ORIGINAL ARTICLE

PONSETI TECHNIQUE FOR MANAGEMENT OF CONGENITAL IDIOPATHIC CLUB FOOT

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Background: Clubfoot or congenital talipes equinovarus, is a congenital deformity of the foot. It consists of cavus, adduction, varus and equinus. This is due to medial displacement of navicular and calcaneus around the talus. Talus is in equinus. Medial deviation of the head and neck of talus is due to force of calcaneus on talus. **Methods:** This descriptive case series study was conducted at Orthopaedic unit, Ayub Teaching Hospital, Abbottabad from 1st August 2015 to 31st January 2016 to determine the frequency of idiopathic clubfoot correction, by using the Ponseti method. A total of 177, unilateral and bilateral clubfeet, from both genders were studied. Patients between age of 2 weeks to 2 years were included in the study. Basic pirani score six (06) who were previously untreated were included in the study. Syndromic patients, previously treated and patients with associated neuro-mascular disorders were excluded from the study. Patients who were corrected with serial castings, were put in foot abduction brace. Those who needed some sort of surgery underwent surgery. All the data was collected in the proforma and analysed by SPSS version 16.00. **Results:** A total of 177 clubfeet were included in the study. Mean age of the patients was 10.28±7.45 ranging from 2 weeks 2 years. There were 93 (52.5%) male and 84 (43.5%) female out of total 177 patients. Of these 20 patients were corrected with serial casting only while 150 patients underwent percutaneous tenotomy, which is a minor procedure and done on out –patient department basis. After correction, the feet were put in 70 degree of abduction in abduction brace. Only 7 patients required some sort of surgery, more than tenotomy. **Conclusion:** Ponseti is very effective, economical and non-invasive way of treating congenital idiopathic clubfoot. only resistant cases may need some sort of extensive surgery.

Keywords: Clubfoot; Ponseti method; Pirani score

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INTRODUCTION

Clubfoot or congenital talipes equinovarus, is a congenital deformity of the foot. It consists of cavus, adduction, varus and equinus. This is due to medial displacement of navicular and calcaneus around the talus. While talus is in equinus. Further, medial deviation of the head and neck of talus is due to force of calcaneus on talus. The severity of the deformity varies from patient to patient. The exact cause of this deformity is not yet known. However, there are various theories which describe this deformity. One theory is that, it is primarily a germ plasm defect of the talus, causing planter flexion and inversion of this bone. Soft tissue changes are secondary to this bony defect. Second theory says that it is primarily soft tissue defect and bony changes are secondary to it. Still some authors have noted abnormal distribution of type1 and type 2 muscle fibres in clubfeet.[1]

Clubfoot is a worldwide issue. More than 2.2 million children are born in a year with this deformity. Various studies show various frequencies. If left as such, it can lead to permanent contractures and bony deformities. So, this needs correction by surgery or serial casting. Surgery is associated with recurrence, overcorrection, joint stiffness and pain. So, manipulation and serial casting is preferred by many orthopaedic surgeons, worldwide. Manipulation and serial casting was treatment of choice for idiopathic club foot correction, in Iowa University, since 1950's. In 1996, Dr. Ignacio Vincent Ponseti, work was published, who wrote about this low cost, effective method. Since then, this method got acceptance all over the world.[2]

Two types of casting material can be used, plaster of Paris and semi rigid fibre glass. Plaster of Paris is stiff and cheaper but parents are more satisfied with semi rigid fibre glass. The goal of treatment is to have a painless, functional, plantigrade foot with good motion and with no need for shoes modification. It is achieved with serial manipulation and casting on weekly basis. Foot abduction orthosis for 3 months, continuously, and then at night and at naptime for a further 4 years.[3]

Recurrence rates vary from 8–50% which is mostly due to non-compliance and inaccuracy of application technique. But in case of recurrence, re-casting is effective. Orthosis is needed after correction. Surgery is indicated if correction is suboptimal after casting.[4] Walking age is delayed 2 months as compared to normal child. Although this

can be delayed further in severe cases.[5]

