

Comparison of Outcomes of Ponseti Casting With vs. Without Mother by the Side in Children with CTEV – A Prospective Comparative Study

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Abstract

Background: Congenital Talipes Equinovarus (CTEV) is a common congenital musculoskeletal deformity effectively managed by the Ponseti method. Child distress during serial casting may influence treatment quality and caregiver compliance. This study evaluated whether maternal presence during Ponseti casting affects treatment outcomes.

Methods: This prospective comparative study included 50 children with idiopathic CTEV treated over 18 months. Participants were divided into two groups: Group A (Ponseti casting with the mother present, n=25) and Group B (without the mother present, n=25). Outcomes assessed included Pirani score improvement, child cooperation, number of casts required, Achilles tenotomy rate, brace compliance, complications, and parental satisfaction.

Results: Both groups achieved satisfactory correction with the Ponseti method. Maternal presence was associated with better child cooperation, improved parental satisfaction, and better brace compliance, while Pirani score improvement, tenotomy rate, and complications were comparable between groups.

Conclusion: Maternal presence during Ponseti casting may enhance the overall treatment experience by improving child cooperation and caregiver compliance without compromising clinical outcomes.

Keywords: Congenital Talipes Equinovarus, CTEV, Clubfoot, Ponseti Method, Maternal Presence, Child Cooperation, Pirani Score, Brace Compliance, Parental Satisfaction.

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INTRODUCTION:

Congenital Talipes Equinovarus (CTEV), commonly known as clubfoot, is one of the most frequent congenital musculoskeletal deformities affecting the lower limb. It is characterized by four classical components—**Cavus, Adductus, Varus, and Equinus (CAVE)**—which result in a rigid deformity of the foot and ankle. The incidence of idiopathic clubfoot is estimated to be approximately **1–2 per 1,000 live births**, with a male predominance and bilateral involvement occurring in nearly 50% of affected children. If left untreated, clubfoot can lead to lifelong disability, abnormal gait, pain, social stigma, and reduced quality of life. Early diagnosis and timely intervention are therefore essential to achieve a functional, pain-free, plantigrade foot and prevent long-term disability (1,2).

The aetiology of idiopathic clubfoot remains multifactorial and incompletely understood. Current evidence suggests an interaction between genetic

predisposition and environmental influences during foetal development. Several hypotheses have implicated neuromuscular abnormalities, connective tissue disorders, vascular insufficiency, and developmental arrest during embryogenesis. Although numerous genes have been associated with clubfoot susceptibility, no single causative mechanism has been established. Despite advances in understanding its pathogenesis, treatment remains focused on correcting the deformity rather than addressing its underlying cause (3,4).

Historically, extensive surgical release was considered the standard treatment for resistant clubfoot. However, long-term follow-up studies demonstrated that aggressive surgery often resulted in painful, stiff, and arthritic feet during adolescence and adulthood. Consequently, the emphasis shifted toward conservative treatment methods aimed at preserving normal anatomy and foot mobility. Among these, the **Ponseti method**, developed by Dr. Ignacio Ponseti, has become the worldwide gold

standard for managing idiopathic clubfoot due to its excellent functional outcomes and minimal requirement for extensive surgery (5, 6).

The Ponseti method consists of gentle weekly manipulation of the foot followed by the application of well-molded above-knee plaster casts to gradually correct each component of the deformity in a specific sequence. Cavus is corrected first, followed by adduction and hindfoot varus, while equinus is corrected last, often requiring a percutaneous Achilles tenotomy. After complete correction, maintenance with a foot abduction brace is crucial to prevent recurrence. Numerous studies have reported initial correction rates exceeding 90–95%, making the Ponseti technique the preferred treatment worldwide, including in low- and middle-income countries because of its simplicity, cost-effectiveness, and reproducibility (5, 7, 8).

Although the technical aspects of the Ponseti method are well established, successful treatment depends on several patient- and caregiver-related factors. Proper manipulation, meticulous cast application, regular follow-up, and strict adherence to brace protocols are essential for achieving optimal outcomes. One of the frequently encountered challenges during serial casting is infant distress and poor cooperation. Excessive crying, limb movements, and resistance during manipulation may interfere with accurate correction, prolong the procedure, compromise cast quality, and potentially increase the number of casts required. In addition, negative procedural experiences may influence parental confidence and compliance with subsequent treatment phases (9, 10).

