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Evaluation of outcome in idiopathic clubfoot managed by accelerated ponseti method

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Abstract

Background: Clubfoot deformity is among the commonest congenital anomaly. Its incidence 2 per 1000 live births per year. Its incidence is more in developing nations. Males to female ratio is about 2:1. In this study the efficacy of accelerated ponseti method in management of CTEV and effect of initial pirani scoring on final outcome were assessed.

Methods: This prospective study was completed during September 2015 to September 2017 in JLN medical College Ajmer and the cases were selected on OPD basis. Total 26 patients with 34 clubfoot include in our study. Our treatment was by accelerated ponseti technique (every fifth day casting).

Results: Average number of caste applied was 6.41. Average number of cost increases with increase in Age and pirani severity score. 80% of patient has no deformity at time of follow up. The P value calculated by Paired 't' test shows highly significance of treatment ($p < 0.0005$). 17.41% has statistically residual deformity (minor forefoot adduction). The failure was 2.86%.

Conclusions: Accelerated ponseti technique of treatment for clubfoot deformity is very effective and produces painless mobile flexible plantigrade and cosmetically acceptable foot without need of any major surgical intervention in very short duration.

Keywords: club foot, CTEV, Accelerated ponseti technique, pirani severity score

Introduction

Congenital talipes equinovarus CTEV, commonly called club foot, is a congenital condition with the deformity of foot and consist of four components equinus, hind foot varus, fore foot adductus and cavus^[1]. Untreated club foot results in pain and disability. Although clubfoot is one of the most known congenital deformities with approximate incidence of 2 in every 1000 live births^[1]. Its management especially in severe cases is still challenging. The condition is bilateral in half of the cases. With etiology still unknown, several theories were proposed to explain the origin of clubfoot, considering intrinsic or extrinsic causes, including: intrauterine position of the fetus, mechanical compression or increase of intrauterine hydraulic pressure^[1]; interruption in fetal development^[1]; viral infections^[3]; vascular deficiencies^[3]; muscular alterations^[1]; neurological alterations^[4]; defect in the development of bones structures^[4] and genetic defects^[4].

Patients and methods

This prospective study was completed during September 2015 to September 2017 in JLN medical College Ajmer and the cases were selected on OPD basis. Total 26 patients with 34 clubfoot include in our study. Our treatment was by accelerated ponseti technique every fifth day casting. Patients were evaluated detailed history and physical examination. Every clubfoot taken up for the study was graded according to pirani severity score and ponseti technique of manipulation. This was done by-Stabilising the talus by placing the thumb over the lateral part of its head. Elevating the first Ray to achieve supination of the forefoot in respect to the midfoot and hindfoot. Putting on the well-padded toe to groin plaster cast by holding this position and molding it well. 5 days later the first cast was removed and then after a short period of manipulation, next cast applied.

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Holding the supinated foot in abduction while applying the cast. Heel varus and ankle equinus were corrected simultaneously because of coupling of tarsal bones. These corrective casts continue till abduction of 70° achieved. Final cast is applied for three weeks after percutaneous Tenotomy in 70° abduction and 10 to 15° of dorsiflexion. Then foot abduction orthosis is given for 23 hours a day for first three months and then at night during sleep until three years of age. (Figure 1 to 6)



Fig 1: Before treatment



Fig 2: After 1st cast



Fig 3: 4th cast



Fig 4: After final cast foot abduction orthosis



Fig 5: After 3 months



Fig 6: After 9 months

Results

Total 26 patients with 34 clubfoot include in our study. Our treatment was by accelerated ponseti technique. Mean age at presentation of all patients were 5.1 months (range of 0.33-18 months). The minimum age at presentation for starting treatment was 10 days. The most common age at presentation was between 0 to 6 months. There were 17 males and 10 females (one child left this study). 8 patients had bilateral deformity where as 18 patients has had a unilateral clubfoot. The average number of cast applied was 6.41. Out of 34 foot,

tenotomy was done to 76.47% (26) foot, and cast correction was done for 23.53% (8) foot. Average Pirani score before casting was 4.147 and post-treatment was 0.147. The average duration of follow-up was 10.5 months. 11 feet had skin excoriation secondary to cast problems. 4 patients had pain and tenderness at the site of tenotomy and no infection. In all patients plantigrade foot was achieved. Recurrence was seen in only three cases. (Figure 7 to 9)

