



Original Article

## Idiopathic Clubfoot Treated by Ponseti Technique

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### ABSTRACT

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**Introduction:** Idiopathic clubfoot (talipes equinovarus) is a congenital foot deformity characterized by cavus, equinus, varus, and adductus, commonly affecting the mid and hindfoot.

**Methodology:** This hospital-based prospective observational study was conducted in the Department of Orthopaedics at Trauma Centre, PBM Hospital, Bikaner, and included all cases of idiopathic congenital talipes equinovarus (CTEV).

**Result:** The Ponseti method successfully corrected CTEV in children up to 2 years of age, with 93.87% achieving excellent outcomes, though a prolonged casting period and tendo-Achilles tenotomy were often necessary, particularly in older patients. Compliance with the foot abduction brace was crucial to prevent relapse, and minor complications.

**Conclusion:** The Ponseti method effectively corrects idiopathic clubfoot in children up to 2 years, with proper adherence to casting and foot abduction orthosis critical for successful long-term outcomes.

**Keywords:** Idiopathic Clubfoot, Ponseti, Tenotomy.

### INTRODUCTION

Idiopathic clubfoot (talipes equinovarus) is a congenital foot deformity characterized by cavus, equinus, varus, and adductus, commonly affecting the mid and forefoot<sup>1</sup>. With a prevalence of 1 to 2 per 1,000 live births, it is the most frequent congenital deformity in children<sup>2</sup>. The condition can occur in isolation or as part of syndromes like arthrogryposis multiplex congenital or spina bifida<sup>3</sup>. The development of clubfoot entails the interaction of several environmental and genetic factors<sup>4</sup>. The pathogenesis of clubfoot is attributed to the excessive formation of collagen, which leads to fibrosis and the shortening of ligaments, tendons, and muscles in the feet<sup>5</sup>. In the absence of treatment, clubfoot results in rigidity of the affected limb and leads to fixed alteration in gait<sup>6</sup>. The Ponseti and Kite methods are the most commonly used conservative approaches for correcting clubfoot deformities<sup>7</sup>. Developed in the 1930s, the Kite method focuses on sequential and gradual correction of each deformity, starting with forefoot adduction, followed by hindfoot varus, and concluding with ankle equinus<sup>8</sup>. Each deformity is corrected only after the previous one has been fully addressed<sup>9</sup>. While Kite reported a 70-75% success rate, several studies have failed to replicate such high success rates. Additionally, 20-30% of patients required further surgical intervention after treatment with the Kite method<sup>10</sup>. In the 1950s, Ponseti developed his technique, but it became only widely used in the 1990s<sup>11,12</sup>. The Ponseti technique corrects the midfoot cavus, hindfoot varus, and forefoot adduction simultaneously, while the equinus deformity is treated later. In selected cases, percutaneous Achilles tendon tenotomy is performed to enhance the correction of equinus deformity<sup>11</sup>. Several studies have reported more than 95% success rate for the Ponseti method<sup>7,13,14</sup>.

### AIM

To correct all the components of the deformity in CTEV sequentially to achieve pain free, functional, plantigrade supple foot.

### METHODOLOGY

This hospital-based prospective observational study was conducted in the Department of Orthopaedics at Trauma Centre, PBM Hospital, Bikaner, and included all cases of idiopathic congenital talipes equinovarus (CTEV) presenting at the

orthopaedics OPD over a study period of 1.5 years. The study included both unilateral and bilateral cases of CTEV in children under 2 years of age, with consecutive sampling used to select participants. Exclusion criteria neuropathic, syndromic, and relapsed clubfoot cases, as well as children over 2 years of age. Above knee corrective cast were applied in interval of one week and tenotomy was performed in some cases to correct the residual equinus. After correction patients were given FAB(Foot Abduction Brace) to wear 23 hours in a day for initial 3 months, then 6 to 8 hours during sleeping till the age of 4 to 5 years. Patients were followed up for 1 year, with monthly visits for the first 3 months, followed by every 3 months thereafter. The Pirani score was used to assess the severity of deformity during the corrective phase of casting, and percutaneous tendo-Achilles tenotomy was considered when the mid-foot score was less than 1 and the hind-foot score was greater than 1. During the maintenance phase, brace application was monitored using the Pirani score to assess for relapse.

**Sample size:**

Prevalence of congenital clubfeet is 2%

Sample size is calculated using the formula= $n = \frac{z^2pq}{d^2}$

Here,

Z= is standard normal variate [at 5% type 1 error (p<0.05) it is 1.96] p=prevalence of congenital clubfeet

q= 1-p

d=allowable error (5%)

$n = \frac{(1.96)^2(2)(100-2)}{(5)^2} = 30.11 = 32$  Sample size is 32.

**RESULT**

In the study, out of the total cases, 53% had bilateral and 47% had unilateral involvement. In unilateral cases 54% had left-sided, while 46% had right-sided involvement.

**Table 1: Relationship of age with Pirani score and No. of casts:-**

Age group	No. of feet	Mean pirani score	Mean no. of cast
Day1-6 months	37	5.48	6.59
7-12 months	11	4.59	9
13-18 months	1	4	12
19-24 months	0	0	0
	49		

When we examine the cases, we found that 37 clubfeet were below the age of 6 months had a Mean Pirani score of 5.48 and mean number of casts 6.59, 11 clubfeet were between the age group of 7-12 months had a mean Pirani score of 4.59 and the mean number of casts 9, 1 clubfoot was between the age group of 13-18 months had a Pirani score of 4 and number of casts 12.

