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A comparative study between standard and accelerated ponseti method in management of idiopathic congenital talipes equinovarus

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Abstract

Introduction: Congenital Talipes Equinovarus is one of the most common congenital deformities of foot and ankle. Ponseti method of serial manipulation and once weekly casting has claimed a success rate of 95 %. However, modification of the Ponseti method in terms of duration with twice weekly casting can shorten the time immobilized in plaster with increased parents compliance.

Materials and Methods: A randomized comparative study was carried out for total 64 patients (100 clubfoot) attending the Outpatient department of Orthopaedics, Silchar Medical College and Hospital from 1st June, 2017 to 31st May, 2018. 32 patients each in Standard Ponseti group and Accelerated Ponseti group were allotted according to computer generated randomisation plan. The method of manipulation was similar in both the groups with once weekly casting in Standard Ponseti group and twice weekly casting in Accelerated Ponseti group. The initial and final Pirani scores, number of casts required for correction, treatment time in plaster, rate of tenotomy and relapse of deformity in the Standard and Accelerated Ponseti groups were recorded and compared using paired and unpaired t-test methods as required.

Results: The two groups did not differ with respect to their initial and final Pirani scores. The mean number of casts required was 5.92 ± 1.09 in Standard Ponseti group, and 6.09 ± 1.11 in Accelerated Ponseti group (p-value = 0.4203). However, there was significant difference in the treatment time in plaster with mean treatment time of 41.42 ± 7.62 days (range -28 to 56 days) in Standard Ponseti group and 21.13 ± 3.94 days (range-14 to 31 days) in Accelerated Ponseti group with p-value < 0.05. 41 out of 48 feet in Standard Ponseti group and 46 out of 52 feet in Accelerated Ponseti group required percutaneous tenotomy. Relapse of equinus and adduction deformity was seen in 3 feet each in Standard and Accelerated Ponseti groups on follow up.

Conclusion: Accelerated Ponseti method of twice weekly casting has similar results as Standard Ponseti method with the advantage of earlier correction of the deformity and better parents compliance.

Keywords: CTEV, accelerated ponseti method, pirani score, standard ponseti method

1. Introduction

Congenital Talipes Equinovarus (CTEV) is one of the most common congenital deformities of foot and ankle ^[1]. The incidence of congenital talipes equinovarus is approximately one in every thousand live births ^[2]. Males are affected twice as often as females. Bilateral deformities occur in 50% of cases and in unilateral cases, right foot has slight preponderance ^[3]. The four basic components of CTEV are - cavus, forefoot adduction, hind foot varus and ankle equinus. The cavus component involves forefoot plantar flexion. Forefoot adduction occurs at the midtarsal joint mainly at the talonavicular joint. In the varus component, the hind foot is rotated inwards and this occurs primarily at the talocalcaneonavicular joint. Equinus deformity occurs at the ankle joint ^[4]. Many methods have been described for the correction of deformity starting from bandages in Hippocrates time, splinting, binding and casting, posteromedial release of soft tissues, bony procedures and arthrodesis. However, 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 ^[5, 6]. Ponseti method of serial manipulation and casting has claimed a success rate of about 95 % ^[7].

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Many authors emphasized that shortening the correction time is required for patients travelling long distances seeking for treatment. They found that the feet can be corrected at a significantly shorter time by manipulation and casting twice weekly as compared to the traditional protocol of once weekly casting with equivalent outcomes [8]. This study was undertaken to compare the results of Standard Ponseti method with that of the Accelerated Ponseti method in management of idiopathic congenital talipes equinovarus.

2. Materials and methods

The present randomized comparative study was conducted in the Department of Orthopaedics of Silchar Medical College and Hospital, Silchar from 1st June 2017 to 31st May 2018. 64 patients with total 100 clubfeet who met the inclusion criteria were included: Age less than one year, unilateral or bilateral idiopathic CTEV, patients of either sex, parents of the child giving consent to take part in the study. Age more than one year, earlier treated with plaster cast application or any other method, earlier operated for clubfoot, atypical, syndromic or secondary clubfoot were excluded from the study. A computer generated randomization plan was generated and accordingly, 32 patients were treated with once weekly casting and 32 patients were treated with twice weekly casting on fixed days. The cases were treated on an out patient basis. All cases were clinically assessed using Pirani scoring system at initial presentation and subsequent visits. Ponseti method of casting was followed in both Standard and Accelerated Ponseti groups.