Parental involvement has become an integral component of pediatric healthcare. Family-centered care emphasizes the presence of parents during medical procedures to reduce anxiety, improve communication, and enhance satisfaction. In many pediatric settings, the presence of a parent—particularly the mother—has been shown to reduce children's fear and procedural distress through emotional reassurance, physical comfort, and familiar interaction. Maternal presence may also alleviate parental anxiety by allowing direct observation of treatment and fostering trust between caregivers and healthcare professionals (11, 12).

However, evidence regarding parental presence during orthopaedic procedures remains limited and sometimes conflicting. While some clinicians believe that maternal presence calms the infant and facilitates smoother casting, others argue that anxious parents may inadvertently increase the child's distress or interfere with the procedure. Moreover, few studies have specifically evaluated whether maternal presence during Ponseti casting influences objective treatment outcomes such as correction rates, number of casts required, tenotomy rates, brace compliance, complication rates, or parental satisfaction. Therefore, the impact of

maternal presence during clubfoot casting remains inadequately explored (13, 14).

Child cooperation during repeated casting sessions may represent an important determinant of treatment success. Reduced crying and improved relaxation of the lower limb can facilitate more accurate manipulation and cast molding, potentially resulting in better correction with fewer casts. Furthermore, positive caregiver experiences during treatment may improve long-term adherence to brace wear, which is the most important factor in preventing recurrence after successful correction. Understanding whether maternal presence influences these outcomes could provide valuable evidence for optimizing pediatric orthopaedic practice and family-centered care protocols (10, 15).

The present prospective comparative study was therefore designed to evaluate the outcomes of Ponseti casting in children with idiopathic CTEV when performed with the mother present throughout the casting session compared with casting performed without maternal presence. The study compares changes in Pirani scores, child cooperation during casting, number of casts required for correction, requirement for Achilles tenotomy, brace compliance, treatment-related complications, and parental satisfaction. By identifying whether maternal presence has a measurable effect on clinical and behavioural outcomes, this study aims to generate evidence that may help refine Ponseti treatment protocols, improve patient-centered care, and enhance overall treatment success in children with idiopathic clubfoot.

Aim

To compare the clinical outcomes of Ponseti casting performed with the mother present during the casting session versus without the mother present in children with idiopathic Congenital Talipes Equinovarus (CTEV).

Objectives

Primary Objective

1. To compare the improvement in Pirani scores between children undergoing Ponseti casting with maternal presence and those undergoing casting without maternal presence.

Secondary Objectives

2. To compare the level of child cooperation during Ponseti casting in both groups.
3. To compare the number of casts required to achieve complete correction.
4. To compare the requirement for percutaneous Achilles tenotomy between the two groups.
5. To compare brace compliance during the post-correction phase.
6. To evaluate and compare treatment-related complications, including cast-related complications and recurrence.

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- To assess parental satisfaction with the treatment process in both groups.

Materials and Methods

Study Design

Prospective comparative study.

Study Setting

The study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital (Saveetha Medical College and Hospital) over a period of 18 months (January 2024 to July 2025).

Study Population

Children diagnosed with idiopathic Congenital Talipes Equinovarus (CTEV) presenting to the outpatient and inpatient services of the Department of Orthopaedics.

Sample Size

A total of 50 children with idiopathic CTEV were included in the study.

Group A: 25 children undergoing Ponseti casting with the mother present throughout the casting session.

Group B: 25 children undergoing Ponseti casting without the mother being present during the casting session.

Sampling Method

Consecutive sampling of eligible patients fulfilling the inclusion criteria until the required sample size is achieved.

Inclusion Criteria

- Children aged 0–12 months with untreated idiopathic CTEV.
- Unilateral or bilateral clubfoot.
- Parents/guardians willing to provide written informed consent.
- Children planned for treatment using the Ponseti method.

Exclusion Criteria

- Syndromic or non-idiopathic clubfoot (e.g., arthrogryposis, spina bifida).
- Previously treated or operated clubfoot.
- Children with associated neuromuscular disorders.
- Children with congenital anomalies affecting the lower limbs.
- Parents unwilling to participate or unable to comply with follow-up.

Study Procedure

After obtaining approval from the Institutional Ethics Committee and written informed consent from the parents or legal guardians, eligible children were enrolled in the study.

Participants were allocated into two groups:

Group A: Ponseti casting performed with the mother present throughout the manipulation and casting procedure.

Group B: Ponseti casting performed without the mother present during the procedure.