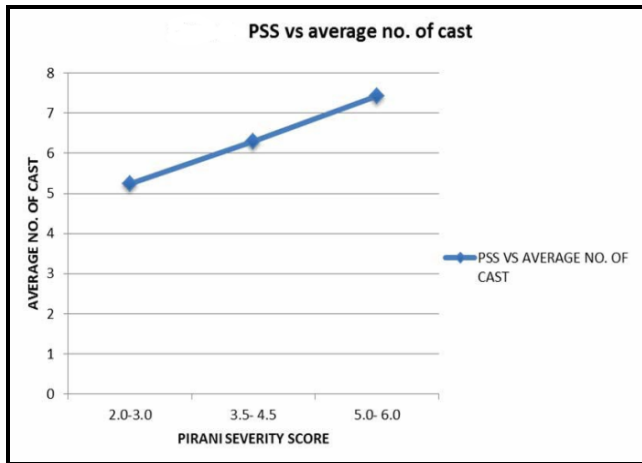


Fig 7

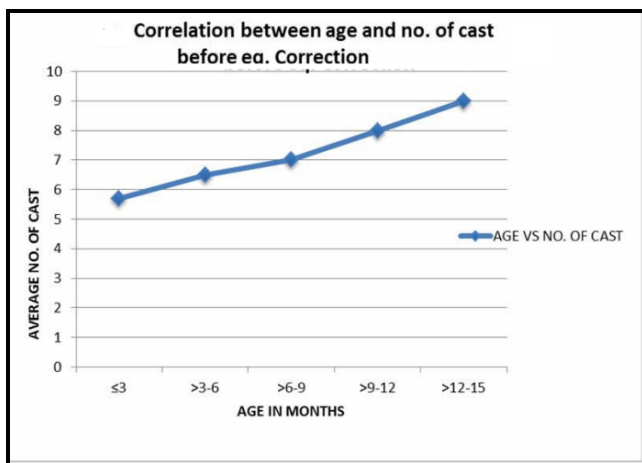


Fig 8

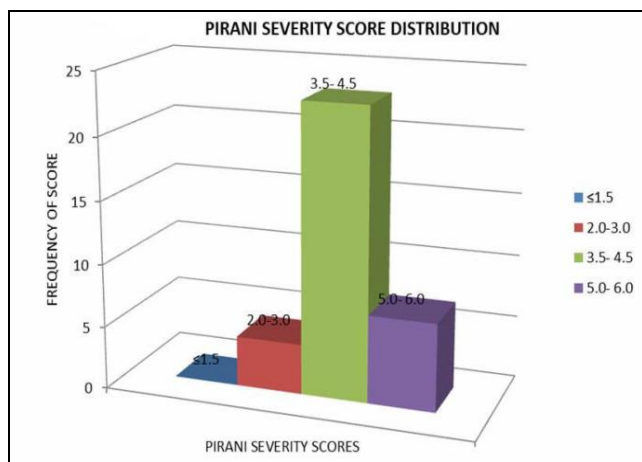


Fig 9

Discussion

Clubfoot is a complex deformity of foot that requires meticulous and dedicated efforts on the part of the treating physician and parents for the correction of the deformity. In

