

COMPARATIVE STUDY OF ACCELERATED PONSETI METHOD VERSUS STANDARD PONSETI METHOD FOR THE TREATMENT OF IDIOPATHIC CLUBFOOT

¹Hitesh Sewawat, ²Brijesh Singh Sankhala, ³Avtar Singh Balawat, ⁴Amit Kumar*

1. Orthopaedic Senior Resident, Sawai Man Singh Medical College and Hospital, Jaipur, Rajasthan, India.
2. Senior Specialist Orthopaedic, Sawai Man Singh Medical College & group of attached hospitals, Jaipur, Rajasthan, India.
3. Assistant Professor, Department of Orthopaedics, Sawai Man Singh Medical College & group of attached hospitals, Jaipur, Rajasthan, India.
4. Orthopaedic Senior Resident, Sawai Man Singh Medical College and Hospital, Jaipur, Rajasthan, India.

*Corresponding author

Amit Kumar, Orthopaedic Senior Resident, Sawai Man Singh Medical College and Hospital, Jaipur, Rajasthan, India.

E mail: amitkumarmaurya825@gmail.com

ABSTRACT

Introduction: The standard Ponseti method is the optimum treatment of idiopathic CTEV which requires a serial manipulations and castings at weekly intervals. Few published results stated that the correction can be achieved in a significantly shorter time interval with multiple manipulations and castings per week.

Objective: This study was undertaken to compare the outcome of accelerated ponseti technique for idiopathic clubfoot by manipulations and casting done twice a week.

Materials & methods: A randomized comparative study was carried out for total 65 patients (80 clubfoot) attending the Outpatient department of Orthopaedics Sawai Man Singh Medical College and Hospital from 1st June, 2020 to 31st May, 2021. 40 clubfeet 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 groups with once weekly casting in Standard Ponseti group and twice weekly casting in Accelerated Ponseti group. The initial and final Pirani scores, treatment time in plaster, number of casts required for correction, rate of tenotomy and relapse of deformity in the Standard and Accelerated Ponseti groups were documented 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 of feet. The mean number of casts required was 4.88 ± 1.8 in Standard Ponseti group, and 4.97 ± 1.89 in Accelerated Ponseti group (p -value = 0.845NS). However, there was significant difference in the treatment time in plaster with mean treatment time of 35.636 ± 14.54 in Standard Ponseti group and 23.625 ± 15.03 days in Accelerated Ponseti group with p -value < 0.002S and 6 out of 33 feet in Standard Ponseti group and 8 out of 32 feet in Accelerated Ponseti group required percutaneous

tenotomy. Relapse of equinus and adduction deformity was seen in 2 feet out of 33 in Standard ponseti group and 3 out of 32 in Accelerated Ponseti groups on follow up.

Conclusion: The accelerated Ponseti method of treatment is a safe and effective method with twice a week manipulation. It significantly shortens the timeframe for the treatment and compliance of parents towards the treatment. The results obtained in our study showed good correction of deformity in shorter time interval when compared to standard method, which helps reducing economic concerns, cast complications and improving patients compliance.

Keywords: CTEV, accelerated ponseti method, tenotomy, standard ponseti method

INTRODUCTION

Congenital Talipes Equinovarus (CTEV) is the most common congenital foot disorder worldwide.¹ The incidence of CTEV is approximately one in every 1000 live births.² 50% of cases have bilateral foot involvement and in unilateral cases right foot has slight preponderance than left.³ Males are affected twice as often as females.⁴ The deformity has four components ankle equinus, hind foot varus, forefoot adduction and mid foot cavus with supination and is associated pathoanatomical changes including hypoplasia of skin and underlying tissues, musculoskeletal tissues and neurovascular bundle on the posterior and medial side, which resulting as hypoplastic and smaller foot than normal one.⁵ The cavus component involves plantar flexion of forefoot. Adduction at forefoot occurs at the midtarsal joint mainly at the talonavicular joint. In the varus component, the hind foot is rotated medially around talus and this occurs primarily at the talo-calcaneo-navicular joint. Equinus deformity occurs at the ankle joint⁶. 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 is replaced by non-surgical Ponseti method now a days.⁷ Ponseti method of serial manipulation and casting has claimed a success rate of about 95%.⁸ Many authors emphasized that shortening the correction time is required for patients travelling long distances which helps to reduce the treatment time significantly thereby increasing the compliance towards treatment, decreasing the economic concerns and cast complications. They found that the feet can be corrected at a significantly shorter time interval by manipulation and casting twice weekly as compared to the traditional protocol of once weekly casting with equivalent outcomes.⁹ This study's aim was to compare the results of Standard Ponseti method with that of the Accelerated Ponseti method in management of idiopathic congenital talipes equinovarus.