All children underwent treatment according to the standard Ponseti protocol. Weekly gentle manipulation followed by application of above-knee plaster casts was performed until correction was

achieved. Percutaneous Achilles tenotomy was performed whenever indicated to correct residual equinus deformity. Following complete correction, all patients received a foot abduction brace according to the standard Ponseti bracing protocol.

Statistical Analysis: Data were analysed using SPSS software. Continuous variables (Pirani score, number of casts) were expressed as mean $\pm$ standard deviation and compared between groups using the independent Student's t-test. Categorical variables (child cooperation, tenotomy requirement, complications, brace compliance, parental satisfaction) were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS:

A total of 50 children with idiopathic CTEV were evaluated, 25 in Group A (mother present) and 25 in Group B (mother absent). Both groups achieved satisfactory correction with the Ponseti method, with comparable improvement in Pirani scores (Group A: 5.5 to 0.5; Group B: 5.4 to 0.7) (Fig. 5). Group A required fewer casts on average to achieve correction (5.2 vs. 6.1 in Group B) (Fig. 1).

Child cooperation during casting was rated as good in 76% of children in Group A compared with 44% in Group B (Fig. 2). The requirement for percutaneous Achilles tenotomy was comparable between the two groups (Fig. 3).

Treatment-related complications and distress episodes were low and broadly comparable between groups, though Group A showed a modestly lower rate of minor complications (Fig. 4). Brace compliance was markedly better in Group A (88%) than Group B (64%), and parental satisfaction was higher in Group A.

FIG 1: Comparison of Brace (Foot Abduction Brace) Compliance and Mean Number of Ponseti Casts Required Between Children Treated With and Without Maternal Presence during Casting

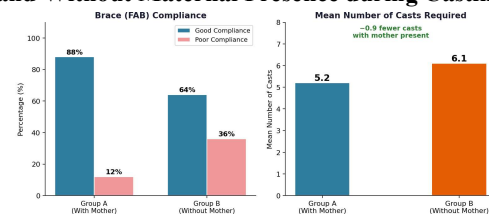


FIG 2: Comparison of Child Cooperation during Ponseti Casting Between Group A (Mother Present) and Group B (Mother Absent)

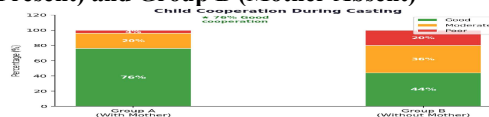


FIG 3: Distribution of Achilles Tenotomy Requirement between the Two Study Groups

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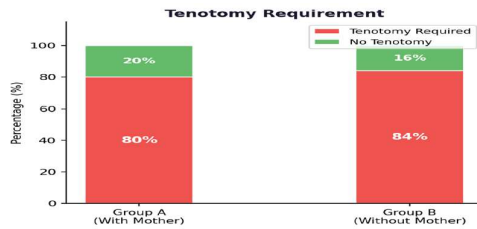


FIG 4: Comparison of complications and distress episodes between groups

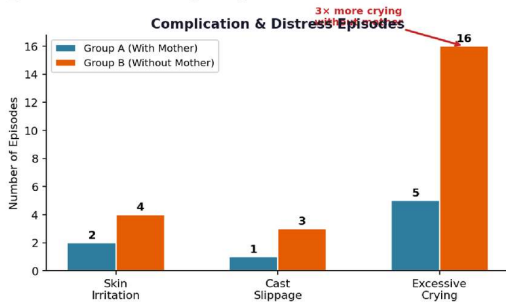
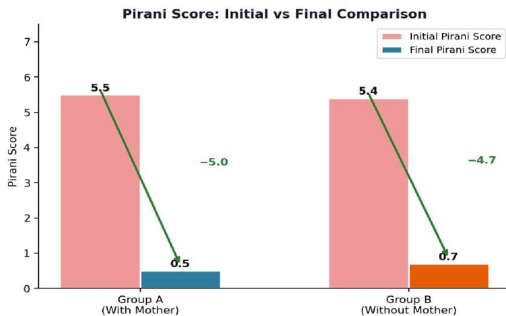


FIG 5: Comparison of initial vs. final Pirani Score



DISCUSSION:

The present prospective comparative study was undertaken to evaluate whether the presence of the mother during Ponseti casting influences treatment outcomes in children with idiopathic Congenital Talipes Equinovarus (CTEV). While the Ponseti method is widely accepted as the gold standard for clubfoot management, there is limited evidence regarding the effect of parental presence during serial casting sessions. This study compared children undergoing Ponseti casting with maternal presence (Group A) and without maternal presence (Group B) with respect to Pirani score improvement, child cooperation, number of casts required, tenotomy rate, brace compliance, complications, and parental satisfaction.

