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DOI: [10.36347/PJAMMR.2022.vol-01-.022](https://doi.org/10.36347/PJAMMR.2022.vol-01-.022)

| Received: 26.04.2022 | Accepted: 28.04.2022 | Published: 11.05.2022

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ASGHAR KHAN, ISRAR UL HAQ, DILAWAR KHAN, BAHADAR ALI KHAN, SAJID AKHTER: PJAMMR –Vol 01- Issue 01-April-2022

Publisher Name : Spark Group Of Company (A Research base company )

Page 1 | 11

# Treatment Success with the Ponseti Technique in Congenital Talipes Equino Varusup to two Years of Age.

<sup>1</sup>Asghar khan, <sup>2</sup> Israr ul haq, <sup>3</sup> Dilawar khan, <sup>4</sup> Bahadar ali khan , <sup>5</sup>Sajid Akhtar

1 Consultant orthopedic surgeon Saidu group of teaching hospital swat Pakistan.

2 Prof of Pediatric Saidu Medical College swat Pakistan.

3 Prof of orthopaedicsaidu medical college Pakistan

4 Assistant Professor orthopedic saidu medical college swat Pakistan

5 Assistant professor orthopedic swat Pakistan.

Corresponding Authors: Asghar Khan , Email: <sup>1</sup> [drakyzai@yahoo.com](mailto:drakyzai@yahoo.com)

## ABSTRACT

## Original Research Article

**BACKGROUND :** Congenital talipes equinovarus (CTEV) is a severe foot birth disorder that may make walking difficult and painful and limit mobility. Seventy-five percent of clubfoot infants are born in low- and middle-income countries.

Clubfoot has long been treated. As orthopaedists gravitated toward surgery to treat clubfoot in neonates, non-operative treatment became less popular.

**OBJECTIVE:** The study sought to examine how the Ponseti technique works, how bad the deformity is (as measured by the Pirani score), and how much it costs to treat congenital talipes equino Varus in babies under the age of two. The Ponseti Clinic treated 490 individuals with 456 CTEV-infected foot cases.

**MATERIAL AND METHODS:** A study involving participants from Pakistan's saidu teaching hospital swat was done. The youngsters were 3.20 months old on average, and they needed 6.80 casts to improve. At the final follow-up, 90.20 percent of patients (score > 24) had positive functional outcomes. The Ponseti method for CTEV treatment may be helpful in terms of both function and aesthetics. This method is a safe, straightforward, and economical technique to treat clubfoot in an impoverished country like Pakistan.

**Keywords:** clubfoot; Ponseti; Pirani score; congenital talipes equinovarus, Saidu teaching hospital swat

## INTRODUCTION

A difficult congenital foot abnormality is congenital talipes equinovarus (CTEV). Calluses, Untreated clubfoot causes foot and bones infections, <sup>1</sup>the helplessness to clothing regular shoes., and important limits in flexibility and career chances One in every 1200 live newborns is born with congenital clubfoot. It has a man to woman percentage and a bilaterally frequency of 48-3 percent <sup>2-3</sup> Every year, 28,000 Pakistani newborns are born with clubfoot, according to studies conducted by the Global Clubfoot Initiative. <sup>4</sup> 75% of clubfoot newborns are born in low- and middle-income countries (LMICs) <sup>5</sup> Many of these go undetected or undertreated, resulting in a life of disability. Untreated clubfoot has terrible consequences for the patient, their family, and society. <sup>6</sup> Untreated or improperly handled cases result in neglected clubfoot. These children go through a lot. Failures and challenges are common in surgery. As a result, the number of revision procedures is growing. Following surgery, the foot is still

stiff, weak, and painful. The discomfort gets unbearable after adolescence.<sup>7</sup> Almost everyone agrees that non-operative treatment for clubfoot is the best option. (Dr. Ignacio) Ponseti created a clubfoot correction treatment based on manipulation and casting that effectively realigns clubfoot in infants without requiring significant surgery.<sup>8</sup> The Ponseti procedure has a worldwide success rate of 90–95 percent, with surgery rates dropping by

7% each year after reaching a high in 2020.<sup>9</sup> Several clubfoot scoring systems have been described throughout the years. The Ponseti-Laaveg and Dimeglio categories are two examples. These are difficult to use and are disliked. The Pirani Score<sup>10</sup> was developed by Shafique Pirani MD to analyze each clubfoot component correctly. In wealthier countries, the program is often used. The Ponseti technique is becoming more popular in low- and middle-income nations<sup>11-12</sup>.

