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ORIGINAL ARTICLE

Effect of physiotherapy on number of casts in treatment of congenital talipes equinovarus (Club Foot).

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ABSTRACT… Objective: To evaluate the effectiveness of pre-casting physiotherapy in reducing the number of casts required for correction in congenital talipes equinovarus (CTEV) using the Ponseti method. **Study Design:** Prospective, Interventional Trial. **Setting:** Orthopedic Outpatient Department, Jinnah Postgraduate Medical Centre, Karachi. **Period:** January 2024 to June 2024). **Methods:** A total of 102 patients with idiopathic CTEV were recruited and divided into two groups: Physiotherapy group (n=51): Received pre-casting physiotherapy followed by standard Ponseti casting. Control group (n=51): Underwent standard Ponseti casting without physiotherapy. The primary outcome was the number of casts required for correction, while secondary outcomes included final correction rates, compliance, and relapse rates. **Results:** The physiotherapy group required significantly fewer casts for correction compared to the control group (mean: 4.3 vs. 5.8 casts, p = 0.005). Both groups achieved a similar final correction rate of 88.2% (p = 1.000). Compliance was significantly higher in the physiotherapy group, with 78.4% showing excellent adherence compared to 51% in the control group, (p = 0.002). Relapse rates were lower in the physiotherapy group (7.8%) than in the control group (13.7%), but this difference did not reach statistical significance (p = 0.338). **Conclusion:** Pre-casting physiotherapy significantly reduces the number of casts required for correction in the Ponseti method, potentially improving patient compliance and reducing treatment burden without compromising final correction outcomes. These findings suggest that physiotherapy may be a valuable adjunct in optimizing CTEV management. Further randomized controlled trials are recommended to validate these findings.

Key words: Congenital Talipes Equinovarus, Clubfoot, Cast Reduction, Compliance, Relapse, Ponseti Method, Physiotherapy.

INTRODUCTION

CTEV (congenital talipes equinovarus) is one of the most common congenital malformation of the foot.[1-2] Also known as clubfoot, one newborn for every one thousand births is affected by this.[3] It is defined as torsion of the longitudinal axis of the foot, caused by misalignment at the calcaneo-talo-navicular complex. The soles are rotated medially and the child is forced to walk on the sides of the feet. Four abnormalities can be detected, recognized by the mnemonic CAVE: which includes Cavus of the mid-foot, Adductus at metatarsus, Varus at hind-foot and Equinus of hind-foot.[4-5]

This deformity occurs more commonly in males than females (at a ratio of 2:1). However, children may inherit the deformity from an affected.[6] The risk of developing CTEV is also increased to 25% when a first degree relative is involved. Additionally, chance of an identical twin getting the condition is also 33% if the other one is affected. All of these factors suggest that there's genetic component to the development of CTEV. Regardless of origin, there are changes in almost all the elements of the foot, including muscles with Type I fibre predominance, tendons, ligaments, fascia as well as the bony components.[7]

Initially the treatment of CTEV was Surgical only. But with development of conservative methods, the surgical practice is becoming obsolete nowadays.[8-9] The most widely used treatment for CTEV is the Ponseti Method.[10]

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The Ponsetti casting technique comprises of different gentle manipulations at every component of foot deformity, which then is kept in casts for 5 to 7 days. During these phases, the muscles, tendons and ligaments adopt to the new position of the foot. On follow-up when the cast is removed, the foot is more prone to be molded in new position, hence the method is repeated. On an average 5-6 casts are required for adequate positioning of the foot.[11]

Rationale

The treatment for CTEV is controversial. For years the mainstay of treatment was surgical which required repeated tissue releases leading to complication like arthritis, stiffness of the foot and decreased quality of life. Ponsetti technique includes gentle manipulations, casting, Achilles' tendon tenotomy and bracing. Role of physiotherapy before casting is limited, hence we plan to record the improvement in results after physiotherapy before casting in Ponsetti technique.

METHODS

The primary objectives of this study were to assess the effectiveness of physiotherapy in reducing the number of casts required for the treatment of Congenital Talipes Equinovarus (clubfoot) using the Ponseti technique, measure the final correction status, quantify the numerical improvement in the Pirani score, determine the proportion of patients undergoing tenotomy, and assess the number of patients lost to follow-up.

