

Evaluation of Outcome of Correction of Clubfoot by Conventional Ponseti and Accelerated Ponseti

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Abstract

Introduction: Congenital idiopathic clubfoot is a common orthopedic condition in children. It has been associated with neuromuscular disorders and various syndromes. The Ponseti method has transformed the management of children with clubfoot producing good long-term results. The condition is more common in male children.

Aim: To analyze the efficacy of accelerated Ponseti in the management of clubfoot and compare with the standard Ponseti.

Materials and Methods: We selected 40 children with idiopathic clubfoot <1 year and compared both standard and accelerated Ponseti methods. All were treated on outpatient basis. Each clubfoot was scored using Pirani score before cast application each week. Each foot manipulated and corrected with AK cast weekly in standard Ponseti and twice weekly in accelerated Ponseti.

Results: Out of the 20 patients corrected with standard Ponseti only 3 patients (11.5%) had relapse and only four cases among 20 patients corrected with accelerated Ponseti had relapse (20%).

Conclusion: Based on our study, we conclude that standard method of Ponseti correction is more effective than accelerated method of Ponseti correction.

Key words: <1 year, Accelerated ponseti method, Idiopathic clubfoot, Standard ponseti

INTRODUCTION

Congenital idiopathic clubfoot is a common congenital orthopedic condition occurring in children. It consists of four components: Cavus, forefoot adduction, varus, and equinus. It has been associated with neuromuscular disorders and various syndromes. Many conservative and surgical options are available for the management of clubfoot. Conservative methods involve serial manipulation and casting. If these cases are poorly treated, later on, it leads to extensive surgical procedures. After surgery, foot becomes stiff and painful.^{1,2}

The Ponseti method has transformed the management of children with congenital talipes equinovarus (CTEV)

producing good long-term results and in the last two decades has gained wide acceptance in the worldwide orthopedic community. The standard Ponseti method uses weekly foot and leg plaster changes to gradually correct the deformity, using a strictly defined sequence of molded plaster changes.^{3,4}

A new technique accelerated Ponseti method, in which standard weekly plaster change method was accelerated to two times a week was found to be equally effective in achieving correction. The duration, the child was in plaster was reduced and total duration of treatment was reduced to half. This is a significant advantage which can lead to better compliance.^{5,6}

It is estimated that more than 100,000 babies are born worldwide each year with congenital clubfoot. Males are more commonly affected than females (2:1). In nearly 20-40% of cases, bilateral involvement is seen. In parents already having a child affected with CTEV, there is a 10% chance of second child to be affected. In cases of monozygotic twins, if one twin has CTEV, the second twin has 30% chance of CTEV.⁷

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Aim

To analyze the efficacy of accelerated Ponseti method in the management of CTEV and to compare the functional outcome between Ponseti and accelerated Ponseti in the management of CTEV.

MATERIALS AND METHODS

This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. The Institutional Ethics Committee approval and informed consent from the parents were obtained. A total of 40 children (51 feet) were treated in the period between October 2010 and October 2012. Among these 40 children, 20 children (26 feet) were treated by standard Ponseti method and 20 children (25 feet) were treated by accelerated Ponseti method. The patients were randomized by computer generated numbers to either the standard Ponseti or the accelerated Ponseti method. All children were treated on an outpatient basis to reduce any bias from altered compliance and enabling us to directly compare the efficacy of two methods in terms of correction of the deformity. Parents were clearly informed about the management protocol and informed consent was obtained. Details regarding complications need for surgery and importance of braces were explained to the parents during each visit. Inclusion criteria: Idiopathic CTEV, age <3 months. Exclusion criteria: Age >3 months, associated with neurologic abnormalities and multiple contractures. Each clubfoot was scored each week using Pirani scoring system before cast application. Children were made to sleep by giving breast milk before cast application. In the standard Ponseti group, each foot was manipulated weekly and corrective above knee casts with knee in 90° of flexion were given. Step by step correction as recommended by Ponseti was followed. First cavus is corrected followed by varus and equinus is corrected at last. In the accelerated group, each foot was manipulated twice in a week at fixed intervals. The principle of correction was the same as that of Ponseti technique. In both the groups, tenotomy was done when cavus, adductus, and varus are fully corrected but ankle dorsiflexion remained <10° above neutral. It was made certain that abduction was adequate before performing tenotomy. Percutaneous Achilles tenotomy was done as an outpatient procedure using local anesthesia. No neurovascular complications were seen. Before the application of final cast or tenotomy, measurements were taken so that when the child comes for final cast removal, brace would be ready.

Endpoint of treatment is determined by two factors:

- Foot was well corrected without any deformity
- Passive dorsiflexion of 20° was possible after final cast removal.

Immediately after the removal of final cast, a Dennis Browne splint was applied. In the case of unilateral CTEV, brace was set at 70° external rotation on involved side and 40° rotation on uninvolved side. In cases of bilateral CTEV, both feet were set at 70° external rotation. The two shoes were connected by a bar such that distance between the heels of the shoes equals the width of the shoulder. Parents were advised to follow the bracing protocol strictly. For the first 3 months, brace was worn for 23 h a day; then the brace was worn for 12 h at night and 2-4 h in the middle of the day for a total of 14-16 h. Parents were advised to follow this protocol up to the age of 3-4 years. During follow-up, if any relapses were found they were treated appropriately by repeat casting. Most of them were forefoot adduction which got corrected by repeat casting. Photographs were taken at each visit, before and after cast application, and were shown to the parents to know about the improvement in correction.

