

Original Research Article

Surgical outcome with single stage procedure for neglected congenital talipes equinovarus

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Received: 20 October 2019

Revised: 17 November 2019

Accepted: 19 November 2019

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ABSTRACT

Background: Congenital talipes equinovarus is one of the commonest congenital anomalies. In developing countries like India especially in the rural population still there are many myths, culture and awareness issues regarding this deformity. Many patients get initial treatment with casting but tend loose follow ups in this prolonged treatment. To give optimal results in these scenarios, the technique for single stage procedure which includes bony and soft tissue repair gives excellent results.

Methods: In a retrospective longitudinal study, 13 children with neglected clubfeet were involved. Valid consent, clinical and radiological evaluation was done. Patients underwent single stage (bony and soft tissue) procedure described in the study. Post operatively data was collected and scoring was done as per International clubfoot study group (ICSG) at each follow ups.

Results: A total 13 children out of whom 9 were male and 4 females, all having unilateral deformity were studied. The age group was between 5-22 years (mean 13.5). Postoperatively, the children were followed at 6 months intervals. As per ICSG score 10 patients had excellent results, 3 patients had good results and none had poor results. 2 patients had minor complication - delayed wound healing (2-3 weeks).

Conclusions: Treatment of neglected clubfoot using single stage procedure dorsal close wedge osteotomy with soft tissue release has a high rate of good and excellent results, with low frequency of complications. It is a good alternative to conventional procedures for management of neglected clubfeet in developing countries, where compliance of patient is a problem.

Keywords: Clubfoot, Neglected, Foot osteotomy, Soft tissue release

INTRODUCTION

Congenital talipes equinovarus (CTEV) is one of the commonest congenital anomalies. Incidence is globally 0.6 to 1.5 per 1000 live births. Most of the times, it is an isolated problem but it may be associated with some other anomalies in 6-8% of the cases, of which developmental dysplasia of the hip (DDH) and arthrogyposis multiplex congenital (AMC) are more common.

In developing countries like India still there are many myths, culture & awareness issues regarding this deformity. So we find many neglected cases that represent in very late ages for the hope of treatment.

The neglected clubfoot, by definition is a foot which has experienced no or minimal surgical or non-surgical management.¹

Neglected clubfoot (NC) can be interpreted in several ways. The English terms that define this condition

(neglected, resistant, or relapsed clubfoot) include the likely related situations of no treatment; inadequate, insufficient, or discontinued treatment; resistant cases (most often syndromic or teratologic); or relapsed and refractory to traditional treatments, whether conservative or surgical.²

NC is a common problem in developing or underdeveloped countries. Approximately 80% of children with congenital clubfoot (CCF) are born in developing countries, many of those with limited and/or late access to the healthcare system and trained specialists for treatment.³

Neglected CTEV is common problem in rural area due to lack of health education, awareness and socioeconomic factors related to it. Many patients get initial treatment with casting but tend loose follow ups in this prolonged treatment. Often times many patients don't follow the bracing protocol which again leads to relapse. In our demography patients come in delayed stages of neglect with severe equino cavo varus deformities. The presentation age may vary from 1 year to 25 years of age.

Management of these patients is challenging in terms of compliance to the treatment, follow ups & spillage protocols. Usually they are not willing for prolonged treatment like JESS or Ilizarov correction and demand for single stage procedure.

Conventional soft tissue/bony procedure do not suffice and they require combination of procedures to get maximum results in single stage surgery. Only bony procedures have risk of AVN, early arthritis and stiffness. Only soft tissue procedures lack to give results for remaining bony deformations. To tackle all these problems and give best possible results in this scenario, the technique for single stage procedure which includes bony and soft tissue repair gives excellent results, we have taken care to preserve cosmetic by using small incisions.

The aim of this study is to provide a single stage procedure for the cases of relapse/neglected clubfoot and study its outcome.



Figure 1: (A) 14 yr old male with left unilateral neglected clubfoot; (B) 8 months after surgery with adequate correction and child able to perform daily routine activities like squatting.

METHODS

This is retrospective longitudinal study conducted at Ujjwal paediatric orthopaedic hospital for 3 years from October 2016- September 2019. A total of 13 children of age between 5-25 years (mean 13 years) were studied for 6 months to 3 years (mean 13 months) who underwent soft tissue and bony procedure in single sitting.

Inclusion criteria were relapse clubfeet children with Grade III, IV deformities (Dimeglio et al).⁴

The patients with neurological clubfeet and age below 5 years were excluded from the study.