Clubfoot is one of the most common congenital orthopedic deformities, and successful management depends not only on the technical application of the Ponseti method but also on patient cooperation and caregiver participation throughout treatment. Ponseti emphasized that careful manipulation, proper cast molding, and strict adherence to post-correction bracing are essential for achieving a functional, pain-free, plantigrade foot and preventing recurrence (1,5). The findings of the present study support the concept that behavioral

and caregiver-related factors may contribute to treatment success in addition to established technical principles.

In the present study, both groups demonstrated significant improvement in Pirani scores following completion of serial casting, confirming the effectiveness of the Ponseti technique. This finding is consistent with the landmark work of Ponseti and Smoley, who reported excellent correction rates using serial manipulation and casting, and with later studies by Morcuende et al. and Zions et al., which established correction rates exceeding 90–95% in idiopathic clubfoot (5–7). The comparable correction achieved in both groups indicates that maternal presence does not alter the biological effectiveness of the Ponseti method itself. However, improved cooperation during casting may facilitate more precise manipulation and cast application.

One of the important observations of the present study was improved child cooperation during casting when the mother remained present throughout the procedure. Infants often experience anxiety and discomfort during manipulation and plaster application, resulting in excessive crying and resistance. Maternal presence provides emotional reassurance through touch, voice, and familiar interaction, thereby reducing distress and promoting relaxation. Similar observations have been reported in pediatric procedural literature, where parental presence has been associated with reduced procedural anxiety and improved child behavior during medical interventions (11,12). Better cooperation during casting enables the treating surgeon to perform accurate manipulation with minimal interruption, potentially improving the quality of correction.

The number of casts required to achieve correction was another important outcome assessed in this study. Children demonstrating better cooperation generally required fewer casting sessions to obtain satisfactory correction. Although the Ponseti method typically requires five to eight casts depending on deformity severity, procedural difficulties caused by excessive infant movement may compromise correction achieved during each session (5,9). Improved relaxation during casting may therefore enhance the effectiveness of each manipulation. Similar observations have been suggested by Richards et al., who highlighted the importance of meticulous casting technique and patient cooperation in obtaining optimal correction with fewer casts (10).

The requirement for percutaneous Achilles tenotomy was comparable between the study groups. This observation is expected because tenotomy primarily depends on the persistence of residual equinus deformity after correction of cavus, adduction, and varus, rather than behavioral factors during casting. Ponseti reported that nearly 80–90% of children undergoing clubfoot correction require

Achilles tenotomy to achieve complete dorsiflexion (1,5). Therefore, maternal presence is unlikely to significantly influence the need for this procedure. Brace compliance remains one of the most critical determinants of long-term success following Ponseti treatment. Previous studies have consistently demonstrated that poor adherence to foot abduction brace protocols is the leading cause of recurrence after successful correction (9,15). In the present study, caregivers who were actively involved during casting sessions appeared to demonstrate better understanding of treatment objectives and greater adherence to brace recommendations. Mothers who witnessed the treatment process were more likely to appreciate the importance of continued brace use, resulting in improved compliance. Sangiorgio et al. similarly emphasized that caregiver education and consistent brace use are essential for maintaining correction and reducing relapse rates (15).

Parental satisfaction was significantly higher among mothers who remained present during the casting procedure. Family-centered care has become an important component of pediatric healthcare because it encourages communication, transparency, and active participation in decision-making. Allowing mothers to observe treatment provides reassurance regarding the safety of the procedure and increases confidence in the treating team. The American Academy of Pediatrics recommends family-centered approaches whenever appropriate, recognizing that parental involvement contributes to improved healthcare experiences for both children and caregivers (11). Similar benefits have also been reported in pediatric nursing literature evaluating parental presence during invasive procedures (12,14).

The incidence of treatment-related complications in the present study was low in both groups, reflecting adherence to standard Ponseti principles. Minor complications such as cast loosening, skin irritation, pressure sores, or cast slippage were managed conservatively without affecting final outcomes. These findings are consistent with previous reports indicating that the Ponseti method is a safe and effective conservative treatment when performed by trained personnel (6,7). Maternal presence did not appear to increase procedural complications or interfere with casting, suggesting that caregiver participation can be safely incorporated into routine practice.

