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Original Research Article

Assessment of functional outcome after ponseti method for congenital idiopathic clubfoot

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ABSTRACT

Background: Congenital Talipes Equino Varus is a developmental deformation needing appropriate intervention for its correction, and the Ponseti technique is a conservative method used for its correction. This study aims to study the outcome of Ponseti correction using the Ponseti scoring system.

Materials and Methods: Children entirely treated by the Ponseti method for idiopathic Clubfoot in a tertiary care hospital were studied from October 2016 to October 2018. Fifty-three children were recruited for the study. Ethical principles adhered to. Structured study proforma was administered after obtaining informed consent from the parent/guardian. Ponseti's scoring system was applied to study various outcomes. IBM SPSS version 22 was used for statistical analysis.

Results: Of 53 participants, 39 were male, and 14 were females. The mean total score in the study population was 82.36, with 30-98. Based on age at evaluation, the proportion of people with excellent outcomes was higher in the long-term group (30.76%), followed by the mid-term group (26.66%), and least in the short-term group (24%). Among the study participants, 24 (45.30%) had a Good (80-89) total score, 14 (26.4%) had an Excellent (90-100) total score, 9 (17%) had a Fair total score, and remaining 6 (11.3%) were had poor (<70) total score.

Conclusions: Conservative methods like the Ponseti technique can be utilized in our country as a treatment option for Clubfoot, with follow-up assessments using the Ponseti scoring system.

1. Introduction

Congenital Talipes Equino Varus (CTEV), also known as Clubfoot, is a common developmental disorder of the lower limb. It is defined as fixation of the foot in adduction, supination, and varus, i.e., inclined inwards, axially rotated outwards, and pointing downwards. Clubfoot is the most common congenital deformity of the lower limbs.[1] The incidence of CTEV is 1-2 per thousand live births.[2] Half of the patients have a bilateral deformity, and in a few cases, unilateral involvement mainly affects the right side. Idiopathic congenital talipesequinovarus (ICTEV) is associated with joint laxity, congenital dislocation of the hip, tibial torsion, ray anomalies of the foot (oligodactyly), absences of some tarsal bones, and a history of other foot anomalies in the family.[2] The structural deformities of Clubfoot might be caused by the subluxation of the talocalcaneonavicular joint, dislocation of the talus bone, abnormalities of peroneus and calf muscles, and contractures of soft tissues on the medial side of the foot.[3–5] Untreated Clubfoot in children, also known as neglected Clubfoot, will suffer day-to-day activities such as difficulties in gait pattern, mobility, daily living skills, and social activities. In addition, neglected clubfoot children walk on the dorsal side of the foot leading to complications such as callus formation, injuries, and infections on the

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dorsum of the foot.[6]

However, surgical methods have limitations due to post-surgical complications such as soft tissue contractures, neurovascular complications, infections, and shortening of the limbs. Almost all of the orthopedic Ans recently agreed that conservative treatment would be the best choice to correct the Clubfoot. All conservative treatment methods aim to obtain the plantigrade, pain-free, functional foot without mobility problems.[7] Initially, the clinical assessment and grading were purely subjective and based on the severity of the deformity and flexibility of the foot.[8] Mac Ewen assessed the clubfeet by the degree of dorsiflexion possible, heel varus, forefoot adduction, and calf atrophy and graded the result as excellent, good, fair, and poor.[9]

The treatment aims to obtain a plantigrade, painless, and functional foot. Every conceivable form of treatment has been recommended by various authors and tried by many at different times with varying success rates.[10] The Clubfoot continues to challenge the skills of the pediatric orthopedic surgeon as it has a notorious tendency to relapse, irrespective of whether the foot is treated by conservative or operative means. The Ponseti method of correcting Clubfoot is critical in developing countries, where operative facilities are unavailable in remote areas, and well-trained physicians and personnel can manage the cases effectively with cast treatment only.[11] The Laaveg-Ponseti score is a 100-point evaluation system with scores between 90 and 100 considered excellent, 80 and 89 as good, 70 and 79 as moderate, and below 70 as poor. In contrast to other systems, it can be used to study the correlation between the functional outcome and radiographic measurements since it relies only on clinical aspects, not including radiographic parameters. Here, more emphasis has been given to patient factors such as pain, satisfaction, and function (70 points), and these factors haven't been described in any other scoring system.[12] The present study was done to assess the Ponseti method for treating congenital idiopathic Clubfoot using the ponseti scoring system in a tertiary hospital setting.

