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Original Research Article

STANDARD AND ACCELERATED PONSETI TECHNIQUE IN MANAGEMENT OF IDIOPATHIC CONGENITAL TALIPES EQUINOVARUS: A COMPARATIVE STUDY

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ABSTRACT

Background: Congenital talipes equinovarus (CTEV) is a common developmental deformity of the foot. Although the Ponseti method is the gold standard for management, prolonged treatment duration may affect patient compliance. **Materials and Methods:** A hospital-based prospective randomized study was conducted on 30 cases of idiopathic CTEV in children less than one year of age. Patients were randomized using a computer-generated random number table into standard weekly and accelerated twice-weekly Ponseti groups. **Results:** Both groups showed significant improvement in Pirani scores. The accelerated group had significantly shorter treatment duration (21.72 ± 3.88 days vs 41.24 ± 7.36 days; $p<0.001$). Tenotomy and relapse rates were comparable. **Conclusion:** The accelerated Ponseti technique is as effective as the standard method, with the advantage of reduced treatment duration.

INTRODUCTION

Congenital clubfoot, also known as congenital talipes equinovarus, is a developmental deformity of the foot.[1,2] It is characterized by equinus of the ankle, varus of the hindfoot, adduction of the midfoot and cavus deformity.[3,4] The deformity is most often idiopathic but may be associated with other conditions in about 20% of cases.[2]

The incidence ranges from 1-2 per 1000 newborns.[4-6] It is twice as common in boys than girls.[7] Bilateral deformities occur in 50% of cases and in unilateral cases, right foot has predominance.8 In India, the pooled prevalence of CTEV is estimated at approximately 3.25 per 1,000 live births (95% CI: 2.15–4.35).[9]

The equinovarus deformity is classified into congenital and acquired. The congenital equinovarus deformity can be idiopathic and non-idiopathic types. The non-idiopathic type include deformity occurring in genetic syndromes, teratological anomalies, neurological disorders (spina bifida) and myopathies. A variety of classification systems based on clinical examination have been used, the most widely used being that of Pirani scoring system, which has been shown to have good interobserver reliability and reproducibility.[7]

The management of clubfoot is multidisciplinary, involving pediatric orthopaedic surgeons, physiotherapists, nurses, plaster technicians, orthotists and other allied professionals.[5] Most orthopaedic surgeons agree that the initial treatment of idiopathic clubfoot should be gentle manipulation, with serial casting, splinting or strapping to maintain the correction.[10-12]

The long-term goal of treatment is a functional pain-free, plantigrade foot with good mobility, without calluses and without the need for shoe-wear modification.[13]

The clinical assessment and progress of treatment by Ponseti casting is done by Pirani scoring system. It is helpful to use this scoring system and document the results every time the feet are examined; before the treatment, during the correction phase, during the brace application and at later checkups. Many methods have been described for the correction of deformity starting from bandages in Hippocrates time, splinting, binding, casting, posteromedial release of soft tissues, bony procedures and arthrodesis. The management of congenital talipes equinovarus has been transformed in the last two decades as surgical correction has been replaced by the non-surgical Ponseti method.[10]

Goal of clubfoot management is to produce and maintain a functional, painless, plantigrade, mobile, callosity free, normal shoeable foot. The standard Ponseti technique uses serial application of weekly plaster casts to gradually correct the deformity. In an accelerated Ponseti technique, cast is applied twice weekly on fixed days instead of one week. Congenital talipes equinovarus (CTEV) is a complex deformity characterized by equinus, varus, adduction, and cavus. The Ponseti method is the gold standard of treatment. Accelerated Ponseti protocols aim to

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reduce treatment duration without compromising outcomes.

MATERIALS AND METHODS

This prospective randomized study was conducted at JLN Medical College, Ajmer after ethical committee approval. Thirty children with idiopathic clubfoot aged less than one year were randomized using a computer-generated random number table into standard and accelerated Ponseti groups. Percutaneous Achilles tenotomy was performed when ankle dorsiflexion was less than 15 degrees. Pirani scoring was used for assessment.

