



ISSN (P): 2521-3466
ISSN (E): 2521-3474
© Clinical Orthopaedics
www.orthoresearchjournal.com
2020; 4(4): 22-25
Received: 11-05-2020
Accepted: 13-06-2020

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Circumventing tenotomy in idiopathic clubfoot

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DOI: <https://doi.org/10.33545/orthor.2020.v4.i2a.221>

Abstract

Background: Congenital talipes equinovarus (CTEV) is one of the most common congenital deformities faced by the orthopaedic fraternity. Although, the deformity is treated conservatively initially with Ponseti's method, the procedure involves performing percutaneous Achilles tendon tenotomy, a procedure that has its own set of potential complications. We describe a novel manipulation technique to circumvent tenotomy in correcting the residual equinus deformity of idiopathic clubfoot.

Materials and methods: A total of 30 (43 clubfeet) patients were included in the study and after the correction of cavus, adduction and varus deformity using Ponseti's method, the residual equinus deformity was corrected using our technique.

Results: All the cases with the residual equinus deformity could be corrected by our technique.

Conclusion: Idiopathic CTEV presenting within a year can successfully be treated without performing percutaneous tendoachilles tenotomy irrespective of the initial Pirani score at presentation using the manipulation technique employed by us.

Keywords: Idiopathic clubfoot, Ponseti's method, Residual equinus deformity, Tenotomy

1. Introduction

Congenital talipes equinovarus (CTEV) is one of the most common congenital deformities with an incidence of 1 in 1000 live births^[1]. There is a general consensus on the fact that the initial treatment of the deformity should be conservative^[1, 2]. Gentle manipulation of the deformed foot followed by cast immobilization was first recommended by kite^[3]. In today's scenario, Ponseti's technique has gained acceptance as one of the most popularly used methods for correcting the idiopathic CTEV^[4, 5].

The entire Ponseti method is divided into two phases viz the treatment phase followed by the maintenance phase. Serial manipulation and casting is done to progressively correct the deformity as part of the treatment phase. The cavus deformity is corrected by aligning the forefoot and hind foot during the application of first cast. Manipulation and casting are continued on a weekly basis thereafter during which the head of talus serves as the fulcrum for the manipulation. The degree of dorsiflexion is assessed before the application of 5th cast and failure to dorsiflex the ankle beyond neutral warrants tenotomy^[6-8]. After the last cast is removed, maintenance phase of treatment is started with the patient being placed in modified FAO (foot abduction orthosis) used for 23 hours a day in the initial 3 months and subsequently as night brace for 3-4 years^[9]. A total of 5 to 6 casts are required to correct the deformity and according to Ponseti, upto 70% of cases require Achilles tenotomy^[6]. Percutaneous tendoachilles tenotomy although performed under local anaesthesia has several reported complications. Bleeding from posterior tibial, peroneal artery, small saphenous vein^[10]; potential injury to tibial and saphenous nerve^[11] and recurrence^[12] of deformity attributable to incomplete release of tendon are some of the documented complications. Percutaneous tenotomy when performed in older children carries the potential risk of weakness of gastrocnemius-soleus and as such contributes to the apprehension associated with the procedure^[13].

The purpose of this study was to circumvent the tenotomy in the correction of the residual equinus deformity in idiopathic CTEV by employing a novel manipulation and casting technique.

2. Materials and methods

2.1 Patients included in the study

A total of 30 patients (43 clubfeet) attending the OPD of our institute between November 2018 to February 2019 meeting the inclusion criteria were included in the study. A written and informed consent was obtained from parents of all children included in the study.

2.2 Inclusion criteria

1. Fresh Idiopathic CTEV.
2. Age up to 1 year on presentation.

2.3 Exclusion criteria

1. Secondary CTEV.
2. Atypical CTEV.
3. Previously treated cases.

2.4 Manipulation and Casting Technique

All the cases were subjected to an initial scoring done in accordance to the scoring system devised by Pirani *et al.* Following the initial scoring, serial manipulation and casting was initiated and continued on a weekly basis with Pirani score being done at each follow up visit before the cast was applied.

The Pirani scoring system takes into account 6 parameters in total which are divided into hindfoot and midfoot components. The hindfoot components are empty heel sign, rigidity of

equinus and posterior crease. Each component is given a score of 0, 0.5, 1 based on the severity of deformity. Likewise, the midfoot components *viz.* curvature of the lateral border of foot, position of head of talus, medial crease are scored as 0, 0.5, 1 (on the basis of severity of deformity). The overall score obtained by summation of midfoot and hindfoot score ranges from 0 to 6 with 6 depicting the most severe deformity^[14].

Serial manipulations and castings were performed for the correction of cavus, forefoot adduction and heel varus in accordance to the method described by Ponseti^[7].

After the application of 4-5 casts, when the cavus, adduction and heel varus deformities were corrected, the degree of dorsiflexion of foot was assessed. If the foot could not be dorsiflexed beyond neutral, the residual equinus deformity was corrected by gentle stretching of the heel cord with a downward pull exerted on calcaneal tuberosity using the thumb and the index finger of one hand and simultaneous upward thrust was applied on the midfoot with the thumb of the other hand on the plantar aspect (figure 3- A & B). The stretching was maintained for 60 seconds and was repeated for three times at the same setting. This was followed by application of well molded toe to groin cast with the foot in 70 degrees of abduction and 15-20 degrees of dorsiflexion (Figure -4). Second manipulation was required in some cases to achieve 15 to 20 degrees of dorsiflexion. The last cast was kept for a period of 3 weeks and thereafter the child was put in the foot abduction brace.



