

Study of Joshi's External Stabilization System in Old Neglected, Recurrent and Resistant Congenital Talipes Equino Varus in Children of 1-3 year Age Group

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ABSTRACT

Introduction: Foot deformities among children present at late because of Neglected CTEV, dropout cases of Plaster-of-Paris treatment or failed surgical procedures. In those, soft tissue release alone is often not sufficient for full correction; correction with Joshi's external stabilization system is a useful option.

Material and methods: We studied a short term follow up of 18 patients with three bilateral cases treated with JESS at department of orthopedics, Kakatiya Medical College, Warangal, regarding the cosmetic functional and anatomical outcome.

Results: Excellent results were obtained in 11 feet, good results in 5 feet and fair in 2, poor in 3. Most common complications encountered were pin tract infection which eventually healed on an outpatient basis without any residual sequelae.

Conclusion: The Joshi's external stabilization system frame is ideally suited for child in neglected clubfoot and recurrent club foot. In general gives overall good results except for pin tract complications

Keywords: Club foot; External fixator; JESS; CTEV

and Sri Rama Hospital, Warangal were taken into study based on the inclusion exclusion criteria.

Inclusion criteria

Children of Age above one year and below 3 years

Type of patient Neglected /recurrent / resistant / Relapsed / POP dropouts

Exclusion criteria

Age below 1 year or above 3year

Patients who medically unfit / refused surgery / denied for informed consent

During the period of from June 2014 to may 2016, patients were followed up regularly.

For all patients, informed consent is taken and no ethical issues were involved

JESS fixator and Components

As per different age groups and size of limb, three sets of assembly components are planned: large, medium and Small. The other material includes Distracters, Link joints, Connecting rods, Z- rods, L-rods, k-wires. (Figure-1)

Surgical procedure for JESS:

The procedure done under general anesthesia with the patient in the supine position.

Tibia is stably transfixated with two transfixation K wires with a distance in between less than middle segment of Z rod and these two wires should be parallel to each other and perpendicular to tibial long axis.

One transfixing wire is passed at the level of the neck, from the fifth to first metatarsal engages at least the fifth and the first metatarsals. One other wire drilled from medial side through the base of first, second metatarsals and one more wire passed from laterally through the base of fifth and fourth metatarsals. Third meta tarsal must be included in either of these wires. These wires are planned in such way that o correspond the holes of block of distracter going to be used. It is to be made sure that all the metatarsals are engaged by at least one of the wire.

Calcaneum is fixed with two parallel wires and these wires to be entered the tuber of the calcaneum from the medial side

INTRODUCTION

Clubfoot is one of the commonest and oldest congenital deformities of mankind, since before the times of Nicholas Andry (1743), first described by Hippocrates (400BC).¹ He called this deformity as Pedes Equinal means resembling the foot of the horse. It occurs in variable severity and usually the mobile types are corrected well with conservative methods. Some of the feet are rigid and do not show full correction with manipulation and stretching. Some remain deformed due inadequate treatment² or with no treatment. Extensive soft tissue surgery to correct complete correction leads to complications ranging from early skin sloughing to late osteo arthritis. Long term fallow ups proved the results of surgical results are unpredictable.³⁻⁵

Gartland's (1964) famous observation of clubfoot was "We are still crippling with a problem the cause of which is not known, the pathological anatomy of which is uncertain, the behavior of which is uncertain and the treatment of which remains controversial". This stands good even today. So present study aimed to know the technical problems and complications associated with the JESS fixator. We also studied the efficacy of controlled distraction in the management of recurrent and resistant neglected congenital equino varus deformity in late presented patients

MATERIAL AND METHODS

Eighteen children who underwent 21 JESS procedures done for old neglected, recurrent or resistant cases of CTEV at Department of Orthopaedic, Kakatiya Medical College, attached to Government Mahatma Gandhi Memorial Hospital, Warangal

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avoiding the posterior tibial artery. These wires should be perpendicular to the long Axis of the calcaneum. The distance between these two wires should again be distance between the holes in the blocks of the distracter to be used. Then the axial Calcaneal wire is passed posterior to anterior. The point of entry is just distal to the insertion of the Achilles tendon. The wire is directed medially and distally to mimic the equinus and the varus of the calcaneum (Figure-2).

