

ORIGINAL ARTICLE

Accelerated Versus Standard Ponseti Method for Idiopathic Congenital Clubfoot: Impact on Treatment Duration, Healthcare Visits, and Clinical Outcomes

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ABSTRACT

Background: Congenital idiopathic clubfoot is a common pediatric deformity affecting 1–2 per 1000 live births and can lead to long-term disability if untreated. The Ponseti method is the standard treatment, while the accelerated protocol uses more frequent cast changes to reduce treatment duration. However, evidence comparing these approaches remains limited in Bangladesh. This study aims to compare accelerated and standard Ponseti methods regarding correction outcomes, treatment efficiency, and healthcare burden. **Methods & Materials:** A prospective comparative study was conducted at NITOR, Dhaka, involving 30 infants with untreated idiopathic congenital clubfoot. Patients received either accelerated Ponseti (twice-weekly casts, n=15) or standard Ponseti (weekly casts, n=15) treatment following standard Ponseti principles. Outcomes assessed included number of casts required, treatment duration, healthcare visits, caregiver burden, and Pirani scores. Data were analyzed using SPSS version 25.0, with $p < 0.05$ considered statistically significant. **Results:** Among 30 infants, baseline demographic and clinical characteristics, including age, sex, bilateral involvement, and Pirani score, were comparable between groups. The accelerated Ponseti group showed significantly shorter treatment duration (36.4 vs. 50.8 days), fewer hospital visits (7.1 vs. 9.8), and reduced caregiver work-loss days (7.8 vs. 10.6) ($p < 0.001$). Final Pirani scores and overall clinical outcomes were comparable between groups, demonstrating effective deformity correction with reduced treatment burden and improved convenience using the accelerated method. **Conclusion:** The accelerated Ponseti method provides correction outcomes comparable to the standard Ponseti method while significantly reducing treatment duration, healthcare visits, and caregiver burden. It may serve as an effective and efficient alternative for managing idiopathic congenital clubfoot.

Keywords: Accelerated Ponseti Method, Standard Ponseti Method, Idiopathic Congenital Clubfoot, Treatment Duration, Clinical Outcomes, Healthcare Visits.

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INTRODUCTION

Congenital idiopathic clubfoot is a prevalent deformity in children characterized by equinus, varus, adductus, and cavus features. It impacts 1–2 per 1000 live births, mainly males, and has a complex etiology that includes genetic and environmental influences [1,2]. Untreated clubfoot can result in stiffness, weakness, chronic pain, and permanent disability. Early diagnosis and comprehensive management are essential for successful outcomes [3]. Clubfoot treatment evolved from Hippocrates' gentle manipulation (400 BC) to casting techniques introduced by Guerin and Kite. In the 1960s, Ignacio Ponseti developed a successful conservative method based on clubfoot biomechanics, which is now the standard treatment worldwide [4].

The traditional Ponseti technique employs weekly above-knee serial casting to progressively address deformities, then follows with percutaneous Achilles tenotomy for remaining

equinus and bracing until the child reaches three years old. The accelerated Ponseti technique adheres to similar principles but requires more regular cast adjustments, frequently done up to three times a week, to reach quicker correction. Recent findings indicate similar results with a shorter duration of the casting phase [5-7]. The conventional Ponseti method provides high correction rates, avoids extensive surgery, and preserves foot function but requires prolonged treatment and strict brace compliance. The accelerated method reduces casting duration with comparable outcomes but requires more frequent visits and has limited long-term evidence [3,8].

Systematic reviews demonstrate that the Ponseti technique is very effective in treating idiopathic clubfoot in children below two years, featuring high correction rates, low complication rates, and a decreased necessity for extensive surgery. Comparative data between accelerated and standard Ponseti methods indicates that accelerated casting results in

comparable clinical outcomes while notably shortening the casting phase duration, though additional research is required to validate long-term relapse results [9,10].

Evidence comparing accelerated and standard Ponseti methods is limited in Bangladesh, with insufficient local data on treatment duration, healthcare visits, and clinical outcomes. This study aims to compare both methods for idiopathic congenital clubfoot to evaluate correction outcomes and treatment efficiency.

METHODS & MATERIALS

This prospective comparative study was conducted in the Department of Orthopaedics, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh, from January to December 2024. A total of 30 infants with untreated idiopathic congenital clubfoot aged ≤ 12 months were enrolled consecutively after obtaining written informed consent from their parents or guardians. Infants with syndromic or neuromuscular clubfoot, previously treated or recurrent clubfoot, and associated congenital lower limb anomalies were excluded.

