

Ponseti Technique In Children With Idiopathic Club Foot Presenting After 1 Year Of Age: A Retrospective Study

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Abstract

Background: Ponseti method is accepted as gold standard treatment for idiopathic clubfoot in infants. However, very few studies are available in literature on use of Ponseti method in older children. The aim of this study is to determine the effectiveness of Ponseti technique in the treatment of late presenting congenital idiopathic club foot (CTEV).

Material & Methods: We retrospectively evaluated the results of ponseti method of serial casting in 23 patients with 32 clubfeet (15 males and 8 females) presenting after the walking age by using Pirani score. Quantitative variables were expressed as mean \pm standard deviation and compared between initial and last follow-up scores using the paired t-test.

Results: The mean age at presentation was 3.4 (range 1 to 15) years and mean follow up was 14.2 (range 6 to 21) months. The mean pre-correction Pirani score improved from 4.51 (range 2.5 to 6) to 0.55 (range 0 to 1) after treatment, respectively which was statistically significant ($p < .001$). In 95% of the feet, satisfactory correction of the deformity was achieved. The mean number of casts applied was 9.2 (range 6 to 16).

Conclusion: The Ponseti technique is an effective method for the management of idiopathic clubfoot, even in older children up to 15 years of age.

Keywords: Clubfoot, Ponseti method, Pirani score, Neglected CTEV

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Introduction

Club foot (CTEV) is among one of the most common congenital musculoskeletal defects [1]. With the introduction of the Ponseti method, treatment of congenital club foot has changed radically in most centers worldwide in favour of serial casting. However, most of these studies on Ponseti method are done in younger children, before the walking age [1,2].

Late presentation of CTEV child after walking age, is a common problem in developing countries like ours due to social stigma, lack of

education, poverty and lack of proper health services [3,4]. These neglected cases when present late, after walking age are complicated by severe deformities, contractures, deformation of bones, callosities and ulcers [5]. The conservative treatment becomes difficult. In the past decades many extensive soft tissue and bony surgeries have been performed to treat such deformities of neglected cases, but the results were not very promising. Additionally, surgeries were associated with many complications such as poor soft tissue healing and higher relapse rate. This results in significant disability, dependency of patient for activities of daily

living, financial and psychological impact on the family and finally many of these patients with neglected clubfoot deformity end up living as beggars on the streets [3,4].

Inspired by some studies which showed excellent role of Ponseti method even in late presenting walking patients of club foot [6-9], we retrospectively analyzed the results and role of Ponseti method of serial casting in neglected club foot deformity, done in the clubfoot clinic of our institution.

Material and Methods

We retrospectively analyzed the records of club feet cases who had been treated by Ponseti method in the club foot clinic of our institute from April 2016 to March 2019. Only neglected cases of CTEV i.e. presenting late after the walking age or one year with idiopathic club foot, with no previous treatment were included in the study. Secondary club foot, atypical clubfoot, non-healing ulcers, previously treated or prior surgeries done were excluded from the study. 29 cases were found eligible to be included in the study, but 6 cases were lost to follow-up after initial correction and were not available with complete follow up and hence were excluded from the study. Thus finally, only 23 cases of neglected CTEV were included in the study.

All the parents of club feet children had been found to be informed about the treatment protocol and they consented to be included as a subject in any study done by the institution. Institutional ethical committee approval was obtained.

All the patients were evaluated pre-treatment and at each visit by Pirani scoring system [10] and were treated weekly with Ponseti's method of serial manipulation and above knee plaster cast application [2]. The feet were manipulated for approximately 10 minutes before plaster cast application. The casting continued till foot abduction to approximately 30° to 40° was achieved (instead of 70°) which is recommended for elder child [11]. Finally, the equinus deformity was corrected by a percutaneous Achilles tenotomy in all

patients irrespective of the age, followed by casting with full correction. The tenotomy in younger children was performed under local anesthesia. Spinal or general anesthesia was preferred in older children as more manipulation was expected in these cases due to presence of a more rigid equinus and cavus deformity. A repeat tenotomy of tendo-achilles was done in children where adequate dorsiflexion, i.e., at least 5° of dorsiflexion was not achieved by the first tenotomy. In few patients percutaneous plantar fasciotomy was needed to correct the residual cavus deformity.

Post-tenotomy cast was removed at 3 weeks in patients aged less than 3 years and 4 weeks in patients aged more than 3 years. After the deformity was corrected, a foot abduction brace was prescribed to all patients for next one year. Initially the brace was worn for 23 hours a day for the first 3 months and after that brace wearing was advised for night time only.

Retrospective data was collected and analyzed forage at the time of presentation, severity of deformity by the Pirani score at initial presentation, change in the Pirani score after the final cast, the number of casts required to achieve full correction and any complications during the casting or bracing phase of the treatment. The quantitative variables were expressed as mean \pm standard deviation and compared between preoperative and postoperative follow-up using the paired t-test. Statistical analysis was performed and a $P < 0.05$ was considered statistically significant.

Results

Out of 23 cases of CTEV who presented after 1 year of age, 9 had bilateral involvement whereas 14 had unilateral deformity (32 club feet). There were 15 male and 8 female patients.

