



E-ISSN: 2395-1958  
P-ISSN: 2706-6630  
IJOS 2024; 10(3): 79-83  
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[www.orthopaper.com](http://www.orthopaper.com)  
Received: 02-05-2024  
Accepted: 07-06-2024

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## Can extended casting be an alternative to tenotomy in CTEV patients?

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**DOI:** <https://doi.org/10.22271/ortho.2024.v10.i3b.3581>

### Abstract

**Aim:** To assess the efficacy of extended serial casting for persistent heel equinus in CTEV.

**Methods:** The current study was a prospective pilot observational study that was conducted from August 2023 to July 2024 on CTEV patients who visited the Orthopaedics OPD at Indira Gandhi Hospital Dwarka, Delhi. The study included all children whose CTEV treatment begin in the age group of 0 to 3-month and having persisting heel equinus after forefoot deformity correction

**Results:** There were 15 children with 22 clubfeet treated in our hospital during the study period. There were more boys (10) compared to girls (5), with a ratio of 2:1, with 7 (46.6%) bilateral deformities, and 8 (53.3%) unilateral deformities. When unilateral, the right feet were more commonly affected (5, 62.5%) than the left feet (3, 37.5%). Max number of clubfoot patient presented at less than 30 days of age. Mean Final external rotation was  $59.94 \pm 1.78$  degrees. The mean Initial Equinus deformity was  $11.44 \pm 1.80$  degrees, mean Final Dorsiflexion was  $21.17 \pm 1.46$  degrees. Mean total number of casts was 8.4 cast in 15 feet (serial casting and extended casting) and 10 cast in 6 patients (serial casting and extended casting). Average in 21 feet was 8.85 cast. The mean duration of the treatment was 62 days. It was seen that tenotomy was done among only 4.5% children.

**Conclusion:** In CTEV patients, extended serial casting can be employed as a substitute for post-casting percutaneous a chilles tendon tenotomy.

**Keywords:** Clubfoot, serial casting, tenotomy

### Introduction

Congenital talipes equinus varus also known as clubfoot, is one of the commonest musculoskeletal deformities of the lower limb with an incidence of 1/1000 live births (1) surgical correction of clubfoot was a primary treatment and both retrospective as well as prospective studies have shown poor results in terms of mobility and the persistence of pain secondary to surgical intervention [2]. Children who are born in developing countries with clubfoot deformity may receive inadequate treatment when compared to the developed nations, which lowers their quality of life.

Historically, conservative management was introduced by Hippocrates in around 400BC [3, 4]. Later, in 1939, Kite introduced his method [5], referred as Kite method, which is including manipulation and casting technique, but the success rate of this method was poor. Subsequently, in 1963, Ponseti developed a conservative method, called as Ponseti method, with manipulation, casting, Achilles tenotomy and bracing. It begins within a few weeks after birth.

Study done by Ponseti showed 90% satisfaction rate among the patients [6]. The current standard care consists of weekly corrective manipulation and casting for gradual correction of the deformity. The final plaster requires a percutaneous tendoachilles tenotomy to be done. The aim of this study is to analyse the functional outcomes of serial cast correction in CTEV by the Ponseti method. The primary objective is to study the effectiveness of extended Ponseti's technique of plaster cast application in the management of idiopathic clubfoot without tenotomy. The secondary objective is to assess the number of cast required in extended casting.

### Methods

The current study was conducted from August 2023 to July 2024 on CTEV patients who visited the Orthopaedics OPD at Indira Gandhi Hospital Dwarka, Delhi. The study included all children whose CTEV treatment started in the age range of 0 to 3 months and had persistent heel equinus following forefoot rectification.

### Inclusion criteria

1. Age less than 3 months.
2. Spine and hip of the patient should have no abnormality.
3. Parents should provide consent for inclusion in the study.

### Exclusion criteria

1. Congenital or neurological deformity in the child.
2. Relapsed or recurrent clubfoot.
3. Any previous intervention, conservative or surgical, done elsewhere.

Parents were fully informed about the study before and their informed consent was obtained. Based on the Ponseti approach, serial casting was initiated for all of the patients. The same Orthopaedic surgeon conducted a clinical

evaluation after observing forefoot and midfoot rectification and scoring was done according to piranis scoring system (Table). Patients who had persistent equinus deformity (piranis score 0.5 - 1) after 5 to 7 abduction castings were only subjected to a maximum of 4 prolonged extended stretching castings.

Stretching cast was applied on a externally rotated foot as achieved in pre-stretching casting. Pressure was applied over calcaneum with counter-traction at knee joint along the axis of tibia. Cast was further augmented with a slab on planter aspect of foot.

We avoided giving pressure on midfoot and forefoot while stretching.

Ankle dorsiflexion was geometrically measured both before and after extended serial casting. When the test protocol resulted in a final dorsiflexion of more than 20° in four or fewer castings, it was considered successful. Failure to attain 20° dorsiflexion using the aforementioned approach was deemed to have occurred. Tenotomy is performed if an ankle dorsiflexion angle of at least 20 degrees cannot be reached. After the inclusion and exclusion criteria 12 children were enrolled in the study.

