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EFFECTIVENESS OF PONSETI'S TECHNIQUE FOR THE TREATMENT OF IDIOPATHIC TALIPES EQUINOVARUS IN CHILDREN

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ABSTRACT

Objective: To assess the outcome of Ponseti technique to treat of idiopathic talipes equinovarus in young ones not more then 2 years .

Methodology: Total of 125 children of idiopathic talipes equinovarus were reported in OPD of orthopeadic PUMHS, Nawabshah. Clinical examination of the patient was done and recorded in proforma. The reported cases of clubfoot in this study was classified as stated by the Pirani scoring system and then series of changes followed by every week over the knee castings.

Results: The age was <2 years and more boys 94(75.20%) compared to girls 31(24.8%). The 54 (43.20%) bilateral deformities and 71 (56.80%) unilateral deformities were observed. The soft mobility of foot in 135(75.4%) while rigid mobility of foot in 44(24.6%) was noticed. Group-I which have results of 1.5 - 2.5 numbering was seen in 55 feet (30.72%). Group-II which have results of 3 - 4.5 numbers was observed in 98 feet (54.74%) and group-III having results of ≥ 5 points were observed in 26 feet (14.52%). In group-II having results of 3 to 4.5 points, 19 feet (10.61%) engage in percutaneous tenotomy, while in group-III having results of ≥ 5 points, 15 feet (8.37%) need the

tenotomy. Over all percutaneous tendon release was performed in 34(19%) children. The 78.4% of sufferers give satisfactory results and nearly 12.8% had good outcome and 8.8% of sufferers had bad outcomnes.

Conclusions: In the end, the Ponseti method is a secure and economical therapy for congenital idiopathic clubfoot and radically decline the requirment for large surgical approach.

Key words: Ponseti's technique, Idiopathic clubfoot, Children.

INTRODUCTION

Congenital Talipes Equino Varus (CTEV) or Clubfeet is one the relatively usual birth defec in pedology with an incidence of 1 per 1000 live births[1,2]. It has total four parts such as hindfoot varus, Ankle equinus, forefoot midfoot cavusv, and adductus. In the most severe cases of CTEV; it is really very hard to treat inspite of presence of conservative and non-conservative therapies [3]. Hence the normal life style of patient is affected a lot, not only this but there is lot of monetary burden on medical system[4]. It has been observed that most of the world is facing Clubfoot as a major issue. Every year 2,200,000 newborns suffer from this problem through the world[5]. The occurrence of CTEV is approximately 1-2 in one thousand alive births ,about 50% cases are bilateral, whereas more than 75% cases happens in developing countries. Gender (male per female) ratio is 2.5:1 and 24.4 % have ancestral tree of unknown cause club foot[6].

The CTEV has 4 components, fore foot varus, adduction, cavus and equinus[7].The important aim of the therapy is to make a walking foot pain free, that become socially and operating supportable [8]. It is common concept that starting therapy of CTEV should not be operation;it makes no difference is severity of clubfoot[9].nowadays there is gold standard method which is Ponseti method, it consists of serial manipulation and casting[10]. This method should be applied in early stage and age which shows 85-95% success rate[11]. The supination of the foot and abduction to make it correct. The talonavicular joint act as fulcrum in this method which correct the whole parts of the problem but the equinus is not accurated by this but all by percutaneous tenotomy of tendo Achilles. It avoids the frequency of recurrence and occurance of rocker bottom foot; cut back the amount of therapy by declining the number of casts need to accurate the deformity of equinus and by preventing the requirment of intense surgery of soft tissue[12]. As the Achilles tendon is one of the main tendons of the foot known for its functional involvement, there are foreboding related to the division of this tendon. Those doubts have recognized as the main obstacle in the known approval of this methodology in the emergenent nations[13,14].

The rational of this study is to judge the efficacy of Ponseti technique for the correction of CTEV in absence of moving towards any intense surgery.

MATERIALS AND METHODS

This is a cross-sectional investigation done from October, 2019 to October, 2020. This study was finished at the Department of Orthopedics, Peoples Medical University, Hospital, Nawabshah as well as cases collection from multicenter under supervision and permission.

Sample Size

The sample calculation will be finished using the Raosoft software for Sample size calculation by using the proportion of (Incidence is about 1-2 in 1000 live births (0.2%), around 80% of the cases occur in emerging countries[5]) with 95% confidential interval and 7% of margin of error, the size of sample stands to be n=125.

Sample size calculation formula

$$n = \frac{Z^2 \times P \times q \times N}{e^2(N-1) + Z^2\, P \times q}$$

Where n is size of sample
Z= Standardized tabulated value at confidence interval.
Here we are taken 95% confidence interval so Z value for 95% CI is1.96.
P=Prevalence 80%q=1-P
N= Population which is taken 20,000e= Margin of error 7%
n= 125
Non-Probability consecutive sampling was conducted.