Relapses are due to scarring, muscles imbalance, inadequate correction, and loss of reduction. Residual deformity includes metatarsus adductus, Achilles contracture and forefoot supination in swing phase of the gait.[6] This leads to surgery rates of 50–90%. One or more revision surgeries done in 47% cases. It is also seen that patients previously treated with Ponseti method are also treatable with recasting, with no extra difficulty. This is due to previous defective correction and non-compliance. There are two common mistakes in this regard. One is counter pressure over calcaneocuboid joint during manipulation, which prevents normal movements of calcaneus under talus and movements of talonavicular joint. Secondly, forceful manipulation makes the child uncomfortable. This causes muscles tension and manipulation gets difficult. It is also seen that hyper abduction in last caste is associated with decreased rates of relapses.[7]

At 30 years follow up, patients treated with Ponseti method has good to excellent results in terms of function and pain, which is 78% as compared to 85% of normal control population, born with normal feet. Education of the parents is of paramount importance in this regard.[7]

Our study aim is to evaluate the efficacy of Ponseti technique for the correction of congenital idiopathic clubfoot without proceeding to any extensive surgery.

MATERIAL AND METHODS

This descriptive case series was conducted at Orthopaedic unit, Ayub Teaching Hospital, Abbottabad, from 1st August 2015 to 31st January 2016. A total of 177 clubfeet were included in the study. Sample size was calculated using World Health Organization software, using the formula to determine proportion with absolute precision 4%, confidence level 95%, anticipated proportion of outcome 92–98% correction rate.[7,8] Unilateral and bilateral, idiopathic clubfeet of both genders were included in the study. Patients with baseline pirani score of 06 were included in the study. Patients of 02 weeks to 02 years were included in the study. Syndromic, previously treated and those with associated neuro muscular disorders were excluded from the study group. Data collection was started after approval of synopsis from ethical committee of the institution. Fully informed consent was taken after explaining benefits and hazards of the procedure. Confidentiality of the data was ensured.

Data was collected from parents in out-patient department and details history of the patient, including history of pregnancy, birth history, developmental history, family history and history of previous treatment with casting or surgery, were taken. Physical examination was done and baseline Pirani score was calculated and recorded for each patient. X-Rays of affected feet were done and findings were recorded. Cast was applied and parents were counselled. Parents were asked for weekly follow up. Patients were followed up to a maximum of 10 Ponseti casts. Patients were put in foot-abduction-orthosis when deformity was corrected. Equinus was the last deformity corrected. In those, in whom this could not be corrected, underwent percutaneous tenotomy and casting. Patients in whom correction was not achieved after 10 casts were considered for some sort of extensive surgery. Surgery was planned according to the type and severity of the deformity. Percutaneous tenotomy was included as a part of Ponseti method. All this data was entered in *Pro forma.*

Data was analysed using SPSS version 16.00. Quantitative variables like age and Pirani score was described by mean±standard deviation. Categorical variables like gender, previous treatment history and deformity corrected or not, were described by frequencies and percentages. The outcome variable of whether corrected or not was stratified by age and gender. Chi square test at 5% significance level was used to know significant difference by age groups and gender.

RESULTS

A total of 177 clubfeet were included in the study group. Mean age of the patients was 10.28±7.45 ranging from 2 weeks to 24 months. In frequency of deformity corrected there were 170 (96.0%) out of total 177 patients, including those who underwent percutaneous tenotomy. Of these, 20 feet (11.29%) were corrected in cast only. Percutaneous tenotomy of 150 feet (84.74%) was done in addition to Ponseti casting, at an average of sixth follow-up visit [range: 5–8 visits]. Thus, a total of 170 (96.04%) idiopathic clubfeet were corrected without going for a major invasive procedure. Tendo Achilles lengthening and posterior capsulotomy was sufficient for correction of the deformity in 5 cases (2.82%) after 10 casts. Only 2 (1.12%) cases were resistant feet and underwent Postero-medial release after 10 casts. as shown in table1. In frequency distribution of deformity corrected by gender, there were 87 (49.2%) male and 83 (46.9%) female patients out of total 177 patients, as shown in table-1. In frequency distribution of type of corrective surgery with gender, patients found with Ponseti casting were 10 (5.6%) male and female, with percutaneous tenotomy 77 (43.5%) male and 73 (41.2%) female, with postero- medial – release 2 (1.1%) male and 0 (0.0%) female, with tendo Achilles lengthening & posterior capsulotomy 4 (2.3%) male and 1 (0.6%) female as shown in table-1.

