were connected by a pair of rods to one of the metatarsal pins on either side of the foot.

Distraction Schedule Distraction was commenced on third post-operative day. The medial calcaneo-metatarsal and tibio-calcaneal distractors were rotated through 360degree in 24 hrs divided in 2 parts i.e. 180-degree turn 12 hourly. The lateral calcaneo-metatarsal and tibio-calcaneal distractors were rotated at half the rate of medial ones. The fixator was removed after about double the distraction phase under sedation. An above knee cast in full correction was given for one week.

Post JESS Removal Follow Up: At one week the cast was removed and child's foot was once again evaluated for various deformities according to Dimeglio's grading system. A post correction A – P and lateral views x – rays were taken with the child and below knee corrective cast was given for another 2 weeks. At next follow up, the child was given a molded corrective splint for night and CTEV shoes. The child was then called for regular follow up every month.



Post Operative Foot



Corrected Foot

III. Results

The present study comprised of a total of 20 clubfeet in 18 patients. The majority of patients were in the age group of 1 year to 7 years (85%). Male: Female ratio was 2:1. Bilateral deformities were more commonly seen (about 70%) than unilateral deformities (30%).

The mean duration of distraction was 30.6 days; maximum 65 days and minimum 17 days; 60% of the patients required less than 4 weeks of distraction. The fixator was maintained in static phase for a minimum of double the time required for distraction of deformity wherever possible.

The average duration of static phase in our study group was 48.1 days ranging from 30 days to 65 days; 60% of cases needed less than 6 weeks of distraction. Static phase was cut short in some patients (20%) by early removal of the fixator because these patients didn't tolerate it or didn't cooperate.

Walking plaster cast to hold the correction was maintained for 6 weeks. The average duration of follow up was 4.7 months.

Table 1– Dimeglio’s Grading

GRADING	TOTAL SCORE	PRE OP		POST OP	
		No of feet	%	No of feet	%
MILD Grade I	0 - 5	0	0	4	20
MODERATE Grade II	5 – 10	0	0	15	75
SEVERE Grade III	10 – 15	19	95	1	5
VERY SEVERE Grade IV	15 - 20	1	5	0	0

The clinical evaluation of the deformity was done using Dimeglio's classification system⁴. The average Dimeglio's scoring before treatment was 12.2 and after treatment 6.15 points. Average improvement was of 6.05 points p value (<0.0001) (t = 13.4). The best possible result was grade 1 in 4 feet (20%) and in another 75% it was grade II. Clinically we could achieve 95% of the feet in grade I or II.

The maximum clinical correction was seen in equinus deformity with 90% resulting in improvement to Dimeglio score 1. The varus component in 40% could be corrected to score 1 clinically. The forefoot adduction component in 30% could be corrected to score 1.

Table 2– Complications

Complications	No Of Feet	Percentage
Pin Prick Injury To Surgeons	5	25
Pain With Fixator	18	90
Swelling Of Foot	12	60
Pin Tract Infection	11	55
Flexion Contracture Of Toes	6	30
Skin Necrosis Due To Foot Plate	6	30
Subluxation Of 1 st Mtp	5	25
Pain After Fixator Removal	12	60
Compression Of Lower Tibial Epiphysis	1	5

Pain, with the fixator in situ, was a very common and very significant complaint of the patients and their parents (90%). Other common complications were swelling of the foot (60%), pain even after removal of fixator (60%), pin tract infection seen in 11 patients (55%), Pressure sores, causing necrosis of the planter surface of toes (30%), flexion contracture of the toes (30%), medial subluxation of great toe (25%), accidental pinprick injury to the operating surgeon in 3 patients (15%). Medial subluxation of great toe at 1st MTP joint was seen in 25% of cases and later we could control it by modification in foot plate

IV. Discussion

Correction by JESS distraction has distinct advantage of fractional distraction, lack of scar tissue formation and the absence of further shortening of the foot. There are many reports of the fixator’s distractor correction of CTEV with variations in the technique with good outcome

The minimum duration to achieve correction was 17 days and maximum duration was 65 days. 60% of the patients required less than 4 weeks of distraction. The mean duration of distraction was 30.5 days.

B B Joshi et al² (1994) recommended maintaining the fixator in static phase for double the period of distraction, which we also followed for our study. **D Paley⁵ (1994)** recommended maintaining the static phase for at least 6 weeks.

After stopping corrective cast in all but one case, an AFO (ankle and foot orthosis) made of thermoplastic material was prescribed to be used throughout the day and night. Patients were taught foot-stretching and ankle mobilization exercise and were asked to motivate the child to walk to walking age group patients. The average duration of follow up was 4.7 months.