Fifteen patients were treated using the accelerated Ponseti method (Group I), in which casts were changed twice weekly, while the remaining fifteen patients received the standard Ponseti method (Group II), with weekly cast changes. Manipulation and casting were performed according to the standard Ponseti principles in both groups. Percutaneous Achilles tenotomy was performed when indicated, followed by application of a final cast for three weeks. After completion of casting, all patients were prescribed a foot abduction brace according to the standard Ponseti bracing protocol and were followed up for six months. Baseline demographic and clinical data were recorded using a structured data collection form.

The severity of clubfoot deformity was assessed using the Pirani scoring system before treatment and at the completion of treatment. Outcome measures included the number of casts required, need for Achilles tenotomy, treatment duration, number of hospital visits, caregiver work-loss days, final Pirani

score, improvement in Pirani score, and overall clinical outcome categorized as-

- Excellent (final Pirani score = 0)
- Good (final Pirani score = 0.5)

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD), and categorical variables as frequency and percentage. Comparisons between the two groups were performed using the independent samples t-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. A P value of <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of NITOR, and written informed consent was obtained from the parents or legal guardians of all participants before enrollment.

RESULTS

Between January and December 2024, a total of 30 infants with idiopathic congenital clubfoot were enrolled in this prospective comparative study conducted at the Department of Orthopaedics, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka. Fifteen patients were treated using the accelerated Ponseti method (Group I), while the remaining fifteen received the standard Ponseti method (Group II). All patients completed the treatment protocol and were followed up for six months after correction.

Table I shows the baseline demographic and clinical characteristics were comparable between the two groups. The mean age at presentation was 6.3 ± 2.6 weeks in the accelerated Ponseti group and 6.5 ± 2.7 weeks in the standard Ponseti group. Male infants accounted for 60.0% of participants in both groups. Bilateral clubfoot was the predominant presentation, affecting 80.0% of patients in the accelerated group and 73.3% in the standard group. The mean baseline Pirani score was similar between the groups, indicating comparable severity of deformity before treatment.

Table I: Baseline demographic and clinical characteristics of the study participants (n=30)

Variable	Accelerated Ponseti (n=15), n (%)	Standard Ponseti (n=15), n (%)
Age at presentation (weeks), mean $\pm$ SD	6.3 ± 2.6	6.5 ± 2.7
Male	9 (60.0)	9 (60.0)
Female	6 (40.0)	6 (40.0)
Bilateral involvement	12 (80.0)	11 (73.3)
Unilateral involvement,	3 (20.0)	4 (26.7)
Baseline Pirani score, mean $\pm$ SD	5.73 ± 0.23	5.70 ± 0.26

Table II presents the treatment characteristics of both groups. The mean number of casts required to achieve correction was similar in the accelerated and standard Ponseti groups (5.20 ± 0.56 vs. 5.40 ± 0.63). Percutaneous Achilles tenotomy was

required in the majority of patients, being performed in 93.3% of the accelerated Ponseti group and 86.7% of the standard Ponseti group.

Table II: Treatment characteristics of the study participants (n=30)

Variable	Accelerated Ponseti (n=15)	Standard Ponseti (n=15)
Number of casts required, mean $\pm$ SD	5.20 ± 0.56	5.40 ± 0.63
Achilles tenotomy performed, n (%)	14 (93.3)	13 (86.7)

Table III shows patients treated with the accelerated Ponseti method completed treatment significantly earlier than those treated with the standard Ponseti method (36.4 ± 3.8 vs. 50.8 ± 4.7 days, $P < 0.001$). The accelerated protocol also significantly reduced healthcare utilization, with patients requiring fewer

hospital visits during the treatment period (7.1 ± 0.7 vs. 9.8 ± 0.8 visits, $P < 0.001$). Furthermore, caregivers in the accelerated group experienced significantly fewer work-loss days than those in the standard group (7.8 ± 1.1 vs. 10.6 ± 1.4 days, $P < 0.001$), reflecting a lower overall treatment burden.