2. Materials and Methods

The study was conducted in the department of orthopedics at a medical college hospital in Chennai. The study was done from October 2016 to October 2018. The current study was a retrospective and prospective study. Patients who had Congenital Talipes Equinus Varus (CTEV)deformity and corrected by the Ponseti method at the outpatient department were recruited. The universal sampling technique was followed, and all patients satisfying inclusion and exclusion criteria were included in the study. A total of 53 children were included. Written informed consents were obtained from the parents or guardians of the study participants. The details of the study were explained, and ethical principles adhered to. The risks and benefits involved in the study and the voluntary nature of participation were explained to the participants before obtaining consent. The confidentiality of the study participants was maintained. Children treated entirely by the Ponseti method for idiopathic Clubfoot were included in the study. Children with Postural Clubfoot, Clubfoot associated with neuromuscular diseases, chromosomal aberrations, and those with CTEV treated by other methods - JESS, Ilizarov, soft tissue releases were excluded from the study. The institutional human ethics committee approved the study. All the study participants were evaluated by history or clinical examination. All the relevant parameters were assessed with a goniometer documented in a structured study proforma. As assessed by the Ponseti scoring system, the functional outcome was considered the primary outcome variable. The subcomponents of the Ponseti scoring system were the secondary outcome variables of interest. The primary explanatory variables were the short-term, midterm, and long-term evaluations. Mode of delivery and ICU care admission was secondary explanatory variables. IBM SPSS version 22 was used for statistical analysis.[13]

3. Results

3.1. Total of 53 subjects were included in the final analysis

The short-term evaluation was done for 25(47.17%) of the population. The mid-term evaluation was done for 15(28.30%) population and long-term evaluation for 13(24.53%) of the study population. The majority of the study participants 39 (73.60%) were males, and 14 (26.40%) were females. There were almost equal 27 (50.90%), and 26 (49.10%) left and right legs included as the study participants. The majority of the study participants 35 (66%) had a normal vaginal delivery, 17(32.10%) underwent C section, and the history was not known in 1(1.90%) participant. The majority of the study population 27 (87.10%) were with the Cephalic presentation, 2(6.45%) was with Breech and Cord @ neck presentations in each, and the remaining 2(6.45%) patients' details were not known. The majority of the study participants 49(90.60%) were term delivered, and only 4 (7.5%) were preterm delivered. (Table 1)

The mean varus in the study population was 19.02° and with the range of 0-40 degrees. Mean valgus in the study population was 12.36° and with the range of 0-40. The mean inversion in the study population was 17.79° and with the range of 0-30. Mean eversion in the study population was 6.83° and with the range of 0-20. Mean Normal gait in the study population was 5.81 and with the range of 0-6.0. Mean can toe walk in the study population was 2 and with the range of -2 to 6. Mean can heel walk in the study population was 1.73 and with the range of -2 to 2. (Table 2)

There were 2 (3.80%) patients with 3, five initial Pirani score each, 4 (7.50%) patients with 4.5 initial Pirani score

and 6 (11.30%) patients with 6 scores whereas 1 (1.90%) with 3.5 and 5.5 Initial Pirani score in each. (Figure 1)

Among the study participants 24 (45.30%) were with Good (80-89) total score, 14 (26.4%) Excellent (90-100) total score, 9 (17%) were with the Fair total score and remaining 6 (11.3%) were with poor (<70) total score. (Figure 2)

The proportion of people with excellent outcome was higher in the long-term group (30.76%), followed by mid-term group (26.66%) and least in the short-term group (24%). The proportion of people with different outcome categories among the three groups is summarized in the above table. Even the minor differences are present in the outcome across the three groups they were statistically not significant (P-value 0.827). Among the study participants 24 (45.30%) had Good (80-89) total score, 14 (26.4%) had Excellent (90-100) total score, 9 (17%) had a Fair total score and remaining 6 (11.3%) were had poor (<70) total score. (Table 3)