The Ponseti technique was utilized to evaluate the functional outcomes of CTEV treatment, the degree of the deformity using the Pirani score, and the 12-13-14-15 Ponseti method in a developing country, such as Saidu teaching hospital swat

## MATERIALS AND METHODS

A prospective clinical study was carried out in Swat's Saidu Teaching Hospital between 2017 and 2021. 456 patients were selected using inclusion and exclusion criteria. The parents of 23 patients withdrew after learning about the whole research method, citing discomfort to the patients and study length as reasons. Those who were uneducated or uninformed could not comprehend the procedure's significance and use for their children. All 23 patients were offered surgery, with four accepting and nine declining. Despite our best efforts, Ponseti remains a mystery. Despite numerous inquiries, these 23 patients refused to participate in the research. Our study included the remaining 433 people. During the follow-up period, we lost 10 patients due to patient relocation, Ponseti cast pain, and parent transportation costs. As a result, the final study included 456 patients with 490 CTEV.

## ETHICAL BEHAVIOR CONSIDERATIONS

It was accepted by the ethics committee (saidu teaching hospital swat) on March 12, 2022.

A permission form was sent to each participant's parents before the trial.

The Ponseti technique was applied to all research participants. It was vital to educate parents about the Ponseti method's course.

## CRITERIA FOR INCLUSION AND EXCLUSION

Children aged 24 months with normal hips and spines who have clubfoot consented to be studied. Patients over 24 months old with neurological abnormalities, spine and hip issues, or prior treatment were eliminated.<sup>16</sup> The Ponseti classification considers untreated clubfoot in children under two. A comprehensive literature search discovered several published studies on babies under two, but few on toddlers under one year 17-18. So we started to investigate 24-month-olds. The stage categories were as follows:

## ASSESSMENT OF THE FINAL RESULT

The deformity severity and functional result were scored using the Pirani rating method before and after therapy. It determines the correction level. It scores three mid-foot signals and three hind-foot indications. The mid-foot (M.S.) and hind-foot (H.S.) scores are three indications that rate deformities from 0 to 3. A Pirani score of 0 denotes a normal foot, a 3 a mildly aberrant foot, and a 6 a severely abnormal foot.

Excellent, good, or terrible outcomes were graded 0–4, good, 4–1, and poor (>1). Excellent and good outcomes indicated success. Poor outcomes were labeled failures and given surgical therapy. On emphasized the necessity of braces and their compliance with the parents and the Ponseti method's objective. Figures 1–7 show the therapy. (a) weekly serial casting; (b) bracing to maintain the correction. Casting began as soon as the kids arrived. All the babies The initial severity was determined using Pirani scoring. Initially, weekly follow-ups were performed to check compliance and comfort and educate the parents.

A three-month, four-year follow-up was advised after the Dennis Brown (D.B.) splint was applied.

Figure 1 shows the first demonstration.



Figure 2 Operation



Figure 3: The first cast. Correction



Figures 4-5 (a-d) Following operation and forming steps, and

Figure 4(A)



Figure 5(B)



Figure 6: Next amputation of the quarter cast.

Figure 6



Figure 7. (a) Fifth cast for equines; (b) after amputation of fifth cast and, Dennis Brown(DB) splint, and shoes.



## STATISTICAL EVALUATION

The data were analyzed using SPSS 2.4. The minority population and other data were mathematically calculated. and %. The Wilcoxon test was used to compare the Pirani score and functional rating before and after therapy, and the chi-square test was used to compare sex and laterality.