Fig 1: 3 Months old right sided CTEV



Fig 2: Right foot after removal of 5th cast



A



B

Fig 3(A&B): Manipulation technique employed to correct the residual equinus deformity after removal of the 5th cast.



Fig 4: Final cast after correction



Fig 5: Application of FAO post cast removal by our technique.

3. Results

In our study, a total of 43 clubfeet (30 patients) were included. Of these, 21 patients (70 percent) were male and 9 patients (30 percent) were female. 17 patients had only one foot deformed and 13 patients had bilateral affliction. In patients with unilateral involvement, the right foot was involved in 7 cases and left foot was involved in 10 cases.

The casting was initiated within the first year of life ranging from 7th day of life (just after the droppings of the umbilical cords) to 1 year of age. At initial presentation, 30 clubfeet had Pirani score of ≥ 5 and 13 clubfeet had score between 4 and 4.5.

The cavus, adduction and varus deformities got corrected after application of 4 to 5 casts in all the cases. The residual equinus deformity was thereafter corrected using the manipulation technique described earlier and the foot was placed in a high groin cast with the foot in 70 degrees of abduction and 15-20 degrees of dorsiflexion for 3 weeks.

Of the 30 clubfeet that had initial Pirani score of ≥ 5 , 21 required 2nd manipulation to correct the residual equinus and 7 were corrected after 1st manipulation by our technique. Out of the 13 clubfeet with an initial pirani score of 4-4.5, 10 feet showed residual equinus deformity and all were corrected in the 1st attempt. (Table 1 & 2)

Table 1: Number of feet showing residual equinus deformity

Pirani score	Number of feet	Number of feet showing residual equinus deformity
≥ 5	30	28
4-4.5	13	10

Table 2: Number of casts required for complete correction of residual equinus

Number of casts for complete correction of residual equinus	Number of feet with pirani score ≥ 5	Number of feet with pirani score 4-4.5	Total number of feet
0	2	3	5
1	7	10	17
2	19	0	19

After the complete correction of the deformities, the patient was placed in a foot abduction orthosis that were worn for 23 hours in the initial 3 months followed by overnight application.

All the patients were followed for a period of at least 1 year (figure 6 -9). Out of the 30 patients, 2 cases with unilateral deformity having initial Pirani scores of 5.5 and 6 respectively showed relapse of the equinus deformity at 12 months of follow up with Pirani score of 0.5 in each case which were corrected by the same technique.

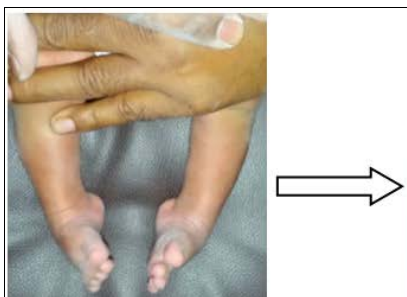


Fig 6: months old baby with bilateral cttev



Fig 7: follow up after 1 year



Fig 8: B/L CTEV in 11 months old baby

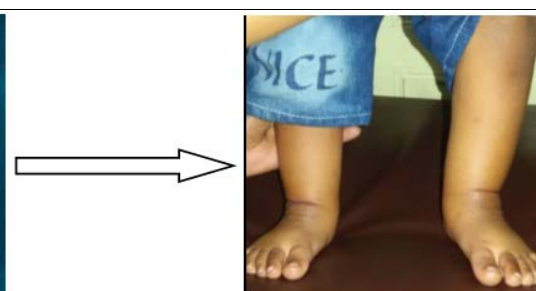


Fig 9: follow up after 1 year

4. Discussion

The Ponseti technique for the treatment of the idiopathic CTEV is highly efficacious^[15]. Percutaneous tendoachilles tenotomy is not required in all cases of idiopathic CTEV^[7]. The hindfoot contracture score of the Pirani scoring system, rigidity of clubfoot are important determinants of tenotomy as reported in previous studies^[14, 16]. According to a study conducted by David et al, children below 6 months are less likely to require tenotomy compared to children above 1 year of age^[14].

Our study shows that tenotomy is not required in all cases of idiopathic CTEV. Early institution of Ponseti technique preferably within the 1st year of life employing the manipulation technique described to correct the residual equinus deformity can significantly reduce the need of tendo-achilles tenotomy. To the best of our knowledge, the manipulation technique used to correct the residual equinus deformity has not been employed previously. This is important in cases where parents are unwilling to give consent for tenotomy in view of the potential complications the procedure entails^[17]. The complications associated with tenotomy can be completely avoided with the casting method described above. Also, the relapse of cases in ponseti technique is mainly due to non-compliance of bracing protocols^[18] which is essentially the same with the technique employed by us. The contrive employed by us to correct the residual equinus was gentle. Maximum two manipulations and casts were necessary to completely correct the residual equinus deformity. While correcting the residual equinus, there is no fear of lending up to any spurious correction leading to rocker bottom foot as the movement occurs absolutely at the ankle joint^[19]. The chances of spurious correction is when one tries to correct the equinus in a foot with under correction of cavus, forefoot adduction or heel varus.

5. Conclusion

We conclude that idiopathic CTEV presenting within a year can be successfully treated without performing percutaneous tendoachilles tenotomy irrespective of the initial Pirani score at presentation using the manipulation technique employed by us.

6. Financial support and sponsorship

Nil.

7. Conflicts of interests

There are no conflicts of interests.

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