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Idiopathic clubfoot treated by Ponseti method: a series of 300 cases

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ABSTRACT

Background: Clubfoot is a complicated deformity of the foot. It is one of the commonest congenital deformities in children. The main aim of this study was to evaluate the efficacy management of clubfoot by Ponseti method.
Methods: This prospective study included 300 children (456 club feet) below the age of 2 years with idiopathic clubfeet from January 2013 to December 2017. In all the cases the Ponseti method was used for the management. The severity of the deformity was assessed with the help of the Pirani score and clinical evaluation of the foot was done.
Results: Out of 300 patients 204 patients were male and 96 patients were female and 144 were unilateral clubfoot and 156 were bilateral cases of clubfoot. The mean number of casts required for correction was 5.4 (4–10). Out of 456 clubfeet 356 (78%) feet were required tenotomy. There was relapse seen in 36 (7.9%) feet which had to be managed with 2–3 serial manipulations and casting and these resolved. Excellent result found in our study in 92% cases, good results were found in 5% cases and poor results were found in 3% cases.
Conclusions: Ponseti technique is a very useful and effective method of management of idiopathic clubfoot up to 2 year of age.

Keywords: Clubfoot, Pirani score, Ponseti technique

INTRODUCTION

Clubfoot is a complex deformity. It is the commonest congenital deformity in children.[1] It have an incidence of 1-2 per 1,000 live births. Sex ratio is 2-2.5 males per female and 50% cases are bilateral. In unilateral cases, right foot has a slight preponderance.[2-4] The real cause of talipes equinovarus is still unknown, however there are some key factors including genetic factor, histologic anomalies, vascular anomalies and intrauterine factor which give some clue about aetiology. The Ponseti method consists of a series of manipulations and immobilizations, as well as tendo-Achilles tenotomy to correct clubfoot deformities. After tenotomy, foot abduction orthosis is used to maintain the obtained correction and prevent recurrence.[5] Manipulation and application of a plaster cast is done at weekly intervals.[6] Treatment is started as soon as possible after birth and consists of weekly manipulations and long leg casting as described by Ponseti.[7-9]

It is reported to provide a lower complication rate, less pain and better function as the patient ages as compared to operative treatment. The Ponseti method is thought to be a very safe, efficient treatment for the correction of clubfoot that radically decreases the need for extensive corrective surgery. Further, it can be used successfully in children up to approximately 2 years of age when no previous surgical treatment has been attempted.[10] So, our study has been done with the aim of evaluation and efficacy of management of clubfoot by Ponseti method.

METHODS

The study was conducted in the department of orthopaedics, S P Medical College, Bikaner from January 2013 to December 2017. Children upto 2 years of age with idiopathic clubfoot (both unilateral and bilateral) were included in our study. Neuropathic clubfoot, syndromic clubfoot, postural clubfoot, metatarsus adductus and children more than 2 years were excluded from our study. Patients were followed up for a period of 6 month or more, at regular intervals.

Parameters used

1. During the corrective phase of casting, Pirani score was used clinically.
2. Percutaneous tendo-achilles tenotomy was considered when Pirani's mid-foot score was less than 1 and hind-foot score was more than 1.
3. During the maintenance phase of brace application pirani score was used clinically to asses relapse.

All the Congenital Talipes EquinoVarus cases were early treated by Ponseti method.

Children were initially assessed for the severity of the deformity using the scoring system of Pirani and clinical photographs were obtained. Initially a layer of cast padding was applied from groin to toe and surgeon held the foot in corrected position. The first one comprised of a below knee plaster to hold the foot in the cast. The next section consisted of extending the cast above knee to convert it into a groin to toe plaster cast. During this, the knee was held in 90 degree flexion. After application of cast the child was observed for about 30 minutes for any sign of ischaemia. The parents were educated about the possible complications like cyanosis, swelling, excess cry and the contact number in case of emergency were provided. They were then advised to report for next cast after 7 days.

