

# Results of the Ponseti Technique of Manipulation Followed by Casting in Patients with Idiopathic Clubfoot

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## Abstract

**Objective:** Determination of outcomes of treatment of idiopathic clubfoot using Ponseti manipulation and serial casting  
**Study design:** A cross-sectional study  
**Place and Duration:** This study was conducted at Jinnah Medical & Dental College/Sohail Trust Hospital Karachi from October 2021 to October 2022.  
**Methodology:** The present study includes 150 children with clubfoot. All the patients were below the age of one year. The participants were treated by the technique of Ponseti manipulation and casting every week. The scoring of Pirani was used for the determination of deformity level. The scoring was done before and after the treatment. The interpretation of Pirani scoring is such that 0-1 is considered an excellent outcome, 1.5-2.5 is considered a good outcome, and more than 3 is considered a poor outcome. The Pirani score before and after the treatment was compared.  
**Results:** The present includes children with idiopathic club feet. A total of 74 (9.33%) children presented with bilateral club feet and 76 (50.66%) children presented with unilateral club feet. The total number of feet treated was 224. The mean age of the patients was 46.64±62.25 days. Out of 150 patients, 87 (58%) were male and 63 (42%) were female. Tendo Achilles tenotomy was performed in 121 (80.67%) children. The average number of casts was 5.43±1.76. The mean Pirani score before casting in the right foot was 4.96±1.2 and after casting was 0.14±0.42 ( $p < 0.05$ ). The mean Pirani score before casting in the left foot was 5.12±1.2 and after casting was 0.8±0.19 ( $p < 0.05$ ). Excellent results were seen in 184 (82.14%) of the feet and good outcomes were noted in 40 (17.86%) feet.  
**Conclusion:** The manipulation technique of Ponseti followed by casting proved to be highly effective in the correction of club foot deformity. Pirani score after the treatment indicated excellent outcomes in most of the patients.

**Keywords:** Ponseti technique, club foot, casting, Pirani score, ctev

## Introduction

Congenital Talipes Equinovarus (CTEV) or idiopathic club foot is a common birth deformity seen in 1-2 in 1000 births on a global level [1]. The ratio of club foot in Pakistan is 1.4-1.5 in 1000 live births [2]. In 30-50% of the cases of CTEV, both feet are involved [3]. The etiology of the disease is related to environmental factors and genetic factors. Some of the cases are associated with myelomeningocele, arthrogryposis, and amniotic bands. Despite all the factors, 80% of these cases

have unknown etiology and these cases are termed as idiopathic [4]. Familial clubfoot cases have an 11% prevalence [5].

The disease has adverse impacts on the mental health of the patients as well as the parents. Hence, it is recommended to get emotional and psychological support along with the treatment of the disease [6]. The sequel of untreated clubfoot can result in permanent deformity of the foot bones and degeneration of the joints lying adjacent to the deformed bone [7]. Due to the adverse effects of surgical intervention and complications of these procedures in idiopathic CTEV, non-surgical

interventions such as taping, splinting, the Ponseti technique, and serial casting are advised [8].

The Ponseti method of manipulation and casting of clubfoot deformity was presented by a North American surgeon Dr Ignacio Ponseti [9]. This technique included an initial step of manipulation and casting and it was sometimes performed with Achilles tenotomy and sometimes without it. The next step included foot bracing [10]. The method is simple, easy to perform, easy to learn, has excellent outcomes, and is economically feasible for patients [11].

The present study aims the determination of the outcomes of the technique of Ponseti manipulation for idiopathic CTEV and the interpretation of outcomes according to the Pirani scoring.

## Methodology

The present descriptive study was performed on 150 children with idiopathic CTEV. Both male and female children were included in the study. The ages of the patients were lesser than one year. All the patients had idiopathic CTEV. As per the inclusion criteria, all the participants included in the study had a normal spine and normal hip. The patients enrolled in the study were taken from the outpatient department of the hospital. As per the exclusion criteria of the study, the patients with syndromic clubfoot, neuromuscular deformities, and neurological defects and previously treated for CTEV, were excluded from the study.

A complete clinical history of the patients was acquired after the enrolment phase. After taking the history of the patients, they were physically examined. Written informed consent was taken from the parents of the patients. After that, the Pirani score of the patients was assessed before the treatment was started. The scoring was done by the examination of the posterior foot crease presence or absence, equinus rigidity, medial crease, heel, degree of curvature of the lateral border, and the head of the talus. The minimum Pirani score was 0 and the maximum was 6. According to the standard protocols of the treatment, the patients were asked to visit every week for Ponseti manipulation and casting sessions. Patients with lesser than 15 degrees dorsiflexion and lesser than 70 degrees abduction, were selected for Percutaneous Achilles tenotomy.

The procedure was done under local anesthesia.

