

Clinical Outcomes of Accelerated versus Standard Ponseti Method in the Management of Idiopathic Congenital Clubfoot

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ABSTRACT

Background: Congenital idiopathic clubfoot is a common pediatric deformity effectively managed by the Ponseti method. The accelerated protocol may reduce treatment duration and improve compliance, but comparative evidence from Bangladesh remains limited. This study aims to compare correction outcomes, treatment duration, and relapse rates between accelerated and standard Ponseti methods to determine the optimal approach for local patients. **Methods & Materials:** A prospective comparative study was conducted at NITOR, Dhaka, Bangladesh, involving 20 infants with idiopathic congenital clubfoot. Patients were allocated into accelerated (n=10) and standard (n=10) Ponseti groups. Cast changes were performed twice weekly and weekly, respectively, following the Ponseti protocol. Clinical outcomes were assessed using the Pirani score, and data were analyzed using SPSS with $p < 0.05$ considered statistically significant. Ethical approval was obtained, and written informed consent was secured from all parents or guardians. **Results:** Among 20 infants, 10 were treated with the accelerated Ponseti method and 10 with the standard Ponseti method. Baseline demographic and clinical characteristics were comparable between the groups. Complete correction (Pirani score 0) was achieved in 80% of the accelerated group and 90% of the standard group ($p = 0.53$). Both groups demonstrated marked improvement in Pirani scores after treatment, with no statistically significant differences in final scores or mean score reduction ($p > 0.05$), indicating similar effectiveness of both treatment protocols. **Conclusion:** Both accelerated and standard Ponseti methods are effective for correcting idiopathic congenital clubfoot, achieving comparable clinical outcomes and high

correction rates. The accelerated protocol may reduce treatment duration while maintaining effectiveness, making it a potential alternative, particularly in resource-limited settings.

Keywords: Accelerated Ponseti Method, Standard Ponseti Method, Management, Idiopathic Congenital Clubfoot

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INTRODUCTION

Congenital idiopathic clubfoot (talipes equinovarus) is a prevalent pediatric deformity characterized by equinus, varus, adductus, and cavus. It impacts 1–2 out of every 1000 live births and has a complex interplay of genetic and environmental causes [1]. Clubfoot involves four main deformities: forefoot adductus, hindfoot varus, midfoot cavus, and ankle equinus. Based on etiology and treatment response, it is classified as idiopathic, postural, neurogenic, or syndromic [2]. Several clinical classification systems exist, with the Pirani score being the most widely used due to its good interobserver reliability and reproducibility [3]. The treatment of idiopathic clubfoot has progressed from comprehensive surgical intervention to the less invasive Ponseti technique. Previous surgeries frequently led to prolonged stiffness, discomfort, and degenerative alterations. Developed by Ignacio Ponseti, the Ponseti technique provides efficient correction with improved functional results and has become the worldwide standard of care [4,5]. The Ponseti method is advantageous due to its high success rate, minimal invasiveness, cost-effectiveness, preservation of foot function,

and avoidance of extensive surgery. However, it requires strict bracing compliance and follow-up, with potential risks of relapse, cast-related complications, and dependence on trained providers [6-8]. The accelerated Ponseti technique is a variation of the conventional protocol that includes more frequent cast changes (two to three times per week) to attain quicker correction. Leveraging the significant remodeling ability of infant tissues could decrease treatment time, boost adherence, lessen healthcare strain, and improve access to effective clubfoot treatment, especially in developing nations [1,9]. Global studies show that both classical and accelerated Ponseti methods achieve effective correction of idiopathic clubfoot. The accelerated protocol shortens treatment duration, while the Ponseti method demonstrates high success rates, good functional outcomes, and low complication rates worldwide [10,11]. In Bangladesh, limited data exist comparing accelerated and standard Ponseti methods for idiopathic clubfoot. This study aims to evaluate and compare their clinical outcomes, including correction rate, treatment duration, and relapse, to identify

the more effective approach for local patients.

METHODS & MATERIALS

Study Design and Setting

This prospective comparative study was conducted in the Department of Orthopaedics, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh, from July 2022 to June 2023 to compare the clinical outcomes of the accelerated and standard Ponseti methods in the treatment of idiopathic congenital clubfoot.

Study Population

A total of 20 infants with idiopathic congenital clubfoot were enrolled using purposive sampling and allocated into two groups: the accelerated Ponseti group (n = 10) and the standard Ponseti group (n = 10).

Eligibility Criteria

Infants aged ≤ 6 months with unilateral or bilateral idiopathic congenital clubfoot whose parents or guardians provided written informed consent were included. Patients with syndromic or secondary clubfoot, relapsed or neglected clubfoot, persistent skin disease preventing cast application, or

whose guardians’ declined participation were excluded.

Treatment Protocol

All patients were managed according to the Ponseti technique. In the accelerated Ponseti group, plaster casts were changed twice weekly, whereas in the standard Ponseti group casts were changed once weekly. Percutaneous Achilles tenotomy was performed when residual equinus deformity persisted after correction of the midfoot deformity. Following cast removal, all patients were prescribed a Steenbeek foot abduction brace according to the standard Ponseti protocol.

Outcome Measures

The severity of deformity was assessed using the Pirani scoring system before treatment and at the final follow-up. The primary outcome was the final Pirani score, while secondary outcomes included the

improvement in Pirani score and the proportion of patients achieving complete correction (Pirani score = 0).