Data collected with predesigned protocol of valid consent, clinical & radiological evaluation and

socioeconomic characteristics. All studies were done as per International clubfoot study group (ICSG) and Bensahel et al at each follow ups.⁴

Preoperative and post ability of squatting was observed along with length of foot. Postoperative pain duration and time to regain maximum functional abilities recorded. All procedures were done on single foot at a single sitting.

Operative technique

All surgeries are done under regional anaesthesia - spinal/epidural anaesthesia. The patient is placed supine; tourniquet is applied and inflated with adequate pressure, after proper painting and draping. Percutaneous plantar fascia is released with no.15 blade correcting the cavus deformity. Tendoachilles Z plasty is done with postero medial incision which helps to unlock heel. To get optimal release of ankle equines, posterior capsular release is done.



Figure 2: (A) 10 yr old girl with right unilateral neglected clubfoot; (B) 1 year follow up after surgery performing painless activities.



Figure 3: (A) Tendo achilles Z- plasty done with postero medial incision; (B) medial transverse incision over TN joint (1.5 cm) to release TN capsule; (C) tibialis anterior tendon harvested from insertion over navicular bone; (D) lateral oblique incision over cuboid bone.

Through medial transverse incision over TN joint extending to navicular bone TN joint capsule release is done. Tibialis anterior tendon (full thickness) is harvested by releasing its insertion over navicular bone.

Lateral oblique incision is taken over dorsolateral aspect of foot (parallel to crease) to expose cuboid. Dorsal soft tissues with neurovascular structures are lifted and preserved with thin periosteal elevator. Using special mini saw, a dorsal closing wedge (1 cm) osteotomy of cuboid and lateral cuneiform is performed through lateral incision and 1st, 2nd cuneiform osteotomy through medial incision by apex of wedge facing plantar.

The harvested tibialis anterior tendon is routed to lateral aspect of foot and buried in lateral cuneiform with tendon fixed over planter side over a button. Wedge closed and fixed with two k wires whose ends are kept outside the skin. The wounds are closed in layers after looking for adequate foot correction. Thigh foot angle and foot progression angles checked on table and plan for tibial derotation osteotomy made. Supramalleolar small anterior incision made and percutaneous subperiosteal osteotomy of tibia done. Derotation of 10-15 degrees achieved by externally rotating the distal tibia, fixation

with crossed K wires under vision of image intensifier. The wound closed in layers and sterile dressing is done.

Post-operative management

Above knee loose cast given to maintain correction, the cast changed on post op day 3 to check wounds. This plaster removed after 1 month, X-rays done for seeing union. After confirming union, k wires were removed.

Below knee walking cast was given for 3 weeks. This is followed by splints (orthosis) for 6 months.

Clinical examination to check correction, outcomes was done as per preformed protocol.

Post op X-rays for radiological evaluation done for confirming outcomes.

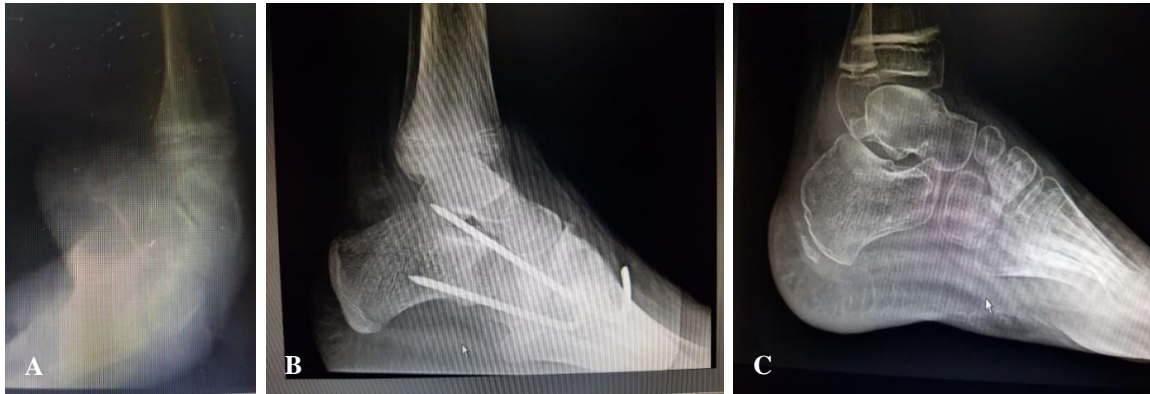


Figure 4: (A) Pre op radiograph suggesting bony deformity; (B) post op radiograph showing osteotomy with k wire fixation; (C) 6 months post op radiograph showing correction of deformity.