After the completion of manipulation sessions and complete correction of the CTEV, the Pirani score was again calculated. The manipulation phase was followed by the application of the Dennis-Brown bract in the maintenance phase of the treatment plan. The interpretation of the Pirani scores taken after the treatment course was over was done in such a way that a  $\geq 3$  score was considered to be a poor outcome, 1.5-2.5 scores were considered as good outcomes and 0-1 scores were thought to be excellent outcomes. The data were carefully collected and then analyzed in the software IBM SPSS version 26.

## Results

A total of 150 patients with idiopathic CTEV were enrolled in the present study. Overall 87 (58%) patients were male and 63 (42%) were female patients. The prevalence was seen slightly more in the male patients compared to the female patients. The disease was present in both feet in 74 (9.33%) and in one foot in 76 (50.66%) children. Hence, the total number of idiopathic CTEV feet treated was 224. There was involvement of the right feet in 118 (52.67%) and left feet in 106 (47.32%). This infers that the majority of the patients had right foot deformities. The mean age of the patients was  $46.64 \pm 62.25$  days with a range of 1 day to 275 days. The average number of casts was  $5.43 \pm 1.76$  with a range of 2 to 11. The mean Pirani score before casting in the right foot was  $4.96 \pm 1.2$  and after casting was  $0.14 \pm 0.42$  ( $p < 0.05$ ) with a range of 2.5 to 6 while post-casting it was  $0.14 \pm 0.42$  with a range of 0 to 2.5 ( $p < 0.05$ ). The improvement seen in those cases was statistically significant. The mean Pirani score before casting in the left foot was  $5.12 \pm 1.2$  ranging from 1 to 6 and after casting was  $0.8 \pm 0.19$  ranging from 0 to 1 ( $p < 0.05$ ). The difference in the score was statistically significant. The outcomes were excellent in 184 (82.14%) of the feet and good outcomes were noted in 40 (17.86%) feet. Tendo Achilles tenotomy was performed in 121 (80.67%) cases. The analysis of the data and comparison of the data after stratification showed that there was no statistical difference in the Pirani score according to age, gender, and tenotomy. This data has been shown in the table 1 and 2. Moreover, there were no complications seen as a result of treatment by Ponseti manipulation and tenotomy.

**Table 1. Analysis and comparison of the data after stratification for the right foot**

Parameters	Number of right feet affected (n=118)	Mean Pirani score after the treatment	P-value
<b>Gender</b>			
Male	46	0.17	0.298
Female	32	0.07	
<b>Age</b>			
Less than three weeks	75	0.73	0.531
Three weeks to three months	32	0.18	
Three months to six months	10	0.3	
Six months to one year	1	0.1	
<b>Number of casts</b>			
1-6	87	0.57	0.016
7-11	31	0.38	
<b>Tendoachilles tenotomy</b>			
Yes	93	0.14	0.831
No	87	0.16	

**Table 1. Analysis and comparison of the data after stratification for the left foot**

Parameters	Number of the left foot affected (n=106)	Mean Pirani score after the treatment	P-value
<b>Gender</b>			
Male	41	0.63	0.531
Female	31	0.19	
<b>Age</b>			
Less than three weeks	54	0.83	0.284
Three weeks to three months	32	0.82	
Three months to six months	12	0.17	
Six months to one year	8	0.18	
<b>Number of casts</b>			
1-6	86	0.08	0.732
7-11	20	0.09	
<b>Tendoachilles tenotomy</b>			
Yes	92	0.08	0.473
No	14	0.05	

## Discussion

The present study included a total of 150 patients treated using the Ponseti method of manipulation and casting. The overall result of the treatment was seen to be highly effective. One such research was done by Matuszewski et al. They included 35 children with idiopathic CTEV in their study, mostly male children. The severity of the deformity was assessed using the Dimeglio system. They applied the Ponseti manipulation technique following the standard protocol of the treatment. The interpretation of the outcomes was done using the Pirani scoring system same as the present study. They found that the method was highly effective in the correction of CTEV and their conclusion supported this method [12].

Sanghvi et al conducted a similar study in which they tested the outcomes of the Ponseti method in the treatment of patients with idiopathic CTEV. They included 42 patients with idiopathic clubfoot deformity in their study. According to their study, the success rate of the study was 87%. They also concluded that this technique does not weaken the Achilles tendon [13]. The results of their study are suggestive of using the Ponseti method for the treatment of CTEV.

Verma et al conducted a study in which they intended to test the efficacy of the Ponseti method, however, the study included toddlers aged between one to three years. 6 to 12 casts were applied over a duration of 10-15 weeks. The treatment was effective for the mentioned age group [14].

The study of Noonan et al compared different non-surgical methods of correction of idiopathic clubfoot. The main methods they compared were physiotherapy and the Ponseti manipulation technique. They concluded that the method of Ponseti is the most effective non-surgical method of correction of the deformity [15].

## Conclusion

The Ponseti technique and casting are greatly effective in the correction of idiopathic CTEV deformity. A significant improvement can be seen using the Pirani score assessment before as well as after the treatment. Using this technique is recommended as it achieves ideal outcomes.

### Funding source

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### Conflict of interest

None

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