Table-1: Frequency distribution of type of corrective surgery needed by gender

Type of corrective surgery needed if any	Sex		Total
	Male	Female	
Ponseti casting	10 (5.6%)	10 (5.6%)	20 (11.3%)
Ponseti casting followed by Percutaneous tenotomy	77 (43.5%)	73 (41.2%)	150 (84.7%)
Ponseti casting followed by Tendo achilles lengthening & posterior capsulotomy	4 (2.3%)	1 (.6%)	5 (2.8%)
Ponseti casting followed by Postero-medial–release	2 (1.1%)	0 (0.0%)	2 (1.1%)
Total	93 (52.5%)	84 (47.5%)	177 (100.0%)

DISCUSSION

Congenital talipes equinovarus is bony and soft tissue deformity of unknown cause, affecting both developed and underdeveloped nations equally. Frequency of idiopathic clubfoot is 1–2 per 1000 live births. Since 1996, Ponseti is favoured line of treatment, all over the world. It is effective and economical way of treating idiopathic clubfoot. It does not need any operation theatre setup. On the other hand, corrective surgery for clubfoot, causes foot stiffness, pain and decrease dorsiflexion of the foot.[1–3]

Keeping in view, the universal trend towards the correction of clubfoot by Ponseti method, we used this method in our institution and got very comparable results for it. More than 96% of correction means drastic decrease in surgeries for clubfoot. Of these, only two cases needed postero-medial release. These 2 were resistant cases. The remaining 5 cases were corrected with posterior capsulotomy and tendo-achilles lengthening. Percutaneous tenotomy was done on out-patient department basis under plain xylocain (2%), when pirani score was 1. The remaining 20 cases were easily corrected in cast.

Our study is very much comparable to the one reported by Morcuende *et al*. who is among the poineers of developing this technique. He reported a success rate of 98% with serial casting followed by a minor procedure of percutaneous tenotomy[7]. As mentioned by Morcuende *et al*., this is because of good understanding of the anatomy of clubfoot.

In another study, conducted by Lourenco *et al*. correction rate was only 37.5% (9-feet). He attributed this to increased age of the patient. In his study, he included patients with walking age. Out of 24 clubfeet, 7 (29.16%) feet had to undergo a second percutaneous tenotomy for equinus while 8 (33>34%) underwent postero medial release.[9] Another distinction of his study was that all the corrected underwent percutaneous tenotomy after serial casting. But in contrast to this, 11.3% did not need any percutaneous tenotomy. This is probably due to young age group in our study.

Porecha *et al*. in his study got 89.79% results at 5 years.[8] Auther attributed this to poor compliance of the patients to Denis Browne splint, which is mandatory to keep the foot in corrected position. Our study was short term; it did not include patients with relapses. Ostadal *et al*. reported 100% results[12]. But a much resent study by Pavone *et al.* reported results very much comparable to our study. He reported success rate of 93.7%.[10] Percutaneous tenotomy was needed in 74.9% after serial casting in his study. But this rate was 84.7% in our study. This is close comparison between these contemporary studies.

A success rate of 90% was reported by Morcuende *et al.* while studying correction by Ponseti method, in patients with Arthrogryposis. He included patients younger than 1 year of age. Although Arthrogryposis is very resistant to correction by Ponseti method. Yet younger patients can be corrected with this method, even with arthrogryposis[11]. The remaining patients need some sort of surgery, which depends on the type and severity of the deformity.

Previous surgery, non-compliance, inadequate counselling of parents, associated neuro-muscular disorders, syndromic feet and age more than 4 years are associated with failure of Ponseti method.[4,6,7] We excluded these cases from our study. This is the reason, why this much high correction is achieved. This study was limited of duration. Further multi centre studies are needed to confirm these results.

CONCLUSION

Ponseti is very effective non-invasive way to treat congenital idiopathic clubfoot, especially in patients below 2 years of age. Only resistant cases may need some sort of surgery in addition to Ponseti method.

AUTHORS' CONTRIBUTION

All authors contributed equally.

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