2.1 Ponseti method of correction

Before application of cast, gentle manipulation of foot for at least one minute was done. Cavus was first corrected by supinating the forefoot, to bring it in line with the hindfoot, and dorsiflexion of the first metatarsal. The cast was applied in two stages: first, a short leg cast was applied to just below the knee and then it was extended above upto groin to convert it into toe-to-groin cast. The knee was held in 90 degree of flexion. Gentle moulding was done. The toes were exposed to look for any signs of ischemia. In next subsequent visits, manipulation and casting was continued to abduct the foot gradually with the lateral part of head of talus as fulcrum.

When hind foot score was one or more, mid foot score of less than one and lateral part of head of talus not palpable, decision to perform percutaneous tenotomy was taken. Steenbeek foot abduction brace was used in all patients after the correction of deformity. The brace was worn for 23 hours a day for first 3 months after casting and then during night and nap time for 12 hours in a day for 3 years. The patients were reviewed 14 days after the application of Steenbeek foot abduction brace to note compliance issues and then reviewed monthly. Statistical analysis was done to compare: age and sex distribution, laterality of foot, initial and final Pirani score, number of casts required and treatment time till tenotomy or correction of equinus without tenotomy, rate of tenotomy and relapse of deformity in the Standard and Accelerated Ponseti groups.

3. Results

The mean age of the patients was 2.89 ± 2.62 months (range - 14 to 300 days) in Standard Ponseti group, and 3.42 ± 3.14 months (range 11 to 330 days) in Accelerated Ponseti group. There were 19 male and 13 female in Standard Ponseti group and 17 male and 15 female patients in Accelerated Ponseti group. 16 cases had bilateral foot deformity, 9 were right sided and 7 were left sided in Standard group. In Accelerated group, 20 cases had bilateral foot involvement, 9 were right sided and 3 were left sided. The two groups did not differ with respect to age, sex and side of involvement (p -value > 0.05). The two groups did not have significant difference in the Pirani score at presentation. In Standard Ponseti group, number of casts required for correction ranged from 4 to 8 with mean number of casts as 5.92 ± 1.09 . In Accelerated Ponseti group, number of casts required ranged from 4 to 9 with mean number of casts as 6.09 ± 1.11 . However, there was significant difference in the treatment time in plaster with mean treatment time of 41.42 ± 7.62 days (range -28 to 56 days) in Standard Ponseti group and 21.13 ± 3.94 days (range -14 to 31 days) in Accelerated Ponseti group (p -value < 0.05). Percutaneous tenotomy was done in 41 out of 48 feet in Standard Ponseti group, and 46 out of 52 feet in Accelerated Ponseti group. Relapse of forefoot adduction and equinus deformity occurred at 6 months follow up in 3 feet each in Standard Ponseti group and Accelerated Ponseti group.

Table 1: Treatment time in plaster in Standard and Accelerated Ponseti groups

Standard Ponseti Group		Accelerated Ponseti Group	
Treatment time in plaster (days)	No. of feet	Treatment time in plaster (days)	No. of feet
28	5	14	4
35	11	17	10
42	19	21	22
49	9	24	10
56	4	28	5
		31	1
Total	48	Total	52

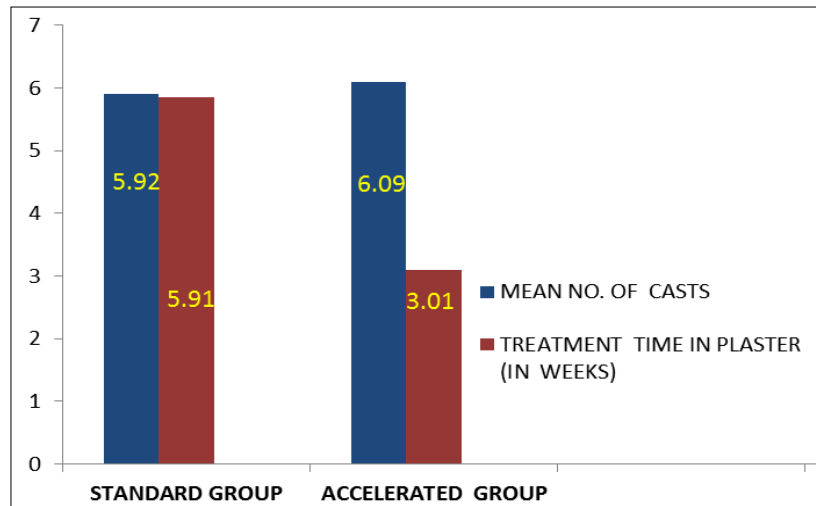


Fig 1: Fig show standard and accelerated group

Table 1: Mean number of casts required and treatment time in plaster (in weeks) in the Standard and Accelerated Ponseti groups

