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Management of Congenital Talipes Equino Varus by Ponseti Technique: Our Experience

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Abstract

Introduction: *Clubfoot is a crippling ailment that can cause children to walk abnormally. The Ponseti treatment technique is utilized to treat children with congenital clubfoot. This study aims to determine the percentage of clubfoot children who benefit from the Ponseti approach and assess its efficacy.* ***Objective:*** *This research aims to assess the effectiveness of the Ponseti approach in the treatment of congenital Talipes Equino Varus (CTEV) in the neonatal age range.* ***Materials and Methods:*** *Between July 2022 and December 2022, a prospective observational study was conducted at the 250-bed municipal hospital in Gopalganj and the Sheikh Sayera Khatun Medical College hospital in Gopalganj. Every baby with CTEV was treated with Ponseti casting.* ***Results:*** *A total of 100 newborns and 155 CTEV feet were treated. There were thirty-four females and sixty-six males. There were sixty feet (38.71%) of non-rigid variety and ninety-five (61.29%) of stiff variation. 45 patients had unilateral involvement and 55 had bilateral involvement. The study group's mean pre-treatment Pirani score was 5.57. 150 feet (96.77%) of the 155 total feet were successfully managed.* ***Conclusion:*** *the Ponseti approach is a great, easy-to-use, minimally invasive method of treating CTEV deformity. Ideally, it can be performed as a day-case procedure without general anesthesia even in the neonatal period.*

Keywords: *Neonate, Talipes equino-varus, Ponseti technique.*

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Introduction:

Approximately 1 in 1000 live babies are affected by clubfoot[1]. It is the primary cause of physical disability resulting from lower limb congenital malformations. The hallmark of this condition is a three-dimensional orthopedic foot malformation. It may be idiopathic, but it may also be a component of a complicated malformation syndrome or a neuromuscular illness. Orthopedic, surgical, or physiotherapy approaches can be used to treat clubfoot. The primary objective is to provide plantigrade feet that are painless and functional. Adults with stiff and painful feet have been shown to result from early, intensive, and repetitive surgical therapy[2]. For the treatment of clubfoot, Ignacio Ponseti established an orthopedic procedure in 1963[3]. The technique involves sequential manipulation and casting to address each of the four clubfoot abnormalities (cavus/supinatus, adductus, varus, and equinus), culminating in an Achilles tenotomy and bracing to keep the repair in place. Before this time, treating this condition was challenging for physiatrists, physiotherapists, nurses, orthopedists, and pediatric orthopedists. There have also been numerous tragic treatment failures with a higher recurrence rate documented. Nonetheless, the approach Ponseti outlined is a cutting-edge technique that is currently in widespread usage worldwide. An analysis of data from the Centers for Disease Control and Prevention and the Nationwide Inpatient Sample in the USA, conducted 47 years after Ponseti's first article on his method[3], showed that the number of surgical releases performed in patients under the age of 12 months decreased from 1641 releases in 1996 to 230 releases in 2006 and that the percentage of club feet treated with surgical release also decreased from 72% in 1996 to 12% in 2006[4]. However, the Ponseti approach has gained popularity not just in the USA but also in Europe and other regions of the world due to early reports on excellent first outcomes from numerous centers[5]. According to a 2011 study, the Ponseti technique, which has an initial correction rate of almost 90% in the majority of studies, is the most effective treatment regimen for congenital clubfoot[6]. The purpose of this study is to ascertain the prevalence of clubfoot in Madagascar and assess how well the Ponseti protocol manages the condition.