Tibial attachment – z rod is fixed to tibia at middle segment by link joints on medial side and lateral side after pre-stressing the wires. now Z rod is left with anterior limb and posterior limb, both perpendicular to long axis of the tibia. Keeping one finger breadth distance from limb connecting rods are attached to these Z rod limbs anteriorly and posteriorly. Similarly metatarsals are fixed to small L rods, with their one limb projecting plantar wards and the angle of L is placed distally. Two more L rods are fixed to calcaneal wires on either side. These rods behind the foot are connected to each other, to one of which axial calcaneal wire also clamped.

Making the segmental connection

- Calcaneal - Metatarsal connection: A pair of appropriately sized distractors are attached to the Calcaneal and metatarsal wires on either side of the foot.
- Tibia to Calcaneum connection: Two distractors are attached to Posterior limbs of the 'Z' rods and to L rods of the Calcaneum, one on either side.
- Tibio-metatarsal connection: The anterior limbs of the 'Z' rods are connected by a pair of rods to the small 'L' rods

Post Operative Management

Pin track sites are covered protective dressings The dressings are performed once in 3 days with savlon, spirit and iodine solution.

Distraction At the rate of 0.25 mm/hrs fractional distraction is applied in all hospitalized patients. Distraction is done on both sides with double the rate on medial side to get more elongation on medial side. The distraction on lateral side also done to prevent crushing effect on growing epiphyses and articular cartilages. End point was assessed clinically and radiologically. During the distraction phase, correction of the deformities is observed clinically and once visual appearance of full correction is achieved, usually by the end of five or six weeks, xray is ordered. The roentgenogram correlation was done with the clinical picture.

After getting full correction, the fixator is held in same position for further three to six weeks to allow soft tissue to get matured in that corrected position under general anaesthesia, the fixator was removed on one stage and immobilization is continued in plaster of paris cast

Appropriate orthotic devices are absolutely essential for maintenance of correction and prevention of recurrence in long term follow up.

Patients were assessed clinically using Carroll assessment, that is Calf atrophy, Posterior displacement of fibula, Creases medial or posterior, Curved lateral border, Cavus, Fixed equines, Navicular fixed to medial malleolus, Os calcis fixed to tibia, No mid tarsal mobility, Fixed forefoot supination – each one point. Worst deformity count is 10 and full correction is 0 points
Radiological evaluation done with ankle and foot AP and stress

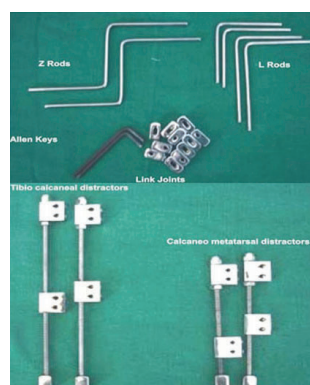


Figure-1: Components of JESS



Figure-2: Application of transfixing k wires

dorsiflexion views. Talo - calcaneal angle in AP and stress dorsiflexion views, Talo - first metatarsal angle in AP view, Tibio - calcaneal angle in lateral view, Talo - calcaneal index were evaluated.

Normal values

Talo calcaneal : AP- 30° – 55° lateral - 25°– 50°

Tibio calcaneal :stress lateral - 10° – 40°

Talus first metatarsal: AP- 5°-15°

Talo-calcaneal index : In AP & lateral >40

This study involves 18 patients in which 3 patients were bilateral and total of 21 feet were studied. The total study period was two years.

RESULTS

Excellent results were obtained in 11 feet, good results in 5 feet and fair in 2, poor in 3. Most common complication encountered was pin tract infection which eventually healed on an out patient basis without any residual sequel.