Statistical Analysis

Data were analyzed using SPSS version 23.0. Continuous variables were expressed as mean ± standard deviation (SD) and categorical variables as frequency and percentage. Between-group comparisons were performed using the independent-samples t-test or Mann–Whitney U test for continuous variables and Fisher’s exact test for categorical variables, as appropriate. A P value <0.05 was considered statistically significant.

Ethical Considerations

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 prior to enrollment. The study

was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Baseline Characteristics

A total of 20 infants with idiopathic congenital clubfoot were enrolled in the study, with 10 patients allocated to the accelerated Ponseti group and 10 to the standard Ponseti group. *Table I* shows the baseline demographic and clinical characteristics of the participants.

The mean age at presentation was 52.9 ± 49.8 days in the accelerated Ponseti group and 35.3 ± 20.4 days in the standard Ponseti group. Male patients comprised 60.0% of the accelerated group and 40.0% of the standard group. Bilateral clubfoot was the predominant presentation, occurring in 90.0% of patients in both groups.

Table I
Baseline demographic and clinical characteristics of the study participants.

Variable	Accelerated Ponseti (n=10), n (%)	Standard Ponseti (n=10), n (%)
Age (days), mean ± SD	52.9 ± 49.8	35.3 ± 20.4
Male	6 (60.0)	4 (40.0)
Female	4 (40.0)	6 (60.0)
Bilateral involvement	9 (90.0)	9 (90.0)
Unilateral involvement	1 (10.0)	1 (10.0)

Final Clinical Outcome

Table II presents at the final follow-up; excellent clinical correction was achieved in both treatment groups. A Pirani score of 0, indicating complete correction, was observed in 8 (80.0%) patients in the

accelerated Ponseti group and 9 (90.0%) patients in the standard Ponseti group. The remaining patients had a final Pirani score of 0.5, representing minimal residual deformity. No patient in either group had a final Pirani score of 1.0 or greater. The

distribution of final Pirani scores was comparable between the two treatment protocols (P = 0.53).

Table II
Final Pirani score at the last follow-up.

Final Pirani score	Accelerated Ponseti (n=10), n (%)	Standard Ponseti (n=10), n (%)	Total (n=20), n (%)	P value
0.0	8 (80.0)	9 (90.0)	17 (85.0)	0.53†
0.5	2 (20.0)	1 (10.0)	3 (15.0)	
≥1.0	0 (0.0)	0 (0.0)	0 (0.0)	
Total	10 (100)	10 (100)	20 (100)	

†Fisher’s exact test.

Improvement in Pirani Score

Table III shows marked improvement in clubfoot deformity was observed in both treatment groups following completion of treatment. The mean baseline Pirani score was 5.98 ± 0.06 in the accelerated Ponseti group and 5.96 ± 0.08 in the standard Ponseti group, with no statistically significant difference between the groups at

baseline (P = 0.53). At the final follow-up, the mean Pirani score decreased to 0.10 ± 0.21 in the accelerated group and 0.05 ± 0.16 in the standard group, with no statistically significant difference between the groups (P = 0.56). The corresponding mean reductions in Pirani score were 5.90 ± 0.21 and 5.95 ± 0.16, respectively. Although the standard Ponseti group demonstrated a

slightly greater mean reduction in Pirani score, the difference between the two groups was not statistically significant (P = 0.54), indicating that both treatment protocols were similarly effective in correcting the deformity.

Table III
Comparison of improvement in Pirani score following treatment.

Variable	Accelerated Ponseti (n=10)	Standard Ponseti (n=10)	P value
Baseline Pirani score, mean ± SD	5.98 ± 0.06	5.96 ± 0.08	0.53*
Final Pirani score, mean ± SD	0.10 ± 0.21	0.05 ± 0.16	0.56*
Mean reduction in Pirani score	5.90 ± 0.21	5.95 ± 0.16	0.54*

*Independent-samples t-test.

DISCUSSION

In this study, age, sex distribution, and laterality of clubfoot involvement were comparable between the accelerated and standard Ponseti groups, with bilateral involvement being predominant. Similar findings were reported in a comparative study where the demographic characteristics, including age and sex distribution, were comparable between treatment groups, and both techniques achieved effective correction. A systematic review also confirmed the effectiveness of the Ponseti method, showing high correction rates and favorable outcomes in idiopathic clubfoot management ^[12,13].

In this study both groups achieved excellent correction, with complete correction in 80% of accelerated and 90% of standard Ponseti cases, showing no significant difference. A comparative study reported similar success rates between accelerated and standard Ponseti methods, with accelerated casting reducing treatment duration while maintaining effective deformity correction. A systematic review and meta-analysis further confirmed that accelerated Ponseti provides comparable clinical outcomes to the conventional method with potential benefits in reducing treatment burden ^[14,15]. In our study both groups showed marked improvement in Pirani scores with no significant difference in mean score reduction. Similar comparative studies also reported comparable improvements in Pirani scores and clinical outcomes between accelerated and standard Ponseti methods, supporting the accelerated protocol as an effective alternative ^[16,17].

In general, both accelerated and standard Ponseti methods provide comparable and effective correction of idiopathic congenital clubfoot, with the accelerated protocol offering the advantage of shorter treatment duration without compromising clinical outcomes.

CONCLUSION

Both accelerated and standard Ponseti methods are effective for the management of idiopathic congenital clubfoot, achieving comparable correction rates and favorable clinical outcomes. The accelerated protocol may reduce treatment duration and improve treatment compliance without compromising results, making it a valuable alternative in resource-limited settings. Further large-scale studies with longer follow-up are recommended to validate these findings.

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