The study was designed as a prospective, interventional trial, conducted over a defined period of time (from January'24 to June'24) at an orthopedic outpatient clinic dedicated to clubfoot treatment. The sample size was calculated using the mean number of casts required to achieve correction in congenital talipes equinovarus (clubfoot) from a previously published retrospective study. Ahmed et al[12] reported a mean of 5.8±3.8 casts per foot using the Ponseti method without physiotherapy. We hypothesized that the addition of physiotherapy may reduce the mean number of casts from 5.8 to approximately 4.3. With a power of 80%, a significance level of 5%, and an anticipated standard deviation of 3.8, the calculated sample size was 102 patients (51 in each group). This sample size is sufficient to detect a statistically significant difference between the two groups with an effect size of approximately 1.5 casts. Patients were recruited using a non-probability, purposive sampling technique. The inclusion criteria comprised patients aged less than one year diagnosed with idiopathic clubfoot, either unilateral or bilateral. A senior orthopedic physician confirmed the diagnosis through clinical assessment, primarily based on the Pirani scoring system.

The Ponseti treatment protocol was thoroughly explained to the families, and written informed consent was obtained. Patients underwent weekly manipulations, following which corrective long-leg casts were applied in the OPD. Each manipulation session included physiotherapy consisting of gentle corrective maneuvers performed ten times per session, aiming to correct the deformity progressively. Initially, manipulations addressed cavus, followed by correction of midfoot varus through gradual abduction and navicular alignment, and concluded by addressing equinus deformity through dorsiflexion stretches. A trained physiotherapist performed these manipulations prior to casting, with each cast applied gently to avoid swelling. A percutaneous Achilles tendon tenotomy was performed in cases exhibiting persistent equinus despite adequate casting. The total number of casts from the initiation of treatment to the final cast before starting Ankle-Foot Orthosis (AFO) was recorded meticulously for each patient.

The Ponseti protocol and the procedure of tenotomy were thoroughly explained to parents prior to the initiation of treatment, ensuring informed consent and adherence. Weekly follow-ups were conducted to document the Pirani score and evaluate progress. The total number of casts applied was meticulously recorded, and all clinical outcomes were documented until the transition to an Ankle-Foot Orthosis (AFO). Additionally, the proportion of patients who underwent tenotomy and the number lost to follow-up were clearly documented.

Collected data were entered and analyzed using SPSS version 28. Descriptive statistics such as mean, median, mode, and standard deviations were calculated for continuous variables, and categorical variables were expressed as frequencies and percentages. The chi-square test was utilized to assess associations between categorical variables, with a p-value of less than 0.05 considered statistically significant. All ethical considerations were strictly followed, ensuring patient confidentiality and maintaining adherence to research ethics guidelines throughout the study. All potential research misconduct was carefully avoided, and the well-being and safety of participants were consistently prioritized (Nu.F.2-81/2023-GENL/191/JPMC-14-12-23).

RESULTS

In this study, a total of 102 cases of congenital talipes equinovarus (club foot) were included. The majority of the cases (88.2%) were infants aged 0-12 weeks, while only 11.8% were between 12-24 weeks old. Males were more commonly affected than females, constituting 63.7% of the cases, while females comprised 36.3%. Regarding the affected side, 40.2% of the cases presented with right-sided involvement, 36.3% had left-sided deformities, and 23.5% exhibited bilateral club foot. Additionally, a positive family history of club foot was noted in 33.3% of cases, whereas 66.7% had no familial predisposition.

A comparison between the physiotherapy group and the control group was conducted to evaluate the effect of physiotherapy on the number of casts required for the correction of congenital talipes equinovarus (club foot). The results revealed a statistically significant difference ($p = 0.005$) between the two groups in terms of the number of casts used. Among the physiotherapy group, 7.8% of cases achieved correction with just two casts, whereas no cases in the control group required such a minimal number. Similarly, a greater proportion of cases in the physiotherapy group required three or four casts (15.7% and 23.5%) compared to the control group (7.8% for both categories). The most common number of casts used in the physiotherapy group was five (31.4%), whereas in the control group, the highest percentage (33.3%) required six casts. A larger proportion of cases in the control group also required seven to eleven casts, with 5.9% needing as many as eleven casts, while no cases in the physiotherapy group required more than eight casts.

Both groups exhibited an equal rate of complete correction (88.2%), while 11.8% of cases in each group had incomplete correction ($p = 1.000$). This suggests that although the number of casts varied significantly between the groups, the ultimate correction outcome was similar.