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Materials and Methods:

This prospective observational study was carried out at 250 Bedded General Hospital, Gopalganj, and Sheikh Sayera Khatun Medical College Hospital, Gopalganj from July 2022 to December 2022. We review the medical records of 100 consecutive children (155 clubfoot) <6 months of age. Who underwent Ponseti treatment based on selection criteria and the mean follow-up period was 10.53 months (range 6-12 months). Age at presentation, prior treatment, the Pirani grading system's initial severity, the number of casts used before tenotomy, the necessity of an Achilles tenotomy, brace compliance, and complications were all examined. The results, correction of the deformity, and severity of the deformity upon presentation were all assessed using the Pirani rating system. Every piece of information is gathered via a pre-made questionnaire. The inclusion and exclusion criteria were followed in the study's patient selection process. **Inclusion criteria** were age less than 6 months, both sexes, and unilateral and bilateral idiopathic clubfoot. **Exclusion criteria** were patients over the age of 6 months, patients with other congenital anomalies like Spina bifida, neurological disorders, arthrogryposis, etc., and atypical or secondary clubfoot. The study variables were a. Demographic variables (i. Age, ii. Sex), b. Clinical variables (i. Side of involvement of foot, ii. Pirani score), c. Treatment variables (i. History of previous treatment, ii. Number of plaster casts, iii. Tenotomy, iv. Complications like skin pressure sore, infection). Outcome categorization according to the Pirani scoring system was no correction: Pirani score =6, unsatisfactory correction: Pirani score=3, and satisfactory correction: Pirani score. All this information was collected through a specially designed proforma.

Results:

This prospective observational study was conducted at 250 Bedded General Hospital, Gopalganj, and Sheikh Sayera Khatun Medical College Hospital, Gopalganj from July 2022 to December 2022. One hundred and fifty patients (155 clubfeet) less than 6 months of age were selected consecutively based on selection criteria and the mean follow-up period was 10.53 months (range 6-12 months). The diagnosis was confirmed by history and clinical examination. Treatment was done by the Ponseti method. Factors that were evaluated in this study were age at the initiation of the treatment, history of previous treatment, bilaterality, total number of Ponseti casts applied before tenotomy, requirement of tenotomy, compliance with brace, and complications. The severity of deformity at presentation, correction of the deformity and outcomes were determined by Pirani scoring.

Table I: Distribution of patients according to age (n=100)

Age (days)	Frequency (n)	Percentage (%)
<60	60	60.0
>60	40	40.0
Total	100	100.0

Table 1 shows the distribution of patients according to age. 60 (60.0%) patients age was <60 days and 40 (40.0%) patients age was >60 days.

Table II: Distribution of patients according to involvement of foot (n=100)

Involvement of foot	Frequency (n)	Percentage (%)
Right	20	20.0
Left	25	25.0
Bilateral	55	55.0
Total	100	100.0

Table II shows the distribution of patients according to the involvement of the foot. Out of 100 patients, 55(55.0%) patients had bilateral involvement followed by 20(20.0%) and 25(25.0%) patients had right and left foot involvement respectively.

Table III: Distribution of foot according to the number of casts applied before tenotomy for correction of the deformity (n=155)

Number of casts	Frequency (n)	Percentage (%)
4	35	22.58
5	75	48.39
6	30	19.35
7	10	6.5
8	5	3.23

Table III shows the distribution of the foot according to number of cast applied before tenotomy for correction of the deformity. 75 (48.39%) feet required 5 number of cast followed by 35(22.58%), 30(19.35%), 10(6.5%) and 5(3.23%) feet required 4, 6, 7 and 8 number of cast respectively.

Table IV: Distribution of foot according to requirement of tenotomy (n=155)

Tenotomy needed	Frequency (n)	Percentage (%)
Yes	147	94.84
No	4	2.58
N/A	4	2.58
Total	155	100.0

Table IV shows distribution of foot according to requirement of tenotomy. 147(94.84%) feet needed tenotomy, 4(2.58%) feet did not need tenotomy and 4(2.58%) feet were not applicable (N/A) for tenotomy due to unsatisfactory correction.

Table V: Distribution of foot according to application of Steenbeek Foot Abduction Brace properly (n=155)

Application of SFAB properly	Frequency (n)	Percentage (%)
Yes	151	97.42
No	4	2.58
Total	155	100.0

Table V shows distribution of foot according to application of SFAB properly. SFAB was applied properly in 151(97.42%) feet. Of the 4(2.58%) feet that did not comply with the bracing protocol.

Table-VI: Distribution of foot according to Pirani score before and at different stages of treatment

Wilcoxon Signed Ranks test was done to measure the level of significance.