MATERIALS AND METHODS

The present randomized comparative study was conducted on the CTEV patients attending the Outpatient department of Orthopaedics Sawai Man Singh Medical College and Hospital from 1st June, 2020 to 31st May, 2021. 65 patients with total 80 clubfeet who met the inclusion criteria were included: Age less than two year, unilateral or bilateral idiopathic CTEV, patients of either sex, parents of the child giving consent to participate in the study. Age more than two year, prior treated with plaster cast application or any other method, earlier operated for clubfoot, syndromic or secondary clubfoot were excluded from the study. 40 clubfeet each in Standard Ponseti group and

Accelerated Ponseti group were allotted according to computer generated randomisation plan. 33 patients were treated with once weekly casting and 32 patients were treated with twice weekly casting on fixed days but the method of manipulation was similar in both the groups i.e. Ponseti method of cast correction. The cases were treated on an outpatient basis. The initial and final Pirani scores, total number of casts required for correction, treatment time in plaster, tenotomy rate and deformity relapse rate in the Standard and Accelerated Ponseti groups were compared using paired and unpaired t-test methods as required.

Ponseti method of correction

Gentle manipulation of foot for at least one minute was done before the application of the cast. Cavus was first corrected by supinating the forefoot (pronation not done as it would increase cavus deformity), to bring it in line with the hindfoot, and dorsiflexion of the first metatarsal. Initially a layer of cast padding was applied from groin to toe and the surgeon hold the foot in corrected position. Cast is applied using fast setting plaster in two sections. The first cast is comprised of below knee plaster to hold the foot in corrected position.

The next section consisted of extending the cast above knee to convert into a groin to toe plaster cast. During this, the knee was held in flexion at 90 degrees. Moulding was done gently. After application of the cast the child was observed for about 30 minutes for any signs of limb ischemia. The parents were educated about possible complications like swelling, cyanosis, excess cry and emergency contact number re provided for assistance. They were then advised to report for the next cast after 7 days. 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. After the correction of deformity steenbeek foot abduction brace was used in all patients. The brace was worn by child 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 next 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 in cast, rate of tenotomy and any relapse of deformity in the Standard and Accelerated Ponseti groups.

RESULTS

The mean age of the patients was 25.39 ± 37.92 days in Standard Ponseti group, and 27.72 ± 38.19 days in Accelerated Ponseti group. There were 17 male and 16 female in Standard Ponseti group and 15 male and 17 female patients in Accelerated Ponseti group. 7 cases had bilateral foot deformity, 15 were right sided and 11 were left sided in Standard group. In Accelerated group, 8 cases had bilateral foot involvement, 14 were right sided and 10 were left sided. The two groups did not differ with respect to age, sex, side of involvement and 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 3 to 6 with mean number of casts as 4.88 ± 1.8 . In Accelerated Ponseti group, number of casts required ranged from 3 to 7 with mean number of casts as 4.97 ± 1.89 . However, there was significant difference in the treatment time in plaster with mean treatment time of 35.636 ± 14.54 in

Standard Ponseti group and 23.625 ± 15.03 in Accelerated Ponseti group (p -value < 0.05). Percutaneous tenotomy was done in 6 out of 33 feet in Standard Ponseti group, and 8 out of 32 feet in Accelerated Ponseti group. Relapse of equinus and adduction deformity was seen in 2 feet out of 33 in Standard ponseti group and 3 out of 32 in Accelerated Ponseti groups on follow up.

Table 1: Comparison of duration of treatment in days between the groups

		Group A	Group S	Total	P Value LS
Duration of treatment in days	N	32	33	65	0.002S
	Mean \pm SD	23.625 \pm 15.03	35.636 \pm 14.54	29.723 \pm 15.86	

Table 2: Comparison of various parameter between the two groups

Variables	Standard Group	Accelerated Group	P- Value
Mean Age	25.39 \pm 37.92 days	27.72 \pm 38.19 days	0.806NS
Mean Initial Pirani Score	4.3 \pm 1.5267	4.241 \pm 1.477	0.3790
Mean Final Pirani Score	0.538 \pm 0.5926	0.231 \pm 0.3599	0.655
Mean Number of Casts	4.88 \pm 1.8	4.97 \pm 1.89	0.845NS
Mean Treatment Time in Plaster	35.636 \pm 14.54	23.625 \pm 15.03	0.002S
Percutaneous Tenotomy	6 out of 33 feet	8 out of 32 feet	0.714NS

DISCUSSION

In the last two decades the Ponseti method has attained wide popularity in and is currently accepted as the standard treatment for congenital clubfoot deformity¹⁰. The Ponseti method requires serial corrective casts with long-term brace compliance in maintaining phase.¹¹ Dyer et al¹² stated that Pirani scoring method is reliable and has a good inter observer reliability and is better than Dimeglio scoring system. The Pirani scoring system has been used in our study which serves as a guide to monitor treatment and to clinically grade the feet.