Age Distribution: Ranged from 1 year to three years with an average of 2.2 years. Four patients were in age group of 1 year, in 1.1 To 2year age group were 2 in which one is bilateral. The remaining 12 patients are in the age group 2.1 to 3years and two were bilateral.

Sex distribution: Out of 18 patients 12 (66.6%) were male children and remaining 6(33.3%) patients were female.

Side affected: 15 (83.3%) cases were unilateral and three (16.6%) cases were unilateral

Type of foot operated: 8 (38%) feet are Neglected cases, 9 (42.8%) feet were pop drop out cases and 5(19.2%) feet were recurrent cases

DISCUSSION

The mechanics and anatomy of tarsus of normal and of club

Series	Excellent	Good	Fair	Poor	Type of fixator used
Suresh S, Ahmed A et al (1999) ⁷	77%	13%	0	9%	JESS
Oganesian and Istomina (1991) ⁸	75.7%	18.5%	5.7%	0	Hinged distraction device
CF Bradish et al (1999) ¹⁰	47%	29.4%	11.7%	11.7%	Ilizarov
Anwar Marthya H, Arun B (2004) ⁹	47%	29.4%	22.8%	17.5%	JESS
Present study (2015)	52.3%	29.4%	9.5%	14.2%	JESS

Table-1: Comparison of clinical outcome

Series	No. of feet	Age (years)	Sex		Laterality	
			Male	Female	Unilateral	Bilateral
Suresh S, Ahmed A et al (1999) ¹⁰	44	0.8-6	18	8	8	18
Oganesian and Istomina (1991) ⁸	70	12	37	19	42	14
Bradish CF et al (1999) ¹⁰	17	6-11	7	5	7	5
Anwar Marthya H, Arun B (2004) ⁹	57	0.8-15	39	18	25	16
Present study (2015)	21	1-3	14	7	18	3

Table-2: Comparison of results

foot is different and complex. The deformity has mainly components- adduction component at forefoot, cavus component at mid foot, varus at subtalar and ankle and equines at ankle. Among which more severe and difficult are deformity at hind foot. The pathoanatomical changes are more marked in children who walked compared to children who never walked. Muscle pull and inherent change in their long term position also create change in position, shape and size of tarsus. Our aim of study was study the results of outcome achieved by Joshi's external stabilization system in comparison to other modalities. In Suresh S, Ahmed A et al 1999 of 44 feet treated by JESS there was 77% excellent, 13% good, 0 fair and 9% poor. The results were better because of younger age.⁷

In Oganesian and Istomina 1991 treated by Hinged distraction device there were 75.7% excellent, 18.5% good, 5.7% fair and no poor results.⁸

In Anwar Marthya 2004 treated by JESS there were 47% excellent, 24.4% good, 22.8% fair 17.5% poor results⁹ (Table-1). In Bradish CF et al 1999 treated by Ilizarov device there were 47% excellent, 29.4% good, 11.7% fair and 11.7% poor results.¹⁰ In our study there were excellent results in 52.3%, good in 23.8%, in 9.5% fair and 14.2% patients has poor results.

We compared our study in relation to age at which surgery done, sex, whether uni or bilateral, found that male preponderance and majority are unilateral.

In our study there were 42.8% POP casting dropout and 38% neglected and 19.2% recurrent, the average fixator period were 13.8 weeks. The average follow up was 1.3 years ranging from 6-20 months.

In our study of 18 patients treated by JESS 14 had mild to moderate complications. There were 12 (66.6%) pin tract infections, 1 (1.8%) skin necrosis and 1 (1.8%) flexion contractures of toes.^{11,12} The main shortcoming of study is small number of study group and limited duration of follow up duration.

CONCLUSION

The JESS frame is suited ideally for child with clubfoot deformities left behind or uncorrected by conservative treatment as well as recurrent club foot.³ The parents learn the self distraction technique easily are were able to follow instructions. Once the fixator frame is removed, plaster casting is done which

protects osteopenic bone and maintains correction achieved and also allows gradual weight bearing. The procedure also less invasive and results are good irrespective of severity of deformity.

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