Variables	Standard Group	Accelerated Group	P- Value
Mean Age	2.89 ± 2.62 months	3.42 ± 3.14 months	0.4677(p- value > 0.05)
Mean Initial Pirani Score	5.25 ± 0.76	5.37 ± 0.65	0.3790
Mean Final Pirani Score	0.42 ± 0.17	0.44 ± 0.16	0.655
Mean Number Of Casts	5.92 ± 1.09	6.09 ± 1.11	0.4203
Mean Treatment Time In Plaster	41.42 ± 7.62 days	21.13 ± 3.94 days	0.0001(p-value < 0.05)
Percutaneous Tenotomy	41 out of 48 feet	46 out of 52 feet	0.6527

A case of left sided idiopathic CTEV treated by Accelerated Ponseti method



Left Sided Ctev 1st

Visit 1st Cast

2nd Visit



2nd Cast

3rd Visit

3rd Cast



4th Visit

4th Cast

5th Visit



Foot Abduction Brace



On Follow Up After 8 Month

4. Discussion

Since Hippocrates' initial description of the treatment of clubfoot more than 2,000 years ago, idiopathic clubfoot has been recognized as a difficult deformity to treat [9]. The Ponseti method has attained wide popularity in the last two decades and is currently accepted as the optimal treatment for congenital clubfoot deformity [10, 11]. The Ponseti method requires serial corrective casts with long-term brace compliance for maintaining correction [12]. Aurell *et al.* and Kuhns *et al.* in their ultrasonographic study found that the abnormal relationships of the tarsal bones can be corrected by Ponseti method [13, 14]. Dyer *et al.* [15] stated that Pirani scoring is reliable, has a good inter observer reliability and better than Dimeglio scoring system. The Pirani scoring system serves as a guide to monitor treatment and has been used in our study to clinically grade the feet.

Morcuende *et al.* [16] conducted a study to evaluate the success in deformity correction of clubfoot in relation to time between the cast changes. 230 patients (319 clubfeet) were assigned to 5 days or 7 days group. The average number of casts (four casts) did not differ between the two treatment groups (p -value= 0.85). Average time from first cast to Achilles tenotomy was 16 days for the 5-day group and 24 days for the 7-day group ($P = 0.001$). Percutaneous Achilles tenotomy was performed in 85% cases in the 5-day group and 81% in the 7-day group ($P = 0.4$). 11 cases in the 5-day group and 25 cases in the 7-day group had relapse. Harnett *et al.* [17] modified the standard weekly plaster-change method to three times per week. 19 patients (29 feet) were allocated to the Accelerated group and 21 patients to the Standard group (32 feet). Harnett *et al.* found in their study that the treatment time in plaster ('treatment time in plaster' refers to the number of days in plaster prior to a tenotomy) required in Standard Ponseti group was 42 days (35 -84 days) whereas the treatment time in plaster for Accelerated Ponseti group was 16 days (14- 20

days). There were no episodes of recurrence at six months follow up.

Xu RJ *et al.* [18] conducted a study to evaluate the outcome of a modified treatment program with manipulation and casting offered twice a week. 26 patients (40 feet) were treated with the Ponseti method twice a week. 20 patients with 32 idiopathic clubfeet were treated with Ponseti method once a week. All components of the deformity except the equinus were corrected in average 20.61 days (14 to 28 days) in modified group and in 35.35 days (28 to 49 days) in regular group. Forefoot adduction and varus deformity relapse were seen in 6 feet in modified group and 5 feet in regular group on follow up.

5. Conclusion

Ponseti method is regarded as the standard mode of treatment for congenital talipes equinovarus. Modification in terms of frequency of casting with twice weekly casting has shown that the efficacy remains unchanged producing similar results as once weekly casting. Good evidence is present to support the use of Accelerated Ponseti method with results being similar to that of once weekly casting. Parents who have to travel a long distance for treatment of child may be benefited by shortening the duration of treatment. Twice weekly casting will also reduce the time immobilized in plaster. There will be lesser chance of slippage of plaster. The maintainance of plaster will be of lesser concern for the parents. Reduction in duration of treatment will also help to improve compliance among parents. The result of this study shows that the Accelerated Ponseti method is equally effective as Standard Ponseti method in treatment of idiopathic congenital talipes euinovarus with the benefit of reduction in treatment time.

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