	Mean±SD	Min-Max	p-value
Before treatment	5.35±0.76	4 – 6	
Before tenotomy	1.74±0.77	1 – 4	<0.001
After tenotomy	0.83±0.60	0 – 3	<0.001
Before application of SFAB	0.50±0.69	0 – 3	<0.001
After 2 weeks of SFAB	0.34±0.69	0 – 3	<0.001
At final follow up	0.33±0.89	0 – 4	<0.001

Table VI shows Pirani score before and at different stages of treatment. Pirani score significantly reduced before tenotomy, after tenotomy, before application of SFAB, after 2 weeks of SFAB, and at final follow up comparing with before treatment.

Table VII: Distribution of foot according to outcome (n=155)

Outcome	Frequency (n)	Percentage (%)
Unsatisfactory correction	5	3.23
Satisfactory correction	150	96.77
Total	155	100.0

Table-VII shows distribution of foot according to complications. Two patients (3.23% of the total) experienced skin problems, such as allergies, itching, and skin rashes. All it took to heal this was to keep the casting off. In total, the two feet's skin healed in seven days. The child's parents were instructed to manually stretch their child's foot for seven days, but no cast or corrective manipulation was placed until the child's skin condition returned to normal. Following that, the casting was resumed where it had been stopped.

Discussion:

The most prevalent congenital foot abnormality in the pediatric age range is called CTEV. In spite of this, its management is still unclear[7]. Clubfoot, also known as congenital talipes equine varus, is a complex foot deformity that must be corrected with much care and attention by the treating physician as well as the patient's parents. Getting a plantigrade foot with high mobility and no discomfort is the major goal of treatment for congenital clubfoot[8]. Most people feel that non-surgical treatment is the best course of action for congenital clubfoot[9]. The Ponseti regimen is being used by the current management to transition from an operative to a more conservative course of care[10]. The pathoanatomy of clubfoot gives a solid foundation for the Ponseti approach[7]. As soon as possible, ideally in the first week of life, treatment should begin. If the right gentle manipulations and plaster casts are used, most clubfoot cases can be rectified in 4-6 weeks, culminating in an Achilles tenotomy. But mastery of the technique needs much training, experience, and repetition[11]. The Ponseti method of serial manipulation and casting is widely used in CTEV treatment facilities. Numerous writers have written on their experiences[12]. From July 2022 to December 2022, a prospective observational study was conducted in the orthopedic surgery departments of the 250-bed general hospital in Gopalganj and the Sheikh Sayera Khatun Medical College hospital in Gopalganj. The study included 100 patients (155 clubfeet) of both sexes who had been diagnosed with congenital idiopathic clubfoot and were older than 6 months. The clinical examination and history confirmed the diagnosis. Treatment was administered using the Ponseti technique, and SFAB was used to maintain the correction. Using the Pirani scoring method, the severity, degree of deformity repair, and ultimate result were evaluated. In a different study, Singh et al. (2011)[14] discovered that the patients' ages ranged from 3 to 48 weeks, with the majority of them showing up within three months of giving birth. There was no prior treatment for either the patient or the foot. Out of the 146 feet in their study, 48 feet had received partial treatment somewhere else, and the remaining 98 feet were given to Mootha et al. (2011)[11] first. Singh et al. (2011)[14] discovered in another study that eight patients had previously undergone two to three manipulations and plastering at another facility. Likewise, Abbas et al. (2008)[7] discovered that the involvement of the foot was 56% bilateral, 29% right, and 15% left sided. Porecha et al. (2011)[12] discovered in another study that 36.73% of participants had bilateral involvement, 54.84% had involvement in the right foot, and 45.16% had participation in the left foot. Four to eight casts were required. Similar to this study, Mootha et al. (2011)[11] discovered in their investigation that the necessary number of casts was 4–13. In their investigation, Porecha et al. (2011)[12] discovered that the average number of casts was 6–8. In a different study, Singh et al. (2011)[14] discovered that the range of casts applied was 5-9.