In a study done by Morcuende JA et al,¹³ the time interval between the manipulation & casting was decreased to 5 days and found the results attained by this accelerated method has no difference when compared to the results of standard ponseti method. They also stated that less than 5 days' time interval causes discomfort to the patient and complications like foot and toe edema.

Harnett P et al¹⁴ in their series stated that weekly thrice change of casts had showed similar results as of standard ponseti method and reported no increased incidence of complications. Xu RJ MD¹⁵ in his

study stated that weekly twice manipulation and casting was also equally effective as standard ponseti method and reported no complications as stated by Morcuende et.al.¹³

There were 33 female and 32 males in our series with a male to female ratio of 1:1.03. The male: female ratio in Kite's series was 2.07:1 and in series of Wyne Davis R¹⁶ was 2.17:1. In Jose A. Morcuende et. al¹³ series male to female ratio was 2.02:1. In P. Harnett et.al¹⁴ series male to female ratio was 1:1, this study has smaller study population when compared to other studies.

As regards laterality, the ratio of bilateral to unilateral clubfoot is 1:3.3 (23.08 % bilateral and 76.92 % unilateral) which is in concordance with other series presented by workers like Wyne Davis R¹⁶ (44% bilateral and 56% unilateral), in Mckay (1983) series an incidence of unilateral to bilateral ratio 1:1.7, Harnett P et al¹⁴ (52.5% bilateral and 47.5% unilateral), Jose A. Morcuende et al¹³ (38 % bilateral and 62 % unilateral).

When the feet were divided on the basis of the age at first presentation, it was seen that a large proportion of patients seen were less than one month old and among them child less than a week old are more. The youngest patient included in this study was 2 days old and the eldest was 6 .5 months old.

If we look at the age wise distribution it is obvious that most of the patients had reported in first month of their life but all the patients both less than a month and more than a month showed no difference in response i.e., both mid foot and hind foot scores got corrected and did so quickly ($P > 0.05$). The average number of casts given was 4.92 ± 1.83

If we categorize the feet on the basis of initial Pirani score, we find that those feet which had lower initial score 3 to 4 were more amenable to correction and responded relatively early when compared to those with higher initial score 4.5 -6 (i.e., more severe and more rigid deformity).

The average number of cast application required to achieve full correction of the deformity in patients with Pirani score of 4.5 to 6.0 was 5.7 and the average number of casts required to achieve full correction of deformity in patients with Pirani score less than 4.5 are 3.1.

In our study 14 patients out of 65 i.e., 21.54% patients required percutaneous tenotomy of tendo achilles. usually by literature 80% of the clubfoot treated by ponseti method requires percutaneous tenotomy, but the difference in our study may be due to early presentation of patients (< week) and faster change of casts. However due to smaller number of study population we are not able to conclude on it.

CONCLUSION

Based on our study we conclude that:

1. Accelerated Ponseti method is an excellent conservative method of treatment of Congenital Talipes Equino varus which is safe and as effective as standard Ponseti method.
2. Accelerated ponsetti method significantly reduces time of casting treatment.
3. Compliance of parents and patient towards the treatment was better than the standard method, due to reduced casting time frame.

4. The patients who have lower Pirani score at initial presentation respond better and faster to the treatment as compared to those who have higher Pirani score at initial presentation

Treatment must start at the earliest possible, and by accelerated method the casting time frame can be reduced significantly.

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 maintenance 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 equinovarus with the benefit of reduction in treatment time.

