Original Research Article

Comparison of Results of Standard Versus Accelerated Casting Method for Relapsed Club Foot Deformity

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Abstract: *Relapsed idiopathic clubfoot remains a significant clinical challenge in pediatric orthopedics, particularly in low-resource countries like Pakistan. While the standard Ponseti method with weekly casting is well-established, the accelerated casting method, requiring more frequent cast changes, offers potential advantages in reducing treatment time without compromising outcomes.* **Objective:** *To compare the effectiveness, complication rates, recurrence, and parental satisfaction between standard weekly casting and accelerated bi-weekly casting methods for relapsed clubfoot deformity in a tertiary care hospital in Pakistan.* **Methods:** *A prospective comparative study was conducted at the Department of Orthopedics, Benazir Bhutto Hospital, Rawalpindi, from September 15, 2024, to March 15, 2025. A total of 80 children with relapsed idiopathic clubfoot were divided into two equal groups: 40 treated with the standard Ponseti method and 40 with the accelerated method. Outcomes included a number of casts, treatment duration, Pirani score improvement, complication rates, recurrence at 6-month follow-up, and parental satisfaction using a 5-point Likert scale. Data were analyzed using SPSS v25.0, with independent t-tests and chi-square tests applied where appropriate.* **Results:** *Both groups achieved comparable deformity correction as reflected by similar final Pirani scores (0.7 ± 0.4 in standard vs. 0.6 ± 0.3 in accelerated, p = 0.312). The accelerated group required significantly fewer casts (5.1 ± 0.9 vs. 6.9 ± 1.1, p < 0.001) and shorter treatment duration (2.6 ± 0.5 weeks vs. 6.9 ± 1.1 weeks, p < 0.001). Complication and recurrence rates were low and statistically similar in both groups. Parental satisfaction was significantly higher in the accelerated group (mean score 4.4 ± 0.5 vs. 3.8 ± 0.7, p = 0.002).* **Conclusion:** *The accelerated Ponseti method is a safe and effective alternative to standard casting for relapsed clubfoot, offering faster correction and higher caregiver satisfaction without increasing complications or recurrence. Its adoption may enhance compliance and reduce treatment burden in the Pakistani healthcare setting.*

Keywords: Relapsed clubfoot, Ponseti method, accelerated casting, standard casting, Pirani score, Pakistan, pediatric orthopedics

Introduction

Congenital talipes equinovarus (CTEV), commonly known as clubfoot, is one of the most prevalent congenital musculoskeletal deformities, affecting approximately 1–2 per 1,000 live births worldwide. In Pakistan, the burden is notably higher due to large birth cohorts, limited access to early orthopedic care, and inconsistent follow-up after initial treatment, often leading to relapsed deformities if not managed effectively and timely (1,2). Clubfoot relapse is characterized by the recurrence of one or more deformity components—equinus, varus, adductus, or cavus—after initial correction, and it remains a major challenge for orthopedic surgeons, especially in resource-limited healthcare settings.

The Ponseti method, a globally accepted standard for the initial treatment of idiopathic clubfoot, has also proven effective for relapse management when repeated casting is employed. Traditionally, the Ponseti protocol involves weekly cast applications, gradually correcting the deformity over several weeks before a tenotomy, followed by bracing (3). However, in recent years, the accelerated Ponseti method, which reduces the casting interval to 2–3 days instead of a week, has gained attention for its potential to achieve similar outcomes in a shorter time frame (4, 5). This has significant implications in low- and middle-income countries like Pakistan, where economic constraints, long distances to healthcare centers, and high patient volumes demand efficient yet effective treatment approaches (6).

Previous studies have validated the accelerated casting technique in various international contexts. For example, research from India and Bangladesh has demonstrated that accelerated casting yields comparable correction with fewer hospital visits, improved compliance, and reduced dropout rates (7,8). In the Pakistani context, however, there is limited local evidence comparing standard and accelerated Ponseti protocols, particularly in relapsed cases. A small number of pilot studies have focused on primary clubfoot treatment, but the outcomes in relapsed cases, which often present greater treatment complexity and rigidity, remain underexplored (9).

Given the socioeconomic constraints and high clubfoot prevalence in Pakistan, evaluating the accelerated Ponseti technique for relapsed cases is essential to inform clinical decision-making and optimize treatment protocols. This study aims to compare the effectiveness, complication rates, recurrence, and parental satisfaction between standard weekly casting and accelerated bi-weekly casting methods in children with relapsed idiopathic clubfoot deformity in a tertiary care hospital setting in Pakistan.