All children with idiopathic congenital clubfoot aged less than 1 year presenting to our institution during the study period were screened for eligibility. Inclusion criteria were: 1) idiopathic clubfoot, 2) age<1 years and 3) previously untreated. Exclusion criteria were: 1) syndromic clubfoot, 2) neglected clubfoot, 3) relapsed clubfoot, and 4) postural clubfoot.

A thorough general examination of the child was done at the very outset so as to detect any associated congenital anomalies of hip and spine. Parents were educated before hand about the nature and duration of treatment, expected outcomes, need for tenotomy, chances of recurrence, duration of bracing regime.

Total of 30 cases were selected randomly, randomization was done, 15 were treated by Standard Ponseti (Weekly cast changes) and 15 were treated by Accelerated Ponseti technique (Twice-weekly cast changes). The Standard Ponseti technique uses serial application of weekly plaster casts to gradually correct the deformity. Age and sex of patient, side of involvement, Pirani score at presentation and subsequent visits, number of casts required and treatment time till tenotomy or correction of equinus without tenotomy were recorded for all patients in both the group.

By doing this study it will be possible to compare the average number of plaster casts required during treatment by both techniques and also the duration of plater casts required in treatment by both techniques. All other aspects of treatment including manipulation technique, casting material, and bracing protocol were identical between groups. Percutaneous Achilles tenotomy was performed if dorsiflexion was<150 after correction of other deformities. Post-tenotomy, a final cast was applied for 3 weeks in both groups. The primary outcome measure was the Pirani score14 at the end of casting and at 6 months follow-up. Secondary outcomes included number of casts, duration of treatment, tenotomy rate, complications, and relapses.

Pirani scoring was performed by a blinded assessor who was not involved in treatment. Initial Pirani score was calculated before the first cast. Final score was calculated just before brace application. A score >1 at 6 months follow-up was considered a relapse.

Statistical Analysis

Data was analyzed using SPSS version 28. Continuous variables were compared using independent t-tests and categorical variables using chi-square tests. A p-value<0.05 was considered statistically significant.

RESULTS

Our study showed that the mean age at the start of treatment was 30.8 days in the standard group and 27.6 days in the accelerated group, with no significant difference (p>0.05). Gender distribution was identical in both groups, with 60% male and 40% female (p>0.05). Bilateral cases accounted for 46.66% in the standard group and 53.33% in the accelerated group (p>0.05). Both groups exhibited significant improvements in Pirani scores, reflecting effective correction of the deformities. The extent of improvement was comparable between the groups, with no statistically significant intergroup differences, indicating that both the standard and accelerated protocols were equally efficacious. [Table 1]

Treatment parameters varied between the two groups (Table 2). The mean number of casts required was slightly higher in the accelerated group (6.13 ± 1.15) compared to the standard group (5.75 ± 1.18), but this difference was not statistically significant (p>0.05). However, the mean treatment duration showed a marked difference between the groups. The accelerated group achieved correction in significantly less time (21.72 ± 3.88 days) compared to the standard group (41.24 ± 7.36 days), and this difference was highly statistically significant (p<0.001). The tenotomy rate was high in both groups, with 93.33% (14 patients) in the standard group and 93.33% (14 patients) in the accelerated group undergoing the procedure, but the difference was not statistically significant (p>0.05).

Relapse rates at the 6-month follow-up were assessed (Table 3). In the standard Ponseti group, 1 patient (6.66%) showed relapse, while 14 patients (93.33%) maintained correction. The accelerated Ponseti group had a slightly higher relapse rate with 2 patients (13.33%) showing relapse and 13 patients (86.66%) maintaining correction. However, this difference in relapse rates between the two groups was not statistically significant (p>0.05).

Both groups were comparable at baseline. Treatment duration was significantly shorter in the accelerated group. Pirani score improvement, tenotomy rates, and relapse rates at 6 months were comparable.