RESULTS

A total 13 children out of whom 9 (69.23%) were male and 4 (30.77%) were female, all having unilateral deformity were studied.

Table 1: Distribution according to gender.

Sex	Number of patients	Percentage (%)
Male	09	69.23
Female	04	30.77
Total	13	100

The age of the patients was between 5-22 years (mean 13.5±5.84) years.

Among 13 children 06 were of the neglected type and 07 were of the relapsed type.

Pre operative evaluation

Of 13 feet, 03 were classified as grade III & 10 were grade IV deformity of Dimeglio’s clubfoot classification. All were walking on deformed feet and were not able to squat.

Table 2: A classification scheme for clubfoot by Dimeglio et al.

Grade	Type	Score	No. of feet
I	Benign	<5	0
II	Moderate	5 to < 10	0
III	Severe	10 to <15	03
IV	Very Severe	15 to <20	10

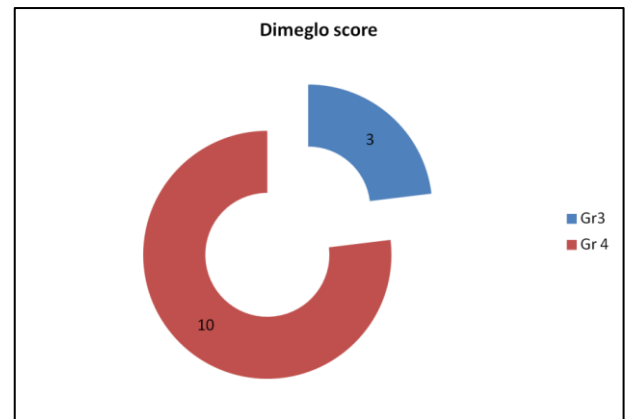


Figure 5: Distribution according to Dimeglio classification.

Intra operative evaluation

Average time for surgery was 75±15 minutes. No intra op or immediate post op complication happened.

Post operative evaluation

The follow up ranged from 4 months to 48 months (mean 26 months). Results categorised as per ICSG in excellent, good and poor categories.

None of the child had non-union, neurovascular complications. Delayed healing happened in two cases due to skin edge necrosis. Pin track infection noted in one case which resolved with oral antibiotics. Walking was

delayed by 2 weeks post cast removal due to some pain and discomfort. Average recovery period was 20-80 days (mean 50 days).

Follow up evaluation

Table 3: Classification of results according to Bensahel et al and ICSG score.

Results	Score	No. of feet	%
Excellent	0-5	10	76.92
Good	6-15	3	23.07
Fair	16-30	0	0
Poor	> 30	0	0
Total		13	100

As per ICSG out of 13 patients, 10 (77%) had excellent results and 03 (23%) had good results. No patient had fair and poor results.

All except one achieved complete squatting by 4 months of time. One case had difficulty in squatting for 8 months which later could be achieved by compensatory mechanism.

Out of 13 feet, 05 children were younger than 10 yrs and 08 were older than 10 yrs. The results shows that frequency of excellent results was higher in younger children (<10 yrs) than the older (10+ yrs) children.

None of the patients had pain in the foot or operative area in any activity at final follow up, squatting was possible in all the patients.

Table 4: Relationship between age at surgery and results.

Age at surgery						
	Less than 10 years		10 years and above		Total	
Results	No. of feet	Percentage (%)	No. of feet	Percentage (%)	No. of feet	Percentage (%)
Excellent	04	80%	06	75%	10	77
Good	01	20%	02	25%	03	23
Fair	0	0	0	0	0	0
Poor	0	0	0	0	0	0
Total	05	100%	08	100	13	100

DISCUSSION

Tenotomies and myotendinous release

The severity of the deformity and the degree of rigidity appear to be fundamental elements for its indication. However, the limits of severity and rigidity that guide closed arthrodiastasis, the association with tenotomies, and the use of osteotomies are still subjects of discussion.⁵