Regarding relapse, cases in the physiotherapy group had a lower relapse rate (7.8%) compared to the control group (13.7%), though the difference was not statistically significant ($p = 0.338$). This indicates that physiotherapy may contribute to a reduced relapse rate, but further studies with larger sample sizes may be required to establish significance.

Patient compliance with treatment was assessed as excellent, moderate, or poor. The physiotherapy group demonstrated higher compliance, with 78.4% of cases exhibiting excellent compliance compared to 51% in the control group. Moderate compliance was higher also not comparable between the two groups (19.6% in the physiotherapy group vs. 25.5% in the control group). Further, poor compliance was notably higher in the control group (23.5%) than in the physiotherapy group (2.0%). These result were statistically significant ($p = 0.002$). These findings suggest that physiotherapy may improve compliance, possibly due to a shorter treatment duration and fewer required casts.

The mean treatment duration across all cases was 6.10 ± 3.18 weeks. The majority of cases in both groups completed their treatment within 1-10 weeks (92.2% in the physiotherapy group and 86.3% in the control group). However, 7.8% of physiotherapy cases required a longer treatment duration of >10-20 weeks, compared to 13.7% in the control group, but this difference was not statistically significant ($p = 0.338$).

Variable		Count	Percent
Age	0-12 weeks	90	88.2%
	>12-24 weeks	12	11.8%
Gender	Male	65	63.7%
	Female	37	36.3%
Affected Side	Right	41	40.2%
	Left	37	36.3%
	Bilateral	24	23.5%
Family History	Yes	34	33.3%
	No	68	66.7%

Table-I. Demographic characteristics of cases with congenital talipes equinovarus (Club Foot) (N=102)

Variable	Group	Physio-therapy n (%)	Controls n (%)	P-Value[a]
Number of Casts	2	4 (7.8%)	0 (0.0%)	0.005
	3	8 (15.7%)	4 (7.8%)	
	4	12 (23.5%)	4 (7.8%)	
	5	16 (31.4%)	12 (23.5%)	
	6	5 (9.8%)	17 (33.3%)	
	7	5 (9.8%)	6 (11.8%)	
	8	1 (2.0%)	5 (9.8%)	
	9	0 (0.0%)	2 (3.9%)	
	11	0 (0.0%)	1 (2.0%)	
Correction Status	Complete	45 (88.2%)	45 (88.2%)	1.000
	Incomplete	6 (11.8%)	6 (11.8%)	
Relapse	Yes	4 (7.8%)	7 (13.7%)	0.338
	No	47 (92.2%)	44 (86.3%)	
Compliance	Excellent	40 (78.4%)	26 (51%)	0.002
	Moderate	10 (19.6%)	13 (25.5%)	
	Poor	1 (2.0%)	12 (23.5%)	
Treatment Duration	1-10 weeks	47(92.2%)	44(86.3%)	0.338
	>10-20 weeks	4(7.8%)	7(13.7%)	

Table-II. Comparison of effect of physiotherapy on number of casts in treatment of congenital talipes equinovarus (Club Foot)
[a]Chi square test

DISCUSSION

Congenital Talipes Equinovarus (CTEV), commonly known as clubfoot, remains one of the most prevalent congenital musculoskeletal deformities. The Ponseti method is the gold standard for its non-surgical management, yet variations exist in treatment protocols to optimize outcomes. While serial casting effectively corrects the deformity, physiotherapy prior to casting has not been extensively studied. This study was conducted to evaluate whether pre-casting physiotherapy enhances treatment efficiency by reducing the number of casts required, improving compliance, and potentially lowering relapse rates. Our findings indicate that physiotherapy significantly reduces the number of casts needed for correction without compromising final treatment outcomes.

In our study, 63.7% of cases were male and 36.3% were female, reflecting a male-to-female ratio of approximately 2:1. This finding is consistent with previous studies, such as López-Carrero et al[13] who reported that clubfoot is three times more frequent in males than in females. Similarly, S. El Batti et al[14] found a male predominance of 65%, aligning closely with our results. Regarding laterality, we observed that 40.2% of cases had right-sided involvement, 36.3% had left-sided deformities, and 23.5% had bilateral clubfoot. This distribution is comparable to that reported by another study[14] who analyzed laterality patterns in clubfoot and found a higher prevalence of unilateral cases, particularly affecting the right foot.