The first cast corrects the cavus deformity by aligning the forefoot with the hindfoot, by maximally supinating the forefoot to bring it in line with heel and elevating the first metatarsal. At this stage, no attempt was made to correct the varus or equinus. The subsequent casts were applied by progressively increasing amounts of abduction to achieve the maximal amounts of correction. In this the foot in supination was abducted while the surgeon applied counter pressure on the head of the talus. The calcaneus abducts by rotating and sliding under talus. Simultaneously it extends and everts and thus correcting the heel varus. To stretch the medial tarsal ligaments fully, the foot was abducted to an angle of about 60 degrees. If there is easy passive dorsiflexion of foot to 15 degree above neutral (after correction of cavus, varus and adductus) while applying a single finger pressure, a final cast was applied in final corrected and fully dorsiflexed position for 3 weeks. If dorsiflexion >15 degrees was not possible, Achilles tenotomy was done under local anaesthesia with 1% lignocaine. After this tenotomy final cast was given in fully corrected and fully dorsiflexed position for 3 weeks. Before cast placement every week, the foot deformity severity was assessed using Pirani scores. After achieving full correction, a foot abduction orthosis with 70 degree external rotation of the affected foot was given for constant use (at least 23½ hours per day) for next 3 months. After this the abduction orthosis was used only for nightwear.

Figure 1: Series of 4 consecutive clubfoot casts from the same patient, showing correction of all deformities (except equinus), with the foot abducted on the talus 50^0 to 60^0 by the fourth casting.

Figure 2: (A) Clubfoot at initial presentation; (B) clubfoot after full correction; (C) bracing.

RESULTS

300 children (456 clubfeet) included in the study of which 204 males and 96 were females. There were 156 bilateral cases and 144 unilateral cases. The right were 84 and left were 60. Most of the children were born by normal vaginal delivery. All the cases were evaluated

using Pirani scoring system initially and during each visit before casting. These feet were treated with Ponseti's method of serial manipulation and castings applying groin-to-toe casts changed every week.

After full correction, the feet were placed in foot abduction brace and a follow –up reading was obtained at three months and at six months. All feet are corrected with casts. The mean number of casts was 5.3. The mean Pirani score at the initial casts was 5.5 and at 3 month Pirani score was 0.052 and at 6 month pirani score was 0.171.

Percutaneous tendoachilles tenotomy was done in 78% cases. Relapse occurred in 3(7.90%) feet.

In our study Ponseti method proved successful, with 92.10% (420 clubfeet) achieving an excellent outcome, 5.3% (24 clubfeet) good outcome, 2.6% poor outcome when evaluated by Pirani scoring system.

Table 1: Mean Pirani at initial stage, at 3 month, at 6 month according to age.

Age group (in months)	Mean initial Pirani score	Mean Pirani score at 3rd months follow up	Mean Pirani score at 6th months follow up
Day 1 to 6	5.5	0	0
7 to 12	5.2	0.25	0.62
13 to 18	6	0	0.5
19 to 24	6	0	0
Total	5.5	0.052	0.171

Table 2: Tenotomy.

Tenotomy	Number of feet	Percentage (%)
Yes	356	78
No	100	22

Table 3: Number of Relapse

Relapse	Number of feet	Percentage (%)
No	420	92.10
Yes	36	7.90

Table 4: Outcome

Results	Number of feet	Percentage (%)
Excellent	420	92.10
Good	24	5.3
Poor	12	2.6

DISCUSSION

300 children were treated for Idiopathic Congenital Clubfoot from January 2013 to December 2017. Total no of clubfoot was 456. All the patients were of age 0 -24 months at initial casting. Mean age of the group was 6.3 months. Several authors have studied whether the initial age at presentation impacts the result of treatment. Abdelgawad et al reported a 6.6% failure rate in patients who presented late for treatment (mean age, 36.3 weeks).[11] Other report have suggested age at presentation does not affect the end result of treatment. Morcuende et al had retrospectively analyzed the records of 157 patients (256 clubfeet). These were from the period 1991-2001 (11 years). Although the mean age of the children of this study has not been mentioned, 81% of children were younger than 6 months and 29% were older than 6 months. Morcuende et al reported a male: female ratio 2.13:1. Ponseti found the incidence six times higher among males.[12] The United Kingdom talipes study showed a male: female ratio 2.3:1.[13] Lochmiller et al showed that CTEV occurs more often in males than in females.[14] The male preponderance found in this study is in agreement with other studies. 156 cases were bilateral clubfeet (52%) and 144 had unilateral deformity. Among unilateral 84 cases (58%) had right sided and 60 cases (42%) had left sided deformity.