A correlation and correlation test assessed the association between the Pirani score and the total number of casts. 0.05 was chosen as the threshold of statistical significance. 1. Results from Our research included 280 men and 176 girls. The median age was 4.03 months, ranging from 0.5 to 24 months. 273 cases (60%) were under 4 months old; 101 cases (21%) were between 8 and 12 months; 64 cases (21%) were between 12 and 24 months (14 percent ). The

research included children aged 12 months to 24 months (**Table 1**)

Age of patients and months	Number of patients	Percentage (%)
<4,	280	61%
>8-12	101	21.33%
>12-24	64	14%
<b>Total</b>	456	100%

### LATERALITY

152 (51.2%) had bilateral clubfoot, 208 (52.41%) had unilateral clubfoot, 100 (51% right) and 56 (54% left).

### CONSANGUINITY AND INTERNAL HISTORY

A total of 153 cases (43.33%) were discovered to be the result of a consanguineous marriage, and 23 individuals had a history of clubfoot (56.33 percent).

Pirani is rated 3.4 out of 5 stars. Pirani scores ranged from 3.5 to 6 at the time of case presentation in our study, with a mean of 5.19 (range 3.5 to 6). (range 0 to 3.5). [2]

**Table no 02: Pirani score distribution before and after treatment**

	Mean	SD	Mean	SD		
	5.04	0.85	0.06	0.21	5.61	<0.0001
	5.27	0.65	0.36	0.39	2.99	<0.0005
	5.29	0.68	1.50	1.41	2.21	<0.05
					2.28	<0.05

Both initial and final Pirani scores in the 4-month age group had a mean + standard deviation (S.D.) of 5.04 + 0.85 and 0.06 + 0.21.

This age group had a mean + SD of 5.27+0.65 and a mean + SD of 0.36+0.39, respectively, for initial and final Pirani scores.

Both initial and final Pirani score mean + S.D. were 5.75 + 0.61 in >12-24 months and 1.50 + 1.41.

### COUNT OF PERFORMANCES

average number of casts needed was 6.91, with 5 to 10. 3 Table Sixty-six plus one casting were needed in the 4-month age group. The mean + S.D. total number of castings needed was 7 + 1.

The mean + S.D. total number of castings needed was 8.33 + 1.86.

**Table no. 03 displays the casts' age distribution.**

Age months	Mean	SD
<4,	6.52	0.72
>8-12	6	1
>12-24	8.11	1.80

**COMPLICATIONS**

During the casting process, a few minor

complications occurred in our series. Tissue cuts, the cast saw injuries, cast come loose, and cast fracture are all possible complications (Figures 8 and 9)

Figure 08. Membrane abrasions.



Figure 09. Cast saw injury



**OVERALL VIEW**

Founded arranged the Pirani score, the ultimate functional results were evaluated as excellent, good, or poor and comprised 280, 101, and 64 individuals, respectively (Table 4)

Table 4 displays the final findings of the study's distribution.

Months of age	Functional outcome			
	Excellent	Good	Poor	
<4,	280 96%	1.2%	0.8%	
>8-12	101 61%	22%	12%	
>12-24	64 22%	4.5%	52%	
Total	456	100%		

**TREATMENT COST ASSESSMENT**

We incurred total costs of 52 USD for each patient,

which was substantially less than the Turcos treatment expenses of 96 USD, making each patient quite reasonable (Table 5).

Table 5. Cost distribution

Ponseti Method (Variables)	USD	Turcos Method (Variables)	USD
Cast and other consummables	25	Pre-operative antibiotics	06
Tenotomy charges	11	Pre-operative investigations	12
Dennis Brown (DB) Splint	19	Removal of stitches and k wires	14
Other hospital charges	16	Post-operative antibiotics	12
		Hospital stay (3 days)	26
		DB splint and ankle foot orthosis	26
<b>Total</b>	<b>71</b>		<b>96</b>