The mean age at presentation was 3.4 (range 1 to 15) years. The mean pre-correction Pirani score was 4.51 (range 2.5 to 6). The mean post-correction Pirani score was 0.55 (range 0 to 1). This difference was statistically

significant ($p < .001$). The mean number of casts applied to achieve final correction was 9.2 casts (range 6 to 16 casts). In 95% of the feet, satisfactory correction of the deformity was achieved (fig 1 & 2). The mean follow-up duration was 14.2 (range 6 to 21) months. A percutaneous Achilles tenotomy was performed in all patients with a mean ankle dorsiflexion after tenotomy of 7° (0° to 10°).

Fig 1. Pre (a) and post (b) treatment clinical photograph of 4 years old child of neglected bilateral CTEV treated by Ponseti casting.



Fig 2. Pre (a) and post (c & b) treatment clinical photograph of 15 years old child of neglected CTEV left side treated by Ponseti casting. Lateral X ray of ankle with foot (d) showing deformed bones, although the foot is corrected clinically.



Complications noticed during the casting phase were mild and manageable. Four patients developed erythema, slight swelling of the toes and redness of the skin due to excessive pressure. Dynamic supination was present in four feet, but caused minimal

disturbance of gait and hence was not operated. No infections, skin necrosis, neurovascular compromise or profuse bleeding after tenotomy were observed. No problems with healing were seen after the tenotomy, even in the oldest patient with age 15 years. Repeat Achilles tenotomy was done in 10 feet due to incomplete initial correction of equinus in 4 and recurrence of equinus in 6 feet. All of the parents were satisfied with the treatment offered to their child as appearance of the feet had improved and children were able to wear normal shoes for the first time in their lives and were able to walk plantigrade.

Discussion:

Neglected clubfoot is a common problem in developing countries due to lack of awareness, poverty and lack of proper medical facilities. It causes considerable physical, social, psychological and financial burdens on the patient and their families. Adults with untreated club feet can experience pain and disability, and have difficulty in finding a job [3-5]. The treatments of neglected clubfoot in the past have been extensive soft tissue release surgery, osteotomies, various types of fixators or arthrodesis. Long term studies of these surgical procedures have shown poor results with complications like painful feet, arthritis, joint stiffness and residual deformity [11-15].

Ponseti method has currently been the gold standard in treatment of CTEV, especially in infants. A few studies have shown promising results evaluating the use of Ponseti method in children with neglected clubfeet [6-9,16]. We have been treating all age group CTEV deformities at our clinic by Ponseti method and inspired by results of these studies, we retrospectively analyzed our results of Ponseti casting in 32 neglected club feet (23 children) with mean age of 3.4 years. In our study, with mean number 9.2 (range 6 to 16) cast, we were able to correct mean pre-treatment pirani score of 4.51 to 0.55 in these neglected CTEV cases with ponseti method of casting in mean follow up period of 14.2 months, which was statistically significant ($p < .001$). In 95% of our feet, satisfactory correction of the deformity was achieved, with all patients

having painless, plantigrade, and cosmetically acceptable feet. It was also observed that percutaneous Achilles tenotomy, which was done in all cases, healed uneventfully even in oldest patient with 15 years' age.

Lourenço and Morcuende treated 17 patients (24 feet) with neglected clubfeet, with mean age of 3.9 years and found good results in 16 feet (66.6%) [6]. Verma et al also found Ponseti method to be very effective in correction of CTEV deformity in toddlers [7]. Khan and Kumar treated neglected clubfoot in 21 children (25 feet) over 7 years' age and found good results in 18 feet (85.7%) [8]. Sinha et al treated 41 clubfeet in 30 patients with mean age of 3.02 years and were able to correct all the feet but in 17% equinus recurred [16]. In our study also, 18.75% (6 feet) feet had recurrence of equinus deformity which was managed by repeat percutaneous Achilles tenotomy without any open soft tissue release surgery. This is because in older children while manipulation and casting, dorsiflexion is most difficult to achieve and hence residual equines persists, which may require repeat tenotomy, especially in older children more than 7 years' age [7].

The mean number of cast (9.2 cast) to correct the deformity in our series was higher than the number as suggested by ponseti (5.2 cast). But this was obvious because, Ponseti mentioned this mean number of cast for correction of CTEV cases when presenting at less than one-year age whereas we treated neglected CTEV cases presenting after walking age of one year. The mean number of casts in our series was comparable to series by

Lourenço and Morcuende (9 biweekly cast), Khan and Kumar (12.1 casts) and Verma (10 cast) [6-8].

It was also observed that in these older children, the feet could not be abducted beyond 40°, as has been advised 70° in younger children. This is because as towards the skeletal maturity, there is poor bone remodeling from deformed state and hence achieving full bony correction by soft tissue manipulation is difficult and not possible. Hence although foot seemed normal shaped externally, but bone could not remodel fully and are seen irregular on X rays, which also is cause of persistence of small sized foot (fig 2). Even Lourenço and Morcuende in their study mentioned that abduction was attempted to approximately 30–40° instead of 70° as recommended in infants [6].

We have also observed that above knee plaster casts and abduction brace were poorly tolerated especially by older children that could have been a risk factor for noncompliance and failure of treatment, but this issue had been dealt with proper parent's education and counseling. A retrospective study and lesser number of patients are limitations of our study.

Conclusion

Presentation of neglected club foot at a later stage after walking age of patient is common in our country, but even in these cases Ponseti's method is a safe, effective and inexpensive method for treatment, although the mean number of cast may be higher and fully abduction of 70° cannot be achieved.

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