Table 1: Baseline characteristics of study population

Parameter	Frequency	Percentages
Age at evaluation		
Short-term (< 3 years)	25	47.17%
Mid-term (3 to 5 years)	15	28.30%
Long term (>5 years)	13	24.53%
Gender		
Male	39	73.60%
Female	14	26.40%
Side of Leg		
Right	26	49.10%
Left	27	50.90%
Mode of Delivery		
LSCS	17	32.10%
NK	1	1.90%
NVD	35	66.00%
Presentation		
Cephalic	27	87.10%
Breech	2	6.45%
Not Known	2	6.45%
Term		
Preterm	4	7.5%
Term	49	92.5%

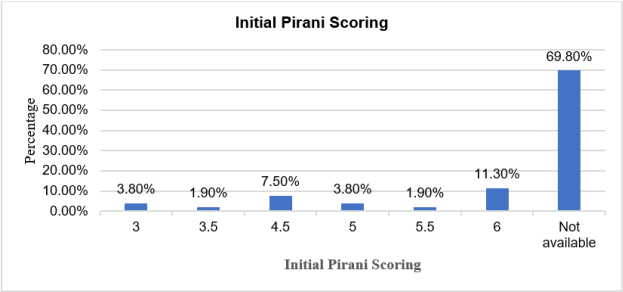

Figure 1: Initial pirani scoring in the study population (N=53)

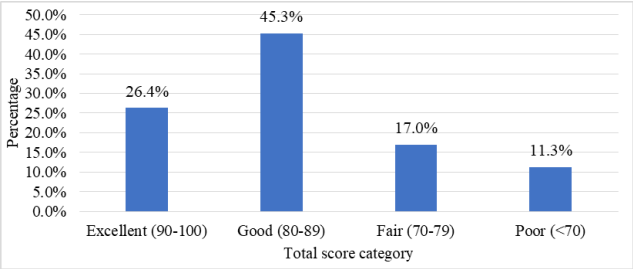

Figure 2: Bar chart analysis of total score category in the study population (N=53)

4. Discussion

The present study intended to assess the short, mid, and long-term effects of the Ponseti method for treating congenital idiopathic Clubfoot using the ponseti scoring system. A total of 53 subjects were included in the final analysis.

In the current study, the mean age of the study population was 48.73 months, with a range of 2.50- 168 months. This was by the study by Asuquo, JE et al.,[14] where the mean age of the study population was 46.17 months. In the current study, most of the study participants, 39 (73.60%), were males, and 14 (26.40%) were females. This was by the study by Asuquo, JE et al.,[14] were 43(62.3%) participants were males, and 27(37.3%) were females. In the current study, the left and right feet had almost equal involvement, 27 (50.90%) and 26 (49.10%). Both left and right feet were equally involved. The bilateral involvement was usually less. Thirteen subjects had bilateral foot involvement, and 27 subjects had unilateral foot involvement.

Environmental factors may play a role in some cases of Clubfoot. Early amniocentesis (< 13 weeks gestation) was associated with an increased risk in talipesequinovarus compared to midgestational amniocentesis or chorionic villus sampling.[15] Increased risk of Clubfoot was partially associated with amniotic fluid leakage, suggesting that oligohydramnios occurring at a critical gestational period may be detrimental to foot development.[16] Environmental exposure to cigarette smoke in utero is another independent risk factor for Clubfoot. In a study of over 3000 patients, Honein, MA et al.[17] reported an association of smoking with Clubfoot, with an adjusted odds ratio of 1.34 for smoking only and 6.52 for a family history only and 20.30 for combined exposure to smoking and family history.