## DISCUSSION

CTEV is a common congenital deformity.<sup>13-14</sup> It has varus, adductus, and cavus. Both the doctor and the parents must work hard to fix the malformation.<sup>14,15,16,17</sup> The aim of treatment is to get a plantigrade foot that works, doesn't hurt, has enough range of motion, has no scar tissue, and doesn't need special shoes. Pakistan is the 2<sup>nd</sup> most populated nation in the world. About 240 million of its persons live in poverty. Every year over 18,000 kids are born with psychogenic clubfoot at the Saidu Teaching Hospital in Swat, Pakistan.<sup>18,19</sup> With so many poor people, the Ponseti method of non-invasive clubfoot therapy could have a big effect on children's health. The goal of our study is to figure out how cost-effective the Ponseti method is by using the Pirani score.<sup>20,21</sup>

## VARIABLES IN DEMOGRAPHY AND ETIOLOGY

M. Changulani et colleagues. Used the Ponseti technique to treat 64 individuals with 98 idiopathic clubfeet and discovered that the mean age at presentation was 12.3 weeks or 3.0 months (1-60 weeks). A total of 23,180 men were examined. M. Changulani et al. identified 48 men (71%) and 16 females (32%), respectively, in their research (21.2 percent). In this case, M. Changulani and others. At 12 weeks or three months of age, 23 of 64 people with 98 idiopathic clubfeet were diagnosed using Ponseti method.<sup>22</sup> M. Changulani et al. found that 71% of the patients were men and 21% were women in their research.<sup>23</sup> But 190 (52%) of the participants had unilateral clubfoot (126 right-sided and 98 left-sided), which is consistent with prior study by Ponseti et al., Changulani et al., Lehman et al., Christian et al., and others (Table 6)

**Table 6: Laterality comparison with other studies.**

Studies	Unilateral (%)	Bilateral (%)
Ponseti et al. [7]	40 (60%)	27 (40%)
Lehman et al. [25]	15 (50%)	15 (50%)
Changulani et al. [24]	32 (48%)	34 (52%)
Christian et al. [26]	70 (60%)	46 (40%)
Pavone et al. [27]	50 (61%)	32 (39%)
Our study	190 (53.33%)	166 (46.67%)

Cast Count and Tenotomy In our study, 309 feet (77%) required tenotomy, whereas 47 feet (23%) just required casting, which is comparable to studies by Changulani et al., Lehman et al., Christian S. et al., Pavone et al. (Table 7)

**Table 7 Tenotomy is compared to previous research.**

Studies	Percentage of Feet Requiring Tenotomy
Changulani et al. [24]	85% of feet
Pavone et al. [27]	72% of feet
Lehman et al. [25]	75% feet
Christian S. et al. [26]	79% of feet
Our Study	77% of feet

## END-TO-END FUNCTIONALITY

Scores by Pirani were employed to measure the functional result.

Excellent, good, or poor results were graded. 456 out of 456 patients had excellent outcomes.

## CONCLUSIONS

The Pirani score may properly grade clubfoot or CTEV. This grading method takes into account all aspects of assessing a clubfoot deformity and helps decide between conservative and surgical treatment options. The Pirani scoring system also helps track and assess therapy progress. In addition to serial casting, bracing maintenance, and parental education, the Ponseti approach for controlling CTEV gives excellent functional and aesthetic results when treated strictly according to Ponseti's standards. With the Ponseti technique, clubfoot repair may be achieved without major corrective surgery while simultaneously lowering parents' social and financial strain in impoverished nations like swat people . They are often unable to afford corrective surgery.

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## RESULTS

In 280 instances (77.2%), whereas good and bad outcomes were equally distributed with 101 (11.2%) and 64 (11.1%), similar to Sakale H et al. 92.

456 out of 280 patients in the 4-month age group had excellent outcomes, while others had bad results. These two patients did not brace. 38 out of 58 patients in the >8–12 month age group failed. This reaffirmed the idea that therapy should begin as soon as feasible to maximize outcomes.

Turco's operation was offered to 38 patients; 16 parents declined, citing the procedure's high cost.



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