Table III: Comparison of treatment duration and healthcare utilization between the study groups (n=30)

Variable	Accelerated Ponseti (n=15)	Standard Ponseti (n=15)	P value
Treatment duration (days), mean $\pm$ SD	36.4 $\pm$ 3.8	50.8 $\pm$ 4.7	<0.001
Hospital visits, mean $\pm$ SD	7.1 $\pm$ 0.7	9.8 $\pm$ 0.8	<0.001
Caregiver work-loss days, mean $\pm$ SD	7.8 $\pm$ 1.1	10.6 $\pm$ 1.4	<0.001

Table IV presents both treatment protocols produced excellent clinical outcomes. The mean final Pirani score was reduced to 0.17 ± 0.24 in the accelerated Ponseti group and 0.20 ± 0.28 in the standard Ponseti group, with no statistically significant difference between the groups ($P = 0.748$). Similarly, the mean improvement in Pirani score was comparable (5.56 ± 0.29 vs. 5.50 ± 0.33 , $P = 0.594$). Excellent correction (final Pirani score

of 0) was achieved in 80.0% of patients treated with the accelerated Ponseti method and 73.3% of those treated with the standard Ponseti method, while the remaining patients in both groups achieved good correction (final Pirani score of 0.5). There was no significant difference in overall clinical outcomes between the two treatment protocols ($P = 0.672$).

Table VI: Clinical outcomes following treatment (n=30)

Variable	Accelerated Ponseti (n=15)	Standard Ponseti (n=15)	P value
Final Pirani score, mean $\pm$ SD	0.17 $\pm$ 0.24	0.20 $\pm$ 0.28	0.748
Improvement in Pirani score, mean $\pm$ SD	5.56 $\pm$ 0.29	5.50 $\pm$ 0.33	0.594
Excellent outcome (Final Pirani score = 0), n (%)	12 (80.0)	11 (73.3)	0.672
Good outcome (Final Pirani score = 0.5), n (%)	3 (20.0)	4 (26.7)	

Overall, both the accelerated and standard Ponseti methods achieved comparable correction of idiopathic congenital clubfoot. However, the accelerated Ponseti method significantly shortened treatment duration and reduced healthcare utilization without compromising clinical effectiveness, demonstrating similar deformity correction with a lower treatment burden for patients and caregivers.

DISCUSSION

In the current study, baseline attributes such as age, gender distribution, bilateral involvement, and Pirani score were similar between the accelerated and standard Ponseti groups. The average age at presentation was 6.3 and 6.5 weeks, with a predominance of males and bilateral involvement as the typical presentation. Comparable demographic trends have been observed in earlier research, indicating that the impacted infants were mainly male and appeared during early infancy, showing similar baseline severity across treatment groups. These results back the dependability of assessing accelerated and standard Ponseti protocols, which have demonstrated comparable correction results, while the accelerated approach shortens casting time and treatment load [4,11].

In this study, the quantity of casts needed and the necessity for Achilles tenotomy were similar between the accelerated and standard Ponseti groups, showing alike correction needs. Earlier randomized and systematic review evidence indicated that expedited Ponseti protocols result in successful deformity correction while utilizing a similar number of casts and tenotomy rates as the traditional method. These results indicate that raising the frequency of cast changes does not diminish correction effectiveness while possibly shortening the overall duration of treatment [12,13].

In the current research, the accelerated Ponseti technique notably decreased treatment time, hospital visits, and caregiver work-loss days when compared to the standard protocol, signifying a lighter treatment burden. Comparable results were observed in a comparative study where the accelerated Ponseti method attained correction much sooner than the traditional approach (18.1 ± 3.0 vs. 33.4 ± 6.7 days, $p=0.001$), although the number of casts needed, relapse rates, and final Pirani scores were similar across the groups. These findings indicate that accelerated casting can achieve

comparable clinical results while enhancing treatment efficiency [14].

In this study, both the accelerated and standard Ponseti techniques resulted in exceptional clinical correction, with similar final Pirani scores, improvement rates, and overall results. Comparable results have been observed in earlier research, where accelerated Ponseti showed correction outcomes on par with the standard protocol while not heightening complications or relapse risk. Long-term data also reinforces the success of the Ponseti technique in sustaining functional correction with minimal relapse rates when appropriate bracing is adhered to. These findings indicate that expedited Ponseti may lessen treatment demands while preserving effective correction of deformities [15,16].

The accelerated Ponseti method provides comparable correction outcomes to the standard method while reducing treatment duration and overall healthcare burden, making it an effective alternative for idiopathic congenital clubfoot management.

CONCLUSION

The accelerated Ponseti method achieves clinical correction comparable to the standard Ponseti protocol while significantly reducing treatment duration, hospital visits, and caregiver burden. It provides effective deformity correction without compromising outcomes and may be a valuable alternative approach for the management of idiopathic congenital clubfoot, particularly in settings where reducing treatment time and healthcare utilization is important.

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