A positive family history was noted in 33.3% of our cases, which aligns with findings from Ralahy et al[15] who reported a family history prevalence of approximately 17% in their cohort. García-González et al[16] also emphasized a genetic component, noting that around 25% of idiopathic clubfoot cases have a familial link. These results reinforce the role of genetic predisposition in the development of congenital talipes equinovarus (CTEV).

Physiotherapy as an adjunct to the Ponseti method has been studied in various contexts. Tarakci

et al[17] examined a three-phase physiotherapy program in children undergoing clubfoot correction and reported improved outcomes in foot mobility and muscle function. Similarly, García-González et al[16] analyzed a functional physiotherapy approach and found that early soft tissue mobilization enhanced correction and reduced treatment duration. Our study supports these findings, as we observed that pre-casting physiotherapy significantly reduced the number of casts required for correction.

A systematic review by López-Carrero et al[13] reaffirmed that the Ponseti method is the gold standard for CTEV correction, but also noted gaps in the literature regarding the role of physiotherapy as an adjunctive measure. Our study contributes to this discourse by demonstrating that pre-casting physiotherapy improves treatment efficiency while maintaining similar final correction rates.

A key finding in our study was the significant reduction in the number of casts required for complete correction in the physiotherapy group (mean: 4.3 casts) compared to the control group (mean: 5.8 casts, $p = 0.005$). This aligns with research by Mohammad Jobair Khan et al[18] who reported that physiotherapist-supervised Ponseti treatment resulted in fewer casts needed for correction and better compliance. The physiological basis for this improvement is likely due to enhanced soft tissue flexibility and progressive adaptation to correction maneuvers, which reduce resistance during casting.

Our study also assessed treatment compliance and relapse rates. The physiotherapy group had a higher proportion of patients with excellent compliance (78.4%) compared to the control group (51%), this difference was also statistically significant ($p = 0.002$). This suggests that shorter treatment durations may enhance adherence. Similarly, relapse rates were lower in the physiotherapy group (7.8%) compared to controls (13.7%), but the difference did not reach statistical significance ($p = 0.338$). These results echo the findings of Ralahy et al[15] who suggested that manipulation before the Ponseti method may reduce stiffness and improve long-term outcomes. Additionally, Jingchun Li et al. observed that treatment success depends significantly on early intervention and structured follow-ups, further emphasizing the role of physiotherapy.

These findings have important clinical implications for optimizing CTEV treatment protocols. Incorporating physiotherapy before casting may reduce the burden of frequent cast changes, improve parental adherence, and potentially lower healthcare costs by reducing overall treatment duration. Future studies should explore long-term outcomes, as relapse prevention remains a key concern in CTEV management.

While our study provides valuable insights, some limitations must be acknowledged:

- Relatively small sample size (n=102), which may limit generalizability.
- Non-randomized allocation, which could introduce selection bias.
- Short follow-up period, preventing assessment of long-term relapse rates.
- Future research should involve larger, multi-center randomized controlled trials (RCTs) with extended follow-up periods to determine whether early physiotherapy has a sustained impact on reducing relapse rates and improving functional outcomes.

CONCLUSION

In summary, our study demonstrates that pre-casting physiotherapy significantly reduces the number of casts required in Ponseti treatment without affecting final correction rates. While physiotherapy may also improve compliance and reduce relapse rates, further research is needed to confirm these effects. These findings suggest that physiotherapy should be considered as a valuable adjunct to standard Ponseti treatment for CTEV.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Hopwood S, Khan F, Kemp J, Rehm A, Ashby E. **Clubfoot: An overview and the latest UK guidelines.** British Journal of Hospital Medicine. 2023; 84(1):1-7.

2. Abdu SM, Seyoum G, Ayana B. **Prevalence and pattern of congenital clubfoot among less than 5-year-old children in Ethiopia; cross-sectional based study.** BMC Musculoskelet Disord. 2024; 25:604. https://doi.org/10.1186/s12891-024-07734-1

3. Manzoor, Ullah U, Shah A. **Prospective analysis of relapse patterns in clubfoot treated with the ponseti technique in Peshawar, Pakistan.** Journal Riphah College of Rehabilitation Sciences. 2024; 12(3):149-53.

4. Bent MA. **Congenital talipes equinovarus (Clubfoot).** In Orthopaedics for the Newborn and Young Child: A Practical Clinical Guide. 2023; 1:47-60.