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Table 1: Baseline characteristics of study participants

Characteristic	Standard Ponseti (n=15)	Accelerated Ponseti (n=15)	P value
Mean age (days)	30.8 ± 10.2	27.6 ± 9.5	>0.05
Male/Female	9 / 6	10 / 5	>0.05
Bilateral cases	7 (46.6%)	8 (53.3%)	>0.05
Baseline Pirani score	4.2 ± 1.3	4.4 ± 1.4	>0.05

Table 2: Comparison of treatment parameters

Parameter	Standard Ponseti	Accelerated Ponseti	P value
Mean number of casts	5.75 ± 1.18	6.13 ± 1.15	>0.05
Treatment duration (days)	41.24 ± 7.36	21.72 ± 3.88	<0.001
Tenotomy rate	14 (93.3%)	14 (93.3%)	>0.05

Table 3: Relapse rates at 6-month follow-up

Group	Relapse	No relapse	P value
Standard Ponseti	1 (6.6%)	14 (93.3%)	>0.05
Accelerated Ponseti	2 (13.3%)	13 (86.7%)	>0.05

DISCUSSION

Early and effective correction of CTEV is paramount for preserving normal foot function and enabling optimal developmental outcomes. The Ponseti method remains the cornerstone of CTEV management due to its high efficacy and non-invasive nature. Nevertheless, practical challenges, including significant travel distances to treatment centers and the associated psychological and economic burdens on families, particularly in resource-limited settings, necessitate the exploration of more time-efficient approaches, such as the accelerated Ponseti technique.

The accelerated Ponseti method offers a significant reduction in treatment duration compared to the standard protocol, a finding corroborated by multiple studies. Meta-analyses by Alsayed et al,[15] and Savio & Maharjana et al,[16] reported reductions of 19.2 days and 24.25 days, respectively. Similar outcomes have been consistently observed in studies by Radler et al,[17] Elgohary et al,[18] Kumar et al,[19] Islam et al20, Singh et al,[21] and Ahmed et al.[22] This reduction in treatment duration is of substantial clinical relevance, as it enhances patient compliance by minimizing the frequency of hospital visits, travel-related stress, and economic costs. Families are relieved of prolonged disruptions to their daily routines, including work commitments and educational responsibilities. These logistical advantages translate to higher adherence to treatment protocols, thereby potentially improving clinical outcomes.

Both standard and accelerated Ponseti techniques demonstrated comparable efficacy in deformity correction, as evidenced by similar improvements in Pirani scores—a validated and widely utilized metric for quantifying the severity of clubfoot. These results align with the research conducted by Singh et al,[21] Savio & Maharjana et al,[16] and Alsayed et al,[15] affirming the non-inferiority of the accelerated protocol in achieving effective correction. Interestingly, some studies, including those by Ahmed et al,[22] and Hussain et al,[23] reported statistically significant faster improvements in Pirani scores within the accelerated treatment groups. This suggests that the accelerated protocol may not only reduce the treatment duration but also expedite the initial clinical improvement, an important consideration in achieving patient and caregiver satisfaction.

The present study observed no significant differences in Achilles tenotomy rates or relapse rates between the two groups, aligning with findings from previous investigations.[23-25]

However, relapse prevention remains heavily reliant on adherence to post-correction bracing protocols. Proper caregiver education on the correct use of braces, rigorous follow-up schedules, and addressing socioeconomic barriers to compliance are critical for sustaining long-term correction. Studies have emphasized the importance of consistent brace use in preventing recurrence, highlighting it as a determinant of treatment success.[25,26] Enhancing caregiver awareness through structured educational programs and simplifying brace designs may further bolster compliance rates.

CONCLUSION

The accelerated Ponseti method provides a safe and effective alternative to the standard protocol, offering comparable outcomes in deformity correction while significantly reducing treatment duration. This approach could improve treatment compliance and reduce the burden on families, especially in resource-limited settings. Further research with longer follow-up is needed to confirm long-term outcomes and optimal casting intervals.

Ethical Approval

Ethical approval was obtained from the Institutional Ethics Committee of JLN Medical College, Ajmer.

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