**Table 1:** Midfoot scores and Hindfoot scores

Parameters	Mild	Moderate	Severe
<b>Midfoot scores</b>			
Curved lateral border	0	0.5	1
Deep medial crease	0	0.5	1
Uncovering of talar head	0	0.5	1
<b>Hindfoot scores</b>			
Empty heel	0	0.5	1
Posterior crease	0	0.5	1
Rigid equinus	0	0.5	1



**Fig 1:** Pre-casting



**Fig 2:** First abduction casting external rotation upto neutral



**Fig 5:** Fourth abduction casting external rotation upto 60 degree



**Fig 3:** Second abduction casting external rotation upto 10 degree



**Fig 6:** First tendoachilles stretching upto neutral dorsiflexion



**Fig 4:** Third abduction casting external rotation upto 40 degree



**Fig 7:** Second tendoachilles stretching 10 degree dorsiflexion





**Fig 8:** Third tendoachilles stretching 20 degree dorsiflexion



**Fig 9:** Bracing

**Result**

**Table 2:** Variables Number of cases (%)

Sex	
Male	10 (75%)
Female	5 (25%)
Side of involvement (out of 22 feet)	
Bilateral	7 (46.6%)
Left	3 (45.4%)
Right	5 (54.5%)
Age at presentation (in months)	
0-1 months	10 (66.6%)
1-2 months	03 (20%)
2-3months	02 (13.3%)
Birth order	
First born	11 (73.3%)
Second or above	04 (26.6%)
Consanguinity	
Consanguineous marriage	01 (6.6%)
Non-consanguineous marriage	14 (93%)

**Table 3:** Variables number of cases (%)

Treatment modality (22 feet)	
Casting only	21 (95.4%)
Casting and heel cord tenotomy	1 (4.5%)
Number of casts required for full correction (Excluding tenotomy feet)	
8-9 casts	15 (71.4%) (8 cast in 9 patient and 9 cast in 6 patient)
10 casts	6 (28.5%)

**Table 4:** Number of cast required to correct equinus deformity alone

3 cast	2 feet
4 cast	13 feet
5 cast	6 feet

**Table 5:** Complications

Superficial blister formation	01 (6.6%)
Relapse	01 (6.6%)
Rockerbottom foot	00
No complication	13 (86.6%)

There were 15 children with 22 clubfeet treated in our hospital during the study period. There were more boys (10) compared to girls (5), with a ratio of 2:1, with 7 (46.6%) bilateral deformities, and 8 (53.3%) unilateral deformities. When unilateral, the right feet were more commonly affected (5, 62.5%) than the left feet (3, 37.5%). Max number of clubfoot patient presented at less than 30 days of age. There were 10 patients who presented at the age less than 1 month, 3 patient between 1 to 2 month of age and only 2 patient between ages of 2 to 3 month.

21 feet out of 22 were treated alone with casting and in one feet tenotomy was done due to relapse after 1 month of extended serial casting. The age at the presentation was 82 days of failure case.

The average number of total cast was 8.4 cast in 15 feet (serial casting and extended casting) patients and 10 cast in 6 patients (serial casting and extended casting). Average in 21 feet is 8.85 cast. Average duration of treatment was 62 days.

**Discussion**

In our study the average no of total cast required to correct the deformity was 8.85 cast whereas the average number of casts required in the study by Laaveg *et al.* [6] was seven.

The average no of cast required for equines correction is 4.19 (29.33 days), whereas post tenotomy patient require 3 weeks post tenotomy casting (21 days). In study conducted by saini *et al.* the numbers of casts required for correction in 16 feet (52%) were five to six and 15 feet (48%) required seven to eight casts for correction [7].

In our study only 1 feet required tenotomy (4.5%) whereas when compared to pirani, 90% of the patients required tenotomy in the study conducted by Pirani *et al.* [8].

In our study 1 feet required tenotomy out of 22 feet. The age at the presentation of that child was 82 days as compare to others the average age was 28 days.

In the present study, 1 case (4.5%) out of 22 feet experienced superficial blister formation, which recovered after the application of adequate soft padding while further casting and allowing the skin to heal. In the study conducted by Lehman [9], 10.2% of cases reported complications. Guruprasath *et al.* [10] reported a complication rate of 13.15%, which included superficial sores and crowding of toes.

**Conclusion**

In lieu of tenotomy, extended casting may be utilized to repair CTEV. To my knowledge, not many research has been conducted on the subject.

From foot to foot, the response to nonoperative treatment may differ depending on the degree of the clubfoot deformity As the tendon creep potential permits permissive extension of the Achilles tendon during manipulation and casting, the necessity for tenotomies can be avoided in children (less than

3 month age) by using lengthy serial casting (stretching). No anaesthesia is necessary, there is no accompanying pain, and there is almost no possibility of infection.

Injuries to the tibial or sural nerves, haemorrhage from injuries to the peroneal artery, posterior tibial artery, or lesser saphenous vein, and incomplete release are all tenotomy-related complications that have been recorded in the literature [11].

Extended serial casting can help you avoid these issues. Hence, the present study was done to assess the efficacy of extended serial casting for persistent heel equinus in CTEV.

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### How to Cite This Article

Chandra N, Bhardwaj A, Goyal D, Jain M. Can extended casting be an alternative to tenotomy in CTEV patients? *International Journal of Orthopaedics Sciences* 2024; 10(3): 79-83.

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