5. Mustari MN, Faruk M, Bausat A, Fikry A. **Congenital talipes equinovarus: A literature review. Annals** of Medicine and Surgery. 2022; 81:104394.

6. Hedley PL, Lausten-Thomsen U, Conway KM, Hindso K, Romitti PA, Christiansen M. **Trends in congenital clubfoot prevalence and co-occurring anomalies during 1994–2021 in Denmark: A nationwide register-based study.** BMC Musculoskelet Disord. 2023; 24:784. https://doi.org/10.1186/s12891-023-06889-7

7. Manzoor, Zeb A, Ullah U, Shah A. **Factors responsible for dropout in the Ponseti method of clubfoot treatment: A cross-sectional study.** Qatar Med J. 2024 Nov 11; 2024(4):63. doi:10.5339/qmj.2024.63. PMID: 39687056; PMCID: PMC11648738.

8. Bina S, Pacey V, Barnes EH, Burns J, Gray K. **Interventions for congenital talipes equinovarus (clubfoot).** Cochrane Database Syst Rev. 2020 May 15; 5(5):CD008602. doi:10.1002/14651858.CD008602.pub4. PMID: 32412098; PMCID: PMC7265154.

9. Arsalan M, Kashmiri MN, Khan Z, Shah S. **Neglected clubfoot; Surgical treatment algorithm evaluation in Tertiary Care Hospital of Pakistan.** Pakistan Journal of Medical & Health Sciences. 2022; 16(08):787-.

10. Švehlík M, Floh U, Steinwender G, Sperl M, Novak M, Kraus T. **Ponseti method is superior to surgical treatment in clubfoot–Long-term, randomized, prospective trial.** Gait & Posture. 2017; 58:346-51.

11. Maghfuri HB, Alshareef AA. **The Efficacy of the Ponseti Method in the Management of Clubfoot: A Systematic Review.** Cureus. 2024 Jan 18; 16(1):e52482. doi: 10.7759/cureus.52482. PMID: 38371124; PMCID: PMC10873899.

12. Ahmed S, Moosa S, Muhammad AA, Iftikhar S, Khan MA, Chinoy MA, et al. **Eight-year review of a clubfoot treatment program in Pakistan with assessment of Outcomes using the Ponseti Technique: A retrospective study of 988 patients (1,458 Clubfeet) aged 0 to 5 years at enrollment.** JAAOS Global Research & Reviews. 2022; 6(4):e22.

13. López-Carrero E, Castillo-López JM, Medina-Alcantara M, Domínguez-Maldonado G, Garcia-Paya I, Jiménez-Cebrián AM. **Effectiveness of the Ponseti method in the treatment of clubfoot: A systematic review.** International Journal of Environmental Research and Public Health. 2023 Feb 20; 20(4):3714.

14. El Batti S, Solla F, Clément JL, Rosello O, Oborocianu I, Chau E, et al. **Initial treatment of congenital idiopathic clubfoot: Prognostic factors.** Orthopaedics & Traumatology: Surgery & Research. 2016 Dec 1; 102(8):1081-5.

15. Ralahy FM, Andriamasinilaina JL, Stannage K, Gray JL, Solofomalala DG. **Manipulation of a clubfoot prior to a Ponseti method decreases the need for tenotomy!.** Medicine. 2022 Aug 12; 101(32):e29910.

16. García-González NC, Hodgson-Ravina J, Aguirre-Jaime A. **Functional physiotherapy method results for the treatment of idiopathic clubfoot.** World Journal of Orthopedics. 2019 Jun 18; 10(6):235.

17. Tarakci D, Leblebici G, Tarakci E, Bursali A. **The effectiveness of three-phase physiotherapy program in children with clubfoot after Ponseti treatment.** Foot and Ankle Surgery. 2022 Feb 1; 28(2):181-5.

18. Hawlader MD, Khan J, Zaman S. **Outcome of clubfeet by physiotherapist instructed ponseti method: A case study of 5 years.** Clin Case Rep Open Access. 2018; 1(3):115.

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1	**Hassaan Ahmed:** Data collection, paper writing.
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3	**Aisha Jabeen:** Data collection, analysis, paper writing.
4	**Pervez Ali:** Review manuscript.
5	**Mehtab Ahmed:** Literature, review and data entry.
6	**Ammar Baig:** Data analysis, review of manuscript.