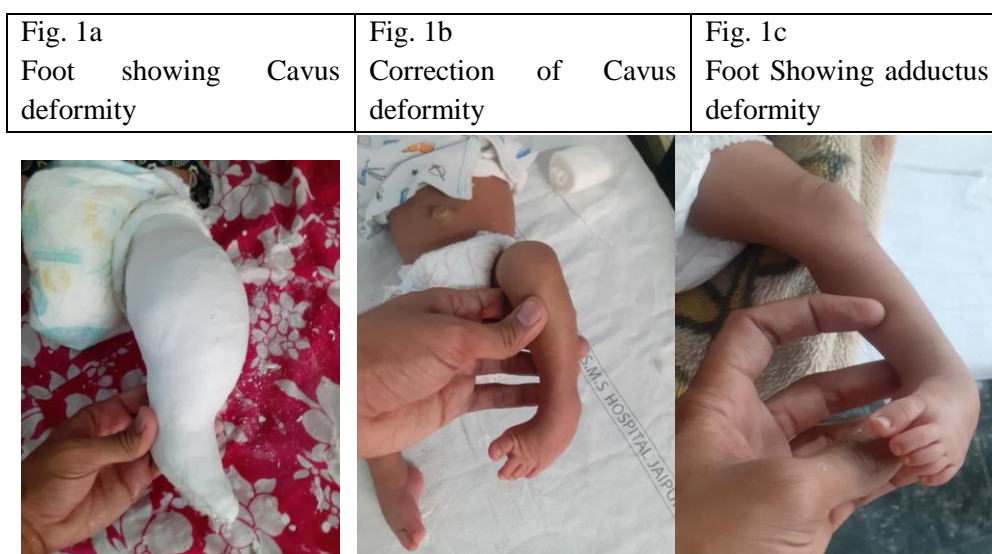




Fig. 2a
Correction of Adductus deformity



Fig. 2b
Foot showing equinus deformity



Fig. 2c
Correction of equinus deformity by Tenotomy



Fig. 3a
Patient on Brace maintenance



Fig. 3b
Patient on 6-month follow-up



REFERENCES

1Wynne-Davies R. Genetic and environmental factors in the etiology of talipes equinovarus. *Clinical Orthopaedics & Related Research* 1972; 84:9-13.

2 Herring JB. Congenital talipes equinovarus. In: Tachdjian MO. *Tachdjian: pediatric orthopaedics*. Philadelphia: Saunders; 2001. p. 922-59.

3 Campbell's Operative Orthopaedics, 13th edition, 2:1031.

4Turco Clubfoot VJ. *Current problems in Orthopaedics* New York: Churchill Livingstone, 1981.

5 Gray K, Pacey V, Gibbons P, Little D, Burns J. Interventions for congenital talipes equinovarus (clubfoot). *Cochrane Database of Systematic Reviews* 2014;8

-
- 6 Anand A, Sala DA. Clubfoot: Etiology and treatment. *Indian Journal of Orthopaedics*. 2008; 42(1):22.
- 7 The Ponseti Method for the Management of CTEV – 10 year Results Presented in National Medical Students Paediatric Conference (NMSPC) 2014, Brighton, UK
- 8 Mohamed H, Nasef MN, Hisham AG. Results of treatment of idiopathic clubfoot in older infants using the Ponseti method: a preliminary report. *Journal of Pediatric Orthopaedics B*. 2009;18:76-78.
- 9 Elgohary HS, Abulsaad M. Traditional and accelerated Ponseti technique: a comparative study. *European Journal of Orthopaedic Surgery & Traumatology*. 2015; 25(5):949-53.
- 10 Steinman S, Richards BS, Faulks S, Kaipus K. A comparison of two nonoperative methods of idiopathic clubfoot correction: the Ponseti method and the French functional (physiotherapy) method. *Surgical technique. JBJS*. 2009; 91A(2):299-312.
- 11 Ponseti IV, Smoley EN. Congenital clubfoot: the results of treatment. *Journal of Bone & Joint Surgery Am*. 1963; 45(2):261-344.
- 12 Dyer PJ, Davis N. The role of the Pirani scoring system in the management of clubfoot by the Ponseti method. *Bone & Joint Journal*. 2006; 88(8):1082-4.
- 13 Morcuende JA, Abbasi D, Dolan LA, Ponseti IV. Results of an accelerated Ponseti protocol for clubfoot. *J Pediatr Orthop*. 2005; 25(5):623-6.
- 14 Harnett P, Freeman R, Harrison WJ, Brown LC, Beckles V. An accelerated Ponseti versus the standard Ponseti method: a prospective randomised controlled trial. *J Bone Joint Surg Br*. 2011; 93(3):404-8.
- 15 Xu RJ. A modified Ponseti method for the treatment of idiopathic clubfoot: a preliminary report. *J Pediatr Orthop*. 2011; 31(3):317-9.
- 16 Wayne –Davies R. Family studies and cause of congenital club foot. *J Bone J Surg*. 1964; 46-B: 445-63.