In skeletally immature patients, up to 10 or 12 years, there are advantages to this approach, which minimizes damage related to the development and growth of the bones of the tarsus and metatarsus.⁵ The soft tissue procedures on feet with severe deformities (Dimeglio III and IV) and in recurrent cases after previous treatments, associated with neurological injuries or neuromuscular diseases and arthrogryposis, appear to have better results, with less overload on the system or even lower incidence of complications, residual deformities, and relapses, in addition to the reduced correction time when compared with the closed treatment.⁶ The indications typically include Achilles tenotomy, which can be open or percutaneous (Hoke or White techniques), and plantar fasciotomy. Other tenotomies include tenotomy of the flexor hallucis longus, fingers, and posterior tibial, which can like-wise be performed using percutaneous or minimally invasive, complete, or Z-shaped techniques. The percutaneous tenotomy of the flexors of the fingers

and hallux is usually made through the inter phalangeal joint of the fingers, with a No. 15 scalpel blade.⁷

Bone procedures and osteotomy

Foot osteotomies are mainly indicated in skeletally mature patients (over 10-12 years) with severe deformities (Dimeglio III and IV), and extremely rigid feet.⁸ Osteotomies can be classified as (1) calcaneal (of the posterior tuberosity or below the subtalar joint); (2) talo-calcaneal (anterior talo-calcaneal, V-shaped, Y-shaped, or dome-shaped); (3) midfoot (navicular-cuboid or cuboid-cuneiform); and (4) forefoot (metatarsal or phalangeal). The related osteotomies combinations are listed. They can be per-cutaneous (with pre-burring or with a Gigli saw) or open.⁹

Cuboidectomy associated with soft tissue procedures presented good results in the series published by Faldini et al.¹⁰

In our study we found excellent results in 77% cases and good in 23% cases which is similar to the other studies mentioned here. The rate of positive results (excellent or good) observed in the comparison between the pre- and post-operative Dimeglio scores is 88%, according to El-Sayed.¹¹ Makhdoom et al observed good results in 74% of patients, using the scale proposed by Renkerand and Carpenter.¹² Refai et al using the AOFAS score as a reference identified 84% good results.¹³ Good results

were also observed by Ahmed et al (72%), Franke et al (100%), Devadoss et al (72%), Kocaoglu et al (90%), de la Huerta (100%), and Ferreira et al (78.9%).^{6,7,9,14,15} Although the numbers of good results were high, the diversity of cases and lack of prospective protocols limits the comparison among the series, as well as prospective evaluation with better statistical value and consequent significance.¹⁵ The scores proposed and used are also quite varied in the literature. Saghieh et al emphasized this limitation and suggested the use of the International Clubfoot Study Group scoring system (ICFSG) as a proposal for prospective evaluation.¹⁶

In 1940, Cole popularised a dorsiflexory osteotomy through the lesser tarsus to correct a cavus type condition.¹⁷ Our technique is similar to Cole's osteotomy but used for treatment of neglected CTEV correction.

The only disadvantage observed in our study was shortening of the foot in some cases which is comparable to other studies by Graham et al, Laaveg et al, Wynne-Davies et al.¹⁸⁻²⁰

We have discussed only neglected cases beyond 5 years of age with Dimeglio Grade III onwards.

Usually all these deformities have contracted TA which is one of the major deforming forces. TA lengthening corrects equinus by unlocking heel. Also it helps to avoid calcaneal osteotomies. Conventional procedures like Dwyer, Evans alone have failed to give complete correction, so combination of different procedures is required.

With our described technique excellent to good results were achieved in all cases with very much cosmetic scar and without undue skin scarring. Since we don't touch any of the articular surfaces in this technique, so no incidence of stiffness or painful joints. No bone grafts are required in this technique. Numbers of follow ups required are less & are placed at minimum 3 weeks duration. Compliance & education of patients like in JESS/ Ilizarov is not required so more patient friendly. It is very much cost effective technique. Only disadvantage is some shortening of foot compared to conservatively treated cases.

CONCLUSION

CTEV is best to be treated at the early age with Ponseti's casting method. In neglected cases many management options are available but most of them require good compliance and extensive patient education for maintenance of correction.

With our technique we can achieve satisfactory outcomes in single sitting surgery with cosmetically optimal foot & minimum patient compliance.

It can be concluded from analyzing this case series that treatment of neglected clubfoot using single stage procedure dorsal close wedge osteotomy with soft tissue release has a high rate of good and excellent results, with low frequency of complications. But still, long term follow up with larger sample size of patient is required for knowing the detailed outcome of this procedure.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Chandak VH, Khatri KJ, Chandak SH. Surgical outcome with single stage procedure for neglected congenital talipes equinovarus. *Int J Res Orthop* 2020;6:37-43.