In Morcuende et al study, 99 out of 157 (66.1%) were bilateral clubfeet and 58 (36.95%) were unilateral. In Wynne et al series, 50-70% of cases are bilateral.[15] The right foot was more affected in our study. In contrast, Byron and Wallander, reported right unilateral are more common.[16,17] The finding from this study shows that 300 cases were Idiopathic while 24 cases were syndromic. This is similar to findings by Zosia that Idiopathic CTEV is by far the most common.[18]

The mean age at the initiation of treatment for 300 patients (456 feet) was 6.3 months; range 8 Days to 24 months. The number of casts per foot in our study was 3 to 10 (average 5.3). In a series Ponseti et al, the number of casts per foot was five to ten (average 7.6).[19,20] The mean initial Pirani score was 5.5 (out of maximum score 6). After full correction the final score was found to be 0 and the mean change of score was found to be 5.5. The mean value of Pirani score at three months follow up was 0.052. At the six months follow up, the Pirani score was 0.171. Mean number of cast was 5.3.

In our series, tenotomy was required in 78% cases (64.5% of cases of 0- 6 months age group; 100% cases of 7-12 months; 100% cases of 13-18 months age and 100% cases of 19-24 months age group,) this means that tenotomy was required in those patients whose age was

more at the time of initial treatment. Porecha et al performed tenotomy in 97% of cases while Bor et al performed tenotomy in 92.3%.[21,22]

In the retrospective study by Morcuende et al, correction was obtained in 98% cases. Correction was obtained in up to 7 casts. 90% of patients required 5 casts for correction. Tendoachilles tenotomy was done in 86% of the cases. An increase in deformity was noted by Pirani scoring. Increase in deformity, relapse occurred in 36 feet. These relapsed feet was corrected by corrective casts. In the relapse group, the mean age was 15 months while the mean age for the entire study was 3.95 months. Thus, in our study, age at initiation of treatment was found to be a risk factor for relapse. In this group, parents reported irregular use of the foot abduction brace. The real impact of this fact was not quantitatively assessed but might have contributed significantly to relapse of the deformity. Relapse appears related to non-compliance in wearing the brace, since all of these cases reported decreased duration of foot abduction brace wear per day. In the retrospective study of Morcuende et al, clubfoot correction was obtained in 253 out of 256 feet (98%). Of the patients who had initial successful correction, deformity relapsed in 10%. He found that this relapse was not related significantly to age at presentation, previous unsuccessful treatment, or the number of casts required for correction. He found that relapse were associated with non-compliance with foot abduction brace. Non-compliance was associated with a 17 times greater odds of relapse compared with compliance. The more the age at the time of initiation of treatment may need more number of casts for full correction and have a higher tendency for recurrence Another factor that might have played role is that the end point for casting in our study was correction of the deformity irrespective of the number of casts taken to achieve the same.

The number of casts required for correction ranged from 3 to 10. The mean number of casts required was 5.3 casts which is almost equal as compared to Morcuende series. In all the cases groin-toe casts were applied in our study. There were 24 cases of abrasions as a result of casting. This was due to inadequate cast padding. Healing of these abrasion can be aided by application of neomycin powder. No major bleeding occurred from tenotomy site.

In our study Ponseti method proved successful, with 97.4% of cases (432 Clubfoot) achieving an excellent to good outcome when evaluated by the Pirani scoring system. Porecha et al reported an excellent to good outcome in 86.56% of cases. In a report by Bor et al, the Ponseti method proved largely successful, with 89.2% achieving a good outcome. Ippolito et al compared patient treated with different protocols (Marino-Zuco method). In Ponseti group, 785 of the feet achieved excellent or good results compare with only 43% in the Non-Ponseti group.

CONCLUSION

From this study it appears that CTEV in children upto 2 year can be successfully corrected by Ponseti method. This correction can be achieved with larger than usual number of casts and with tendoachilles tenotomy. Persisting with casting in spite of slow correction may be successful up to 12 casts. Higher age of the patient necessarily does not mean that the deformity is resistant to correction but may necessitate a more prolong casting period. Tendoachilles tenotomy can be done safely without any adverse effect.

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