94.84% of the feet needed a tenotomy. Similar to this study, Singh et al., (2011)[14] reported that 81.31% of feet received percutaneous tenotomy. Ninety percent of the patients in the Mootha et al., (2011)[11] study needed a tendon Achilles tenotomy. Since there were no objective ways to monitor compliance with the Steenbeek Foot Abduction Brace

(SFAB), verbal reports from parents regarding their use of the brace served as the main way to gauge compliance. In this study, SFAB was applied correctly in 97.42% of the feet, while 2.58% of the feet were non-compliant. Despite having informed the parents of the significance of routine long-term splinting, noncompliance nevertheless happened. Poor brace compliance was a big problem, particularly for kids from lower socioeconomic backgrounds and for parents who had low educational attainment. According to Mootha et al. (2011)[11], a significant proportion of their patients—21.8%—had poor brace compliance. A further study by Porecha et al. (2011)[12] found that 28.57% of the relapsed cases had impaired splint compliance. The follow-up period lasted between six and twelve months. Time constraints resulted in a shorter follow-up period than other research in the literature. The follow-up period for Singh et al. (2011)[14] was 6–24 months. The patients in a different study by Mootha et al., (2011)[11] were followed for two to seven years. The average follow-up duration in another study by Porecha et al., (2011)[12], was five years. The mean Pirani score at presentation was 5.35 ± 0.76 and at final follow-up was 0.33 ± 0.89. The reduction in the Pirani score before treatment and at final follow-up was statistically significant ($p<0.001$). Mootha et al., (2011)[11] found the mean initial Pirani score for the responsive patients to be 4.5 and at follow-up for those patients to be 0.5. In another study by Abbas et al., (2008)[7], the mean precorrection Pirani score was 4.26 and the postcorrection mean score was 1.3, the difference between the two was statistically significant. Few complications were encountered. 5 patients developed skin complications like skin rash, allergy and itching. All it took to heal this was to keep the casting off. Two individuals out of the 49 in the Porecha et al., (2011)[12] study had a plaster sore on the lateral aspect of the skin covering the talar head. That merely required local dressing to heal. The sore took seven days to heal on average. The corrective cast and manipulation were not applied until the wound had healed.

5 (3.23%) of the 150 feet had an inadequate correction, whereas 96.77% of the feet had a successful correction and reacted to the Ponseti treatment. Comparable outcomes were observed in the research carried out by Mootha et al. (2011)[11], wherein of the 146 feet, 87.7% showed response to the first treatment, while 12.3% of the feet required posteromedial medial soft tissue release, 8 of the feet were atypical at presentation, and 5 of the feet were resistant to the first treatment. After first success, 15.6% of foot relapsed. The most frequent reason for the deformity to recur in all of the relapsing feet in their study was poor compliance with the Dennis Browne splint. Using the functional Ponseti Scoring System, Porecha et al. (2011)[12] obtained good to excellent results in 86.56% of feet at mean follow-up after five years. They completed the first adjustment in all 100 feet by using the Ponseti method. 28.35% of the feet experienced relapse at different ages; of these, 52.63% were repaired using the Ponseti casting procedure, and 47.37% were not amenable to it. It was believed that the primary reason for those patients' failure with the Denis Browne splint was poor compliance. With a mean follow-up period of 15 months, 90.65% of feet responded to initial casting in a different study conducted by Sing et al. (2011)[13]. After 10 feet did not improve with the first course of treatment, considerable softtissue release was necessary. After an initial period of effectiveness, 32.71% experienced recurrences; 19 of these cases were effectively managed with repeat casting, tenotomy, and/or casting. The remaining 16 required extensive soft tissue release and external fixator application. The primary reason for the patients' failure with the foot-abduction orthoses (Denis Browne splint) was believed to be poor compliance. With anecdotal or detailed follow-up spanning more than 30 years, Ponseti reported a success rate of over 90% with the casting technique he invented.

Conclusion:

It is concluded that the Ponseti casting technique is an effective means of treating CTEV deformity, with good outcomes and negligible morbidity. Even in the neonatal stage, this approach is easy to use, affordable, low-invasive, and uncomplicated. It is best carried out in an outpatient facility without the need for general anesthesia.