Variants in genes responsible for the metabolism of tobacco,[18] seasonal viral infections,[19] elevated maternal homocysteine,[20] and methylenetetrahydrofolate reductase (MTHFR) gene polymorphisms,[20] have also been associated with an increased risk of Clubfoot.[6] In the current study, the mean valgus in the study population was

Table 2: Summary of the range of moments at the time of evaluation (N=53)

Parameter (deg)	Mean ± SD	Median	Min	Max	95% C.I	
					Lower	Upper
Varus	19.02 ± 9	20.00	0.00	40.00	16.54	21.50
Valgus	12.36 ± 8.8	10.00	0.00	40.00	9.93	14.79
Inversion	17.79 ± 7.57	20.00	0.00	30.00	15.71	19.88
Eversion	6.83 ± 5.09	5.00	0.00	20.00	5.43	8.23
Normal Gait	5.81 ± 0.99	6.00	0.00	6.00	5.53	6.08
Can toe walk	2 ± 1.18	2.00	-2.00	6.00	1.65	2.35
Can heel walk	1.73 ± 0.96	2.00	-2.00	2.00	1.41	2.05

Table 3: Comparison of total score category with Study group based on age at evaluation (N=53)

Study group based on age at evaluation	Total score category				Chi square	P-value
	Excellent	Good	Fair	Poor		
Short-term (N=25)	6 (24%)	12 (48%)	5 (20%)	2 (8%)		
Midterm (N=15)	4 (26.66%)	8 (53.33%)	1 (6.66%)	2 (13.33%)	2.854	0.827
Long-term (N=13)	4 (30.76%)	4 (30.76%)	3 (23.07%)	2 (15.38%)		

12.36, mean inversion was 17.79.

The mean reversion in the study population was 6.83. The mean normal gait in the study population was 5.81. Mean can toe walk was 2 and can heel walk in the study population was 1.73 and with a range of -2 to 2. In our study, the "can toe walk" score was low, illustrating that dorsiflexion was restricted in the study by Laaveg, SJ et al.,[12] the participants with ankle dorsiflexion 5° or less were 35, 6°-15°were 34, and greater than 15°were 35. Seventy-two participants had a varus-valgus motion of heel 32 degrees or less and 28 participants with greater than 32 degrees. Inversion and eversion of the forepart of foot 55 degrees or lea were seen in 73 participants and greater than 55 degrees in 31 participants. In the current study, the age at presentation was at birth for 14(26.42%) participants, <30 days for 27(50.94%) participants, and 1 month and above for 12(22.6%) participants. In the study by Gupta, A et al.,[11] 48 (31%) presented <3 weeks, 52 (34%) presented between 3–6 weeks, 30 (20%) presented between 6–9 weeks, and 12 (8%) between 8-12 weeks. Most of the studies have indicated that the age of presentation was less than a month. It has been shown that early treatment may influence the outcome positively. The mean initial Pirani Score in the study population was 4.94 and with a range of 3-6. Bhaskar et al.[21] had the mean Pirani Score was 5.6 and 5.5 in bilateral and unilateral groups, respectively. Very few studies have used the poinsettia scoring system. In the study by Aggarwal et al.[22] 84% of patients showed good results with a Pirani score < 1.5, fair in 4%, and poor results observed in 12% of the cases. Hence, 88% of patients showed satisfactory results in the short term. Alam, MT et al.,[23] 47 feet were recorded, and 40(85.1%) were good, 4(8.5%) were fair, and 3(6.4%) were poor at short-term evaluation. Patient factors such as satisfaction, pain, and function have been given more emphasis (70 points). Good results have been shown by many studies both short-term, and long-term results indicate that foot function is comparable with that of normal feet.

5. Conclusion

The current study was conducted to compare the treatment outcomes of CTEV cases treated by various methods at different evaluation periods, i.e., short-term, mid-term, and long-term, using the Ponseti scoring system. The Ponseti scoring system is unique, as it gives good weightage to the patient-related aspects like their satisfaction with treatment, limitation of ADL, and pain, along with clinician-assessed factors. Among the study participants, as per the Ponseti scoring system, more than one-fourth had an excellent outcome, and the proportion of people with good, fair, and poor outcomes was 45.30%, 17%, and 11.3%, respectively. It is recommended to establish a continuous database to make long-term assessments on the outcome of a poinsettia method on Clubfoot using standard scoring systems. Ponseti method can be used successfully as the primary treatment for clubfoot deformity. It may be beneficial in a developing country.

6. Source of Funding

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7. Conflict of Interests

The authors declare no conflicts of interest.

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