Methodology

This prospective comparative study was conducted at the Department of Orthopedics, Benazir Bhutto Hospital, Rawalpindi, from September 15, 2024, to March 15, 2025, to compare the outcomes of standard versus accelerated casting methods in the management of relapsed idiopathic clubfoot deformity. A total of 80 children, aged between 6 months and 4 years, diagnosed with relapsed clubfoot were enrolled using non-probability consecutive sampling. Relapse was defined as the recurrence of one or more components of the original deformity in children previously treated with the Ponseti method. Children with syndromic

clubfoot, neuromuscular disorders, or incomplete treatment history were excluded from the study.

Participants were divided into two equal groups: Group A (n = 40) received the standard Ponseti casting protocol with weekly cast changes, while Group B (n = 40) received the accelerated Ponseti protocol with cast changes every 3 to 4 days. The allocation to groups was non-randomized but based on parental preference and logistic feasibility. In both groups, manipulations were performed according to the Ponseti technique by the same orthopedic team to minimize procedural variation. The endpoint of casting was the achievement of full correction or the attainment of a Pirani score ≤1, followed by percutaneous Achilles tenotomy if needed, and subsequent application of a final cast for three weeks. After cast removal, all patients were placed in a foot abduction brace as per standard post-correction maintenance protocol.

Data collection included demographic variables, number of casts required, total duration of treatment (in weeks), initial and final Pirani scores, complications such as cast slippage or skin issues, and recurrence within six months of follow-up. The Pirani scoring system, a six-point clinical tool assessing severity of deformity, was used before the first cast and after the final correction. Parental satisfaction was assessed at the end of treatment using a 5-point Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied).

All data were entered and analyzed using IBM SPSS Statistics version 25. Continuous variables such as age, number of casts, treatment duration, and Pirani scores were expressed as means ± standard deviations, and compared using independent sample t-tests. Categorical variables such as gender, side affected, complications, and recurrence were analyzed using chi-square tests. A p-value ≤ 0.05 was considered statistically significant. Ethical approval was obtained from the institutional ethics review committee (2052/IREF/RMU/2025) prior to the start of the study. Informed consent was obtained from the parents or guardians of all participants, and all study procedures adhered to the ethical principles outlined in the Declaration of Helsinki.

Results

A total of 80 children diagnosed with relapsed idiopathic clubfoot deformity were included in this comparative study, with 40 patients managed using the standard weekly casting method and 40 using the accelerated bi-weekly casting method. Table 1 presents the demographic and baseline clinical characteristics of the 80 participants included in the study, with 40 patients in each group. The mean age of children undergoing standard casting was 26.3 ± 6.4 months, while that for the accelerated casting group was 27.1 ± 7.2 months, showing no statistically significant difference (p = 0.612). The majority of participants in both groups were male, with 70.0% in the standard group and 75.0% in the accelerated group (p = 0.605). Regarding the side affected, unilateral involvement was observed in 55.0% of the standard group and 50.0% of the accelerated group, whereas bilateral involvement was noted in 45.0% and 50.0%, respectively (p = 0.648). None of the baseline variables showed statistically significant differences between the two groups, indicating good comparability for subsequent outcome analysis.

Both methods achieved statistically comparable reductions in Pirani scores, indicating similar clinical effectiveness in deformity correction. However, the accelerated method significantly reduced the number of casts and treatment duration ($p < 0.001$), supporting its efficiency. (Table 2).

Minor complications such as skin excoriation and cast slippage occurred at similar rates in both groups, with no statistically significant difference. Recurrence rates at 6-month follow-up were slightly lower in the accelerated group but not statistically significant ($p = 0.725$), indicating comparable long-term outcomes. (Table 3).

Parents in the accelerated casting group reported significantly higher satisfaction levels due to shorter treatment duration and faster correction ($p = 0.002$). (Table 4).

Table 1. Demographic Characteristics of Participants (n = 80)

Variable	Standard Casting (n = 40)	Accelerated Casting (n = 40)	p-value
Age (months)	26.3 ± 6.4	27.1 ± 7.2	0.612
Gender			
Male	28 (70.0%)	30 (75.0%)	0.605
Female	12 (30.0%)	10 (25.0%)	
Side Affected			
Unilateral	22 (55.0%)	20 (50.0%)	0.648
Bilateral	18 (45.0%)	20 (50.0%)	

Table 2. Treatment Outcomes between Standard and Accelerated Casting Groups (n = 80)