Pressure sores, causing necrosis of the planter surface of toes were seen in 6 patients (30%) of patients. At the start of the study we used supporting bands to prevent flexion contracture of toes, which led to necrosis of the planter surface of the great toe and little toe of the foot. The prevent this we started using footplate.

Medial subluxation of the great toe was seen as another complication in 5 patients (25%) with the use of footplate. And to tackle it, we modified the footplate by extending its toe supporting part vertically to prevent the toe subluxating medially. Though we were able to prevent this medical subluxation of the toes to some

extent, the problem of skin necrosis persisted.

Clinical Evaluation The clinical evaluation of the deformity was done using Dimeglio's⁴ classification system.

The feet treated in this study were classified at the starting-point as grade IV (very severe) in 1 patient (5%), followed by grade III (severe) in 19 patients (95%).

Dimeglio et al.³ reported 12% of his patients as grade IV (very severe), 35% as grade III (severe), 33% as grade II (moderate), and 20% as grade I (benign). J. M. J. Van Mulken et al.⁶ reported in their series as grade IV in 76%, grade III in 20%, and 4% in grade I from a study of 25 clubfeet.

In our series none of the patients had score 0 equinus deformity before correction and after correction score of 1 was seen in 90% of the feet for equinus deformity, in 40% of the feet for varus and in 30% of feet forefoot adduction deformity and in 85% of the feet for calcaneo forefront block deformity.

The maximum clinical correction was seen in equinus deformity, followed closely by calcaneo-forefront block deformity. The deformities, which responded least, were varus and forefoot adduction deformities.

Two of our patients presented with persisting forefoot adduction deformity and lateral convexity of foot. This was corrected by realignment of the talonavicular joint through medical soft tissue release combined with lateral closing wedge osteotomy of calcaneum. The decision to operate was taken as these children were walking with significant degree of in toeing.

The probable explanation for forefoot adduction remaining, as the residual deformity is that in JESS fixator system there is no direct control over the navicular by the K-wires. The apparent clinical correction of forefoot adduction is done at all the mid-tarsal, inter-tarsal and tarso-metatarsal joints rather than talonavicular realignment, which, theoretically also, is less likely to occur with JESS.

The average Dimeglio's scoring before treatment was 12.2 and after treatment 6.15 points (p<0.0001) (t=13.4). Average improvement was of 6.05 points. The average improvement in Van Mulken⁶ series was 8.8 points.

None of our patients were classified as Dimeglio grade 0 after surgery, which signify normal foot and the best possible result was grade 1 in 4 feet (20%) ,15 feet achieved grade II and one was grade III) which is comparable to Van Mulken⁶ series (grade 0 nil, grade 1-20%).

Table-3

Grade	Equinus		Varus		Forefoot Adduction	
	Pre Op	Post Op	Pre Op	Post Op	Pre Op	Post Op
0	0	0	0	0	0	0
1	0	18	0	8	0	6
2	8	2	15	12	17	14
3	6	0	5	0	3	0
4	6	0	0	0	0	0

After treatment, our patients were classified as grade IV nil, grade III-1 patient (5%), grade II-15 patients (75%) and lastly grade I-4 patients (20%) 95% of the patients were in grade I or grade II.

- **J. M. J. Van Mulken et al⁶, 2001** reported 92% satisfactory results in their series of 25 cases (20% as grade I + 72% as grade II). He took cases in grade I & II as satisfactory results. acceptable.

V. Conclusion

Irrespective of age of the patient and severity of the deformity JESS fixator is able achieve correction in most of the cases. Principle of differential distraction successfully overcomes most of the resistant and relapsed deformity in cases of CTEV .

References

- [1]. ASAMI group. Operative principles of Ilizarov. Williams and Wilkins 1991.
- [2]. Joshi B.B., Laud N.S. et. al.: Controlled differential distraction for correction of complex congenital talipesquinovarus. The Clubfoot. The present and a view of the future. Ed. Simons, G.W. Springer Verlag 1994.
- [3]. Dimeglio, A, Bensahel H, Souchet P, Mazeau P, Bonnet F. Classification of clubfoot, J PediatrOrthop 1998; 4;129:36.
- [4]. Dimeglio, A.: Classification of talipesquinovarus. The Clubfoot. The present and a view of the future. Ed. Simons, G.W. Springer Verlag 1994.
- [5]. Paley. D.: Complex foot deformity correction using the Ilizarov circular external fixator with distraction but without osteotomy. The Clubfoot the present and a view of the future. Ed. Simons, G.W. Springer Verlag 1994.
- [6]. Van Mulken J.M.J. et. al.: Treatment of with the Dimeglio score. J. PaediatrOrthp. Vol 21, No 5. 2001.