the past, the most common treatment was surgery. Extended surgical release leads to stiffness and further degenerative changes and it is not acceptable for the first step of treatment [20]. Now a days, manipulation and serial casting are the method of choice for clubfoot deformity [15]. The Ponseti method [11, 17] of correction of clubfoot deformity requires serial corrective casts with long-term brace compliance for maintaining correction. Treatment needs to be started as soon as possible after birth and should be followed under close supervision. In our study, there were 17 males and 10 females. Nine patients had bilateral deformity where as 18 patients has had a unilateral clubfoot. These findings are comparable to other studies while gender ratio in our study is much less than Pulak S. *et al.* Pulak S. *et al.* [21] reported bilateral clubfoot in 26.92% cases. Palmer RM [22] explained that females require a greater number of predisposing factors than males to produce a clubfoot deformity. In our series, 24 (92.30%) patients required less than 8 casts for correction, with 2 patients requiring 12 casts. The average number of castings used to correct the deformity was 6.41 times (range: 4 to 12). It was more than Pulak S. *et al.* [21] (3 to 10 casts, average 4.9) but was less than Ponseti *et al.* [24] (average 7.6 casts) and Tracey Smythe *et al.* [23] (average 7.27 casts) studies. Morcuende [25] reported that 90.0% of the patients required five or fewer casts. Higher Pirani score and older age of patient in our study were associated with an increase in the number of casts required to correct deformity.

In our study, tenotomy was performed in all feet and most of these had Pirani scores of more than 4.5 at presentation. Laaveg *et al.* [26] did tenotomy in 78.0% cases while other studies reported 79 to 93% cases of tenotomy. Reason for higher Pirani score is likely due to tighter connective tissues which are evident in severe deformity and could relate to a biomechanical difference in the collagen itself. Cause for performing tenotomy in previously treated cases was either previous inadequate management or having more severe deformity, as children treated successfully elsewhere would be less likely to present to the clinic. Marleix *et al.* [27] in a systematic review advised Achilles tenotomy regardless of clubfoot severity while Scher DM *et al.* [28] advised to do tenotomy after achieving forefoot abduction.

In our study, 11(32.35%) feet had skin excoriation secondary to cast problems. Four patients had pain and tenderness at the site of the tenotomy, and no infection, profuse bleeding or skin slough was observed. Recurrence was seen in only three cases. Pulak S. *et al.* [21] showed skin excoriation in 13.20% feet and recurrence in 5.0% cases. Moghaddam MH *et al.* [29] showed in his study on 85 severe clubfeet found 2 cases of pain and tenderness, & 1 case of mild infection at the site of tenotomy.

Average Pirani score in our study before casting was 4.147 and post treatment was 0.147. A Pirani score of 1 or less was achieved in 80.6% of feet. T. Smythe *et al.* [23] achieved Pirani score of 1 or less in 85% of feet. J. A. Morcuende *et al.* [30] found that manipulation and casting resulted in the initial correction of the clubfeet deformity in 90% of the patients.

Sana Ullah, Muhammad Inam, Muhammad Arif *et al.* found that a total of 28 patients (40 feet) and 2 casts per week was applied. 34(85%) feet were fully corrected (14) by accelerated Ponseti technique [31].

Harnett P, Freeman R, Harrison WJ, Brown LC, Beckles V *et al.* found that a total of 40 consecutive patients (61 feet) were entered into the trial. The initial median Pirani score was 5.5 (95% confidence interval 4.5 to 6.0) in the accelerated group (three times a week) and 5.0 (95% confidence interval 4.0 to

5.0) in the standard control group. The scores decreased by an average 4.5 in the accelerated group and 4.0 in the control group. There was no significant difference in the final Pirani score between the two groups (chi-squared test, $p=0.308$). The median number of treatment days in plaster was 16 in the accelerated group and 42 in the control group ($p<0.001$)^[32]

Conclusion

Results of the clubfoot treatment by accelerated Ponseti technique in our study have been good and rewarding and now all the clubfeet are treated in our institution by this technique. Furthermore, the Achilles tenotomy is a procedure with low complication that does not seem to affect the child's walking. Age at presentation and previous history of treatment did not greatly affect the final Pirani score. In a developing country like India and in remote areas, this technique is a very safe, less duration of treatment, easy, result-oriented and economical method of clubfoot management. Proper motivation and persuading the parents to accept long-term brace treatment helps maintain the correction over a longer period of time and prevents relapse. The study has a number of limitations. There was no comparator (control or other treatment group) within the study. The study participants were self-selected and therefore selection bias cannot be ruled out. In addition, the Pirani score has been reported to have good intra- and inter-rater reliability and validity in young children it is not validated for older children.

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