Outcome Measure	Standard Casting (n = 40)	Accelerated Casting (n = 40)	p-value
Mean No. of Casts Required	6.9 ± 1.1	5.1 ± 0.9	<0.001*
Duration of Treatment (weeks)	6.9 ± 1.1	2.6 ± 0.5	<0.001*
Initial Pirani Score	5.2 ± 0.6	5.3 ± 0.5	0.521
Final Pirani Score	0.7 ± 0.4	0.6 ± 0.3	0.312
Mean Score Reduction	4.5 ± 0.7	4.7 ± 0.6	0.289

p ≤ 0.05 considered statistically significant

Table 3. Complications and Recurrence Rates in Both Groups (n = 80)

Complication/Recurrence	Standard Casting (n = 40)	Accelerated Casting (n = 40)	p-value
Skin Excoriation	3 (7.5%)	4 (10.0%)	0.688
Cast Slippage	2 (5.0%)	3 (7.5%)	0.641
Recurrence at 6 Months Follow-up	5 (12.5%)	4 (10.0%)	0.725

Table 4. Parental Satisfaction Score (Likert Scale 1–5)

Satisfaction Level	Standard Casting (n = 40)	Accelerated Casting (n = 40)	p-value
Mean Satisfaction Score	3.8 ± 0.7	4.4 ± 0.5	0.002*

Discussion

The findings of this study demonstrate that both standard and accelerated Ponseti casting methods are effective in managing relapsed idiopathic clubfoot deformity in children, with comparable outcomes in terms of final Pirani score and recurrence rates. However, the accelerated casting method showed a significant advantage in reducing the total number of casts and treatment duration without increasing complication rates. Additionally, parental satisfaction was significantly higher in the accelerated group, likely due to the shorter and more efficient treatment process.

The significant reduction in the number of casts and treatment duration in the accelerated group (mean duration 2.6 weeks vs. 6.9 weeks in the standard group; $p < 0.001$) is consistent with findings from Sinha et al., who reported similar results in a randomized controlled trial comparing accelerated and standard casting for idiopathic clubfoot. Their study concluded that accelerated casting achieved effective correction in a shorter time, which is advantageous for both caregivers and healthcare systems in low-resource settings (10). Similarly, Rahman et al. demonstrated that accelerated casting was equally effective in relapsed cases and resulted in lower dropout rates due to reduced hospital visits in a low-resource Bangladeshi setting (11).

The comparable final Pirani scores in both groups of the present study support the claim that the accelerated method does not compromise clinical efficacy. This aligns with findings from a study by Younas et al. in Pakistan, which found no statistically significant difference in correction quality between the two methods in primary clubfoot cases (12). While most local studies have focused on primary cases, our study adds value by specifically addressing relapsed cases, which are often more rigid and require more careful handling.

Complication rates in our study, including skin excoriation and cast slippage, were low and not significantly different between groups. This outcome corroborates the results of Alam et al., who found that accelerated casting did not lead to an increased rate of complications in their cohort of children treated with this method in Punjab, Pakistan (13). The similar recurrence rates at six months between the two groups further reinforce the long-term safety and stability of the accelerated approach, provided the standard post-treatment bracing protocol is followed consistently.

A noteworthy finding in this study is the higher parental satisfaction reported in the accelerated group. The Likert score was significantly higher ($p = 0.002$), reflecting the parents' appreciation for reduced treatment time and fewer hospital visits. This echoes the results of Akbar et al., who identified prolonged treatment duration and logistical challenges as major contributors to non-compliance and dissatisfaction in rural Pakistani populations managing clubfoot (14).

Despite the strengths of this study, including its prospective design and equal group sizes, some limitations must be acknowledged. The non-randomized allocation and single-center design may limit generalizability. Additionally, long-term follow-up beyond six months was not performed, which is essential for evaluating sustained correction and bracing compliance. Future multi-center, randomized controlled trials with extended follow-up are needed to confirm these findings and to support the development of national guidelines favoring accelerated protocols where appropriate.

In summary, this study provides compelling evidence that the accelerated Ponseti method is an efficient, safe, and parent-preferred alternative to standard casting for relapsed clubfoot cases in Pakistan. Its integration into routine orthopedic practice could help address the high burden of relapsed clubfoot in low-resource settings by offering faster correction without compromising outcomes.

Conclusion

This study demonstrates that the accelerated Ponseti method is equally effective as the standard approach in correcting relapsed clubfoot deformities while significantly reducing treatment duration and improving parental satisfaction. With comparable safety and recurrence profiles, the accelerated method offers a practical, resource-efficient solution for the management of clubfoot in Pakistan's high-burden healthcare environment and should be considered for wider implementation in clinical practice.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
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The authors declared the absence of a conflict of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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