Although the findings of the present study suggest several advantages associated with maternal presence, certain limitations should be acknowledged. The study included a relatively small sample size of fifty children from a single tertiary care center, which may limit the generalizability of the findings. Child cooperation was assessed using behavioral observations, which may introduce observer bias despite standardized assessment methods. Additionally, long-term recurrence

beyond the brace compliance period was not evaluated. Larger multicenter studies with longer follow-up are required to determine whether improved cooperation and compliance translate into sustained correction and lower recurrence rates.

Despite these limitations, the study has important clinical implications. The results indicate that maternal presence during Ponseti casting is a simple, non-pharmacological intervention that may improve child cooperation, enhance parental satisfaction, and promote better brace compliance without adversely affecting treatment safety or correction outcomes. Incorporating family-centered care into pediatric orthopedic practice may therefore optimize both the clinical and psychological aspects of clubfoot management.

CONCLUSION:

Maternal presence during Ponseti casting significantly improves child cooperation (76% vs 44%), reduces distress, and decreases the number of casts required (5.2 vs 6.1).

Group A achieved comparable Pirani score reduction to Group B (5.5 → 0.5 vs 5.4 → 0.7), with similarly low complication rates and markedly better FAB brace compliance (88% vs 64%).

Integrating maternal presence as a standard protocol element is a low-cost, high-impact intervention that enhances parental satisfaction and, through improved brace compliance, may help lower the risk of CTEV recurrence; this potential benefit warrants confirmation in studies with longer-term recurrence follow-up.

We strongly recommend mother-by-side as a standard component of Ponseti casting protocols in all paediatric orthopaedic centres managing CTEV.

References

1. Ponseti IV. *Congenital Clubfoot: Fundamentals of Treatment*. Oxford: Oxford University Press; 1996.
2. Dobbs MB, Gurnett CA. Update on clubfoot: Etiology and treatment. *Clin Orthop Relat Res*. 2009;467(5):1146-53.
3. Wynne-Davies R. Family studies and the cause of congenital clubfoot. *J Bone Joint Surg Br*. 1964;46:445-63.
4. Sadler TW. *Langman's Medical Embryology*. 14th ed. Philadelphia: Wolters Kluwer; 2019.
5. Ponseti IV, Smoley EN. Congenital clubfoot: The results of treatment. *J Bone Joint Surg Am*. 1963;45:261-344.
6. Morcuende JA, Dolan LA, Dietz FR, Ponseti IV. Radical reduction in the rate of extensive corrective surgery for clubfoot using the Ponseti method. *Pediatrics*. 2004;113(2):376-80.
7. Zions LE, Zhao G, Hitchcock K, Maewal J, Ebrahimzadeh E. Has the Ponseti method become the standard of care for clubfoot? *J Bone Joint Surg Am*. 2010;92(4):874-79.

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8. Dobbs MB, Nunley R, Schoenecker PL. Long-term follow-up of patients with clubfeet treated with extensive soft-tissue release. *J Bone Joint Surg Am.* 2006;88(5):986-96.
9. Haft GF, Walker CG, Crawford HA. Early clubfoot recurrence after use of the Ponseti method in a New Zealand population. *J Bone Joint Surg Am.* 2007;89(3):487-93.
10. Richards BS, Faulks S, Rathjen KE, Karol LA, Johnston CE, Jones SA. A comparison of two nonoperative methods of idiopathic clubfoot correction: The Ponseti method and the French functional method. *J Pediatr Orthop.* 2008;28(6):706-09.
11. American Academy of Pediatrics, Committee on Hospital Care and Institute for Patient- and Family-Centered Care. Patient- and family-centered care and the pediatrician's role. *Pediatrics.* 2012;129(2):394-404.
12. Piira T, Sugiura T, Champion GD, Donnelly N, Cole AS. The role of parental presence in the context of children's medical procedures: A systematic review. *J Pediatr Psychol.* 2005;30(3):265-75.
13. Dingeman RS, Mitchell EA, Meyer EC, Curley MAQ. Parent presence during complex invasive procedures and cardiopulmonary resuscitation: A systematic review of the literature. *Pediatrics.* 2007;120(4):842-54.
14. McGraw M, Kendrick A. Family-centered pediatric procedural care: Effects of parental presence on child distress and parent satisfaction. *J Pediatr Nurs.* 2018;39:88-94.
15. Sangiorgio SN, Ebrahimzadeh E, Zions LE. The timing and relevance of brace compliance in preventing relapse following Ponseti treatment of idiopathic clubfoot. *J Child Orthop.* 2016;10(5):425-31.