**Table 2: Age-wise tenotomy: -**

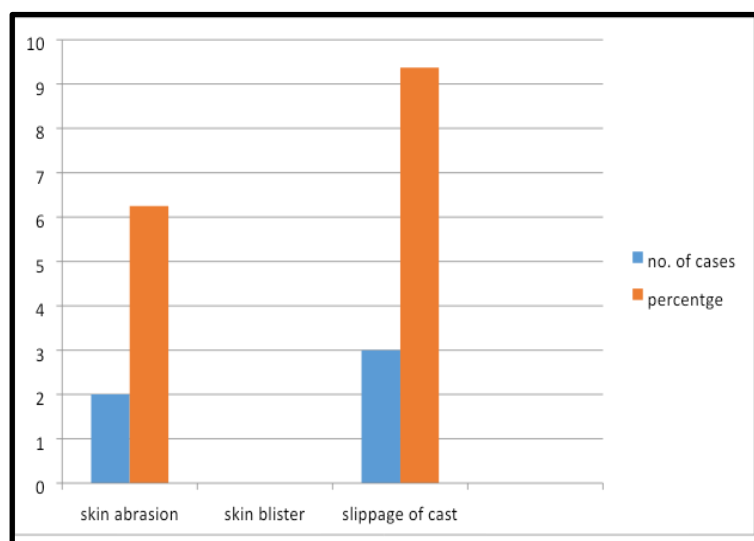
Age group	Tenotomy done (no. of feet)	Percentage
Day 1-6 months	33	89.18
7-12 months	10	90.90
13-18 months	1	100
19-24 months	0	0
Total	44	89.79

We also observed the relation of tenotomy with the age of child at presentation to the hospital. We found that 89% of cases required tenotomy below the age of 6 months, 91% cases required tenotomy in age group 7-12 months, and 100% cases needed tenotomy in age group 13-18 months. It shows that as the age increases, need for the tenotomy also increases because the soft tissue reduces and bones get mature.

**Table 3: Relationship of Pirani score before treatment with Pirani score at 3rd ,6th months and 1 year follow up**

Age group	Mean initial Pirani score	Mean Pirani score at 3 <sup>rd</sup> month follow up	Mean Pirani score at 6 th month follow up	Mean Pirani score at 1 year of follow up
Day1-6 months	5.48	0	0	0
7-12 months	4.59	0.136	0.136	0.409
13-18 months	4	0	0	0
19-24 months	0	0	0	0
Average	5.25	0.46	0.46	0.93

The mean Pirani score decreased from 5.25 at the initial cast to 0.14 after full correction, with an average change of 5.11 points.



**Figure 1: Showing complications during study period.**

At the one-year follow-up, 96% of feet were fully corrected, with only 2 feet showing recurrence due to noncompliance with the foot abduction brace. The final clinical assessment using Pirani scoring showed that 94% of cases had excellent outcomes, 4% had good outcomes, and 2% had poor outcomes, with minimal complications such as skin abrasions and cast slippage.

### DISCUSSION

In our study, mean age of the group was 3.63 months with range of 4 days to 18 months, maximum 75% were below 6 months of age and 25% were above the age of 6 months. On clinical assessment the mean initial Pirani score was 5.25 (out of maximum score 6). After full correction the final score was found to be 0.14 and the mean change of score was found to be 5.11. The mean value of Pirani score at 3,6 and 12 months of follow up was 0.046, 0.046 and 0.093 respectively, signifying mild increase in deformity due to the non-compliance with foot abduction brace. Similarly in Lehman<sup>15</sup> series Pirani score changed from 4.6 to 0.6 in mean 5.3 casts.

On examine the cases, tenotomy was required in 90% cases (89.18% of cases of 0- 6 months age group; 91% cases of 7-12 months ; 100% cases of 13-18 months age ) this means that tenotomy was required in those patients whose age was more at the time of initial treatment. Similarly Porecha et al<sup>17</sup> performed tenotomy in 97% of cases while Bor et al performed tenotomy in 92.3% and Morcuende et al<sup>16</sup> tenotomy was needed in 86% of cases.

On clinical assessment by using the Pirani score, the 97.95% correction obtained in our study. Similarly in the retrospective study by Morcuende et al<sup>16</sup>, correction was obtained in 98% cases. Correction was obtained in up to 7 casts. 90% of patients required 5 casts for correction.

In our study Ponseti method proved successful, with 93.87% of cases (46 Clubfoot) achieving an excellent outcome when evaluated by the Pirani scoring system. Similarly Porecha et al<sup>17</sup> reported an excellent to good outcome in 86.56% of cases.

This study shows that CTEV in children upto 2 year can be successfully corrected by Ponseti method. This correction can be achieved with larger than usual number of casts and with tendoachilles tenotomy.

## CONCLUSION

The Ponseti method is effective in correcting idiopathic clubfoot in children up to 24 months, with older age groups requiring more casts for correction. Tendo-Achilles tenotomy is often necessary and can be safely performed up to 24 months, with no adverse effects at three-month follow-up. Relapse is primarily associated with noncompliance to foot abduction orthosis and the age at which treatment is initiated, emphasizing the importance of strict adherence to casting techniques and post-treatment care.

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