Conflict of Interest: None.

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References:

1. Ansar A, Rahman AE, Romero L, Haider MR, Rahman MM, Moinuddin M, et al. Systematic review and meta-analysis of global birth prevalence of clubfoot: a study protocol. BMJ open. 2018 Mar 1;8(3): 019246.

https://doi.org/10.1136/bmjopen-2017-019246

PMid:29511012 PMCid:PMC5855200

2. Fassier A. Clubfoot and Other Congenital Foot Deformities. Journal of Paediatrics and Childcare, 2016; 29: 310-23.

3. Ponseti IV, Smoley EN. The classic: congenital club foot: the results of treatment. Clinical Orthopaedics and Related Research®. 2009 May 1;467(5):1133-45.

https://doi.org/10.1007/s11999-009-0720-2

PMid:19219519 PMCid:PMC2664436

4. Zionts LE, Zhao G, Hitchcock K, Maewal J, Ebramzadeh E. Has the rate of extensive surgery to treat idiopathic clubfoot declined in the United States? JBJS. 2010 Apr 1;92(4):882-9.

https://doi.org/10.2106/JBJS.I.00819

PMid:20360511

5. Radler C. The Ponseti method for the treatment of congenital club foot: review of the current literature and treatment recommendations. International orthopedics. 2013 Sep;37:1747-53. https://doi.org/10.1007/s00264-013-2031-1

PMid:23928728 PMCid:PMC3764299

6. Jowett CR, Morcuende JA, Ramachandran M. Management of congenital talipes equinovarus using the Ponseti method: a systematic review. The Journal of Bone & Joint Surgery British Volume. 2011 Sep 1;93(9):1160-4.

https://doi.org/10.1302/0301-620X.93B9.26947

PMid:21911524

7. Abbas M, Qureshi OA, Jeelani LZ, Azam Q, Khan AQ, Sabir AB. Management of congenital talipes equinovarus by Ponseti technique: a clinical study. The journal of foot and ankle surgery. 2008 Nov 1;47(6):541-5.

https://doi.org/10.1053/j.jfas.2008.07.002

PMid:19239864

8. Gupta A, Singh S, Patel P, Patel J, Varshney MK. Evaluation of the utility of the Ponseti method of correction of clubfoot deformity in a developing nation. International orthopedics. 2008 Feb;32:75-9. https://doi.org/10.1007/s00264-006-0284-7

PMid:17115153 PMCid:PMC2219936

9. Lehman WB, Mohaideen A, Madan S, Scher DM, Van Bosse HJ, Iannacone M, et al. A method for the early evaluation of the Ponseti (Iowa) technique for the treatment of idiopathic clubfoot. Journal of Pediatric Orthopaedics B. 2003 Mar 1;12(2):133-40.

https://doi.org/10.1097/01202412-200303000-00011

10. Matuszewski Ł, Gil L, Karski J. Early results of treatment for congenital clubfoot using the Ponseti method. European Journal of Orthopaedic Surgery & Traumatology. 2012 Jul;22:403-6. https://doi.org/10.1007/s00590-011-0860-4

PMid:22754429 PMCid:PMC3376778

11. Mootha AK, Saini R, Krishnan V, Kumar V, Dhillon MS, Bali K. Management of idiopathic clubfoot by the Ponseti technique: our experience at a tertiary referral center. Journal of Orthopaedic Science. 2011 Mar 1;16(2):184-9.

https://doi.org/10.1007/s00776-011-0027-5

PMid:21298304

12. Porecha MM, Parmar DS, Chavda HR. Mid-term results of Ponseti method for the treatment of congenital idiopathic clubfoot-(a study of 67 clubfeet with mean five year follow-up). Journal of orthopaedic surgery and research. 2011 Dec;6:1-7.

https://doi.org/10.1186/1749-799X-6-3

PMid:21226940 PMCid:PMC3031260

13. Singh NJ, Keshkar S, De P, Kumar R. Management of clubfoot by Ponseti technique: our experience. IJPMR. 2011;22:12-6.