RESULTS

A total of 40 children (51 feet) were treated; of which 20 children (26 feet) were treated by standard Ponseti method and 20 children (25 feet) were treated by accelerated Ponseti method. In the standard Ponseti group, 6 children had bilateral clubfoot, 8 were unilateral on left side, and 6 were unilateral on right side. Among 20 children, 12 (60%) were male and 8 (40%) were female. Mean age at presentation was 28.4 days. Total mean Pirani score at presentation was 4.97. Most of the cases required six casts for correction, with a mean of 5.55. Tenotomy was performed in three cases (11.5%). The mean number of days the child was in cast was 52.8. Three cases (15%) had a relapse. All relapses were corrected by repeat casting. Mean Pirani score at 3 months follow-up was 0.075. In the accelerated Ponseti group, 5 children had bilateral clubfoot, 8 were unilateral on left side, and 7 were unilateral on right side. Among 20 children, 11 (55%) were male and 9 (45%) were female. Mean age at presentation was 28.1 days. Total mean Pirani score at presentation was 5.025. The mean number of casts required for correction was 5.95. Tenotomy was performed in six cases (24%). The mean number of days the child was in cast was 39.65. Four cases (20%) had a relapse, among which one case of equinus was treated with repeat tenotomy and others were corrected by repeat casting. Mean Pirani score at 3 months follow-up was 0.1.

In our study, idiopathic clubfoot was seen more common in male child than female child. Both standard Ponseti technique and accelerated Ponseti technique for correction of CTEV were done Table 1.

We used Pirani scoring system for comparing the correction of CTEV in both standard and accelerated Ponseti

techniques. The Pirani score was higher in accelerated Ponseti than standard Ponseti at the time of presentation Table 2.

Based on the Pirani score, the patients who had undergone standard Ponseti method of correction had lower relapse rate than patients corrected with accelerated Ponseti method Table 3.

6 months follow-up mean Pirani score showed better result in standard Ponseti method of correction than accelerated method of correction for CTEV Table 4.

DISCUSSION

CTEV is one of the most common congenital anomalies occurring in children.⁸ The method of serial manipulation and casting developed by Ponseti for congenital clubfoot was instituted in an effort to achieve a plantigrade, functional foot without the need to resort to major surgical intervention. The Ponseti method was widely accepted and practiced, giving reliably long-term results. We treated clubfoot cases by Ponseti and accelerated Ponseti method, which involves changing the plaster 2 times in a week. We conducted special clubfoot clinics and did our casting on fixed days in a week so that we gave the chance of new patient's parents to meet old patient's parents and assure them about treatment and compliance.^{9,10} We followed Pirani scoring system and performed tenotomy, whenever necessary. Following cast correction, a Dennis Browne splint was applied and bracing protocol followed.

In both the groups, the mean age of presentation was 28 days. Mean number of casts required for correction in accelerated group (5.95) was comparable with standard group (5.55). Mean number of days in cast was 39.6 days in accelerated group, whereas it was 52.8 days in standard group.

Even though tenotomy rate was higher in the accelerated group (24%) compared to standard group (11.5%), it was not statistically significant. This may be due to slightly higher Pirani score in accelerated group (5.025) as compared to standard group (4.97). In the accelerated group, 80% of cases remained corrected at 3 months follow-up which is comparable with 85% of standard group.

Relapse rate was 20% in accelerated group and 15% in standard group, which is statistically insignificant. In our study, most of the relapses were of forefoot adduction type and equinus type which were corrected mostly by casting. Relapses were found to be mainly due to noncompliance of bracing protocol. This could be reduced by stressing the

Table 1: Gender distribution

Procedure	Male (%)	Female (%)
Standard ponseti	12 (60)	8 (40)
Accelerated ponseti	11 (55)	9 (45)

Table 2: Mean pirani score at presentation

Procedure	Score
Standard ponseti	4.97
Accelerated ponseti	5.025

Table 3: Relapse rate

Procedure	Relapse rate (%)
Standard ponseti	15
Accelerated ponseti	20

Table 4: Mean pirani score at 6 months follow-up

Procedure	Mean pirani score at 6 months follow-up
Standard ponseti	0.075
Accelerated ponseti	0.1

importance of braces at every visit and having follow-up at regular intervals. We taught the parents how to wear those braces and monitored them while applying it.

If the long-term results of accelerated Ponseti method become comparable to those of standard Ponseti method, it can offer patients a number of benefits. The number of days the child was in plaster was reduced in accelerated method. This would provide the parents with the alternative of more rapid treatment. Other advantages are a reduction in the likelihood of plaster slipping and chance for more intensive education regarding the importance of braces, with more visits over a shorter period.^{11,12} Osteopenia after immobilization in above-knee plasters has been reported by Morcuende *et al.*, but these findings resolved within a few months after plaster removal.^{13,14} It is possible that the accelerated method might reduce this problem still further.

CONCLUSION

Based on our study, functional outcome of clubfeet treated by conventional Ponseti method and accelerated Ponseti method is the same. Accelerated Ponseti method offers the advantages of reduced number of plaster days and more rapid correction. Our results show that results are comparable between two groups in every aspect. Based on this, we conclude that accelerated Ponseti method with plaster changes two times a week is as effective as Ponseti method in the treatment of idiopathic CTEV.

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