Inclusion Criteria

1. All patients irrespective of gender.
2. Age less than 2 years.
3. Cases of Congenital Talipes Equinovarus without any other congenitalanomaly.

Exclusion Criteria:

1. Age more than 2 years.
2. Clubfoot secondary to any paralytic disorder or any associated disease like cerebral palsy, arthrogryposis multiplex congenital,spina bifida.
3. Previous operation clubfoot

Data collection procedure

This required inquiry was done after the the sign of a document giving permission for the study obtained from the tolerant and their attendants who fulfill the inclusion criteria. Detailed history, clinical examinations were done. Thegrading of club foot is done as the Pirani scoring system and after that series of manipulations done by weekly above-knee castings. The malformations were made correct in the sequence as elaborated by Ponseti. Cavus is set right in first therapy. In later coming done adduction and varus were slowly set right. The upward bending motion of ankle joint is limited as in equines was corrected in the last part of calcaneal tendon later by casting for about three weeks, other method is by week to week casting. The end application of plaster of Paris was corrected with the foot in 15^0 dorsal flexion and 70^0 rotated externally. The scoring of Pirani scoring was estimated as regular basis when plaster is removed to see if problem is set right. The result was recorded once the final cast is removed ,mostly at 4th or 6th week when calcaneal tendon cut is not necessary and on 56 day when calcaneal tendon cut is completed. The end results of scoring of Pirani was written to see favorable outcome therapy. Successful correction of CTEV was then put in the abducted brace with 15^0 dorsal flexion and 70^0 rotated externally. In the instance of single sided issue, the usual foot is put in 45^0 external rotation. The brace was put for 22 hours/day for 12 weeks, and then only at sleeping time for 4 years. There after patients were made come to opd on every 12^{th} day after initiation of bracing and then every 1 1/2 month for 3 continuous month and then after every three months.

Data analysis procedure

As the whole written information is compiled the survey was conducted by utilizing Statistical Package for Social Science (SPSS) software, version21. Frequency and percentage were computed for categorical variable like gender, unilateral,bilateral and success in terms of congenital talipes equinovarus measured by using Pirani scoring. Mean ± standard deviation was observed for quantitative factors like age of the patients.
Chi square test (if applicable) was applied for qualitative variables betweengroups. $P<0.05$ was contemplate as statistically significant level. Effect modifiers were controlled through stratification of span, sex and duration of treatment to observe their result on outcome variables.

RESULTS

The 125 children of idiopathic talipes equinovarus were included in this study. There were more boys 94(75.20%) as compared to girls 31(24.8%), with a boy to girl ratio of 3.03:1(Table.1).

Table. 1 Gender distribution (n=125)

GENDER			
Boy		**Girls**	
No: of Patients	Percentage	No: of Patients	Percentage
94	75.20%	31	24.8%

There was less than 2 years of age children included in this study. The mean age was 1.5±0.4years (Table. 2).

Table. 2 Age distribution (n=125)

Age in Months	**Number of Children**	**Percentage**
01 to 12 months	88	70.40%
12 to 24 months	37	29.60%

Mean Age: 1.5±0.4years

In 54(43.20%) children bilateral deformities and in71 (56.80%) unilateral deformities were observed. Whereas in unilateral, the right feet were more commonly affected 43(34.4%) than the left feet 28(22.4%) (Table. 3).

Table. 3 Side affected (n=125)

Side affected	**Children**	**Percentage**
Bilateral deformities	54	43.20%
Unilateral deformities	43	34.4%
Right feet	28	22.4%
Left feet	Total of unilateral deformities: 71	Total of unilateral deformities: 56.8%

In the beginning soft movement of foot in 135(75.4%) while rigid mobility of foot in 44(24.6%) were observed. (Fig. 1)

Fig. 1 Mobility of foot (n=179)

The malformation was catagorized, in terms of the scoring of Pirani into 03 categories. Category-1 with a Scoring of 01.5 to 02.5 points was observed in 55 feet (30.72%), Category-2 the commonest category, with a Scoring of 03 to 04 points is observed in 98 feet (54.74%) and category-03 with a scoring of ≥ 5 points was observed in 26 feet (14.52%) (Table. 4).

Table. 4-Pre-treatment Pirani scores (according to Pirani) n= 179

Category	**Scoring**	**Number of feet**	**Percentage**
01	1.5 – 2.50	55	30.72%
02	03 – 04	98	54.74%
03	≥ 5	26	14.52%
Total		179	100%

In initial presentation feet divided in Category 1 mean scoring of Pirani was 2.41±0.5, while in feet divided in Category 2 and Category 3 mean Pirani Score was 3.62±0.9 and 5.35±0.3 . Generally mean Pirani Score for all feet was 4.12±0.2 (Table. 5).

Table. 5-Initial. presentation of children (n= 179)

Category	**Score**	**No of feet**	**Means**
1	1.5-2.5	55	2.41±0.5
2	3.0-4.5	98	3.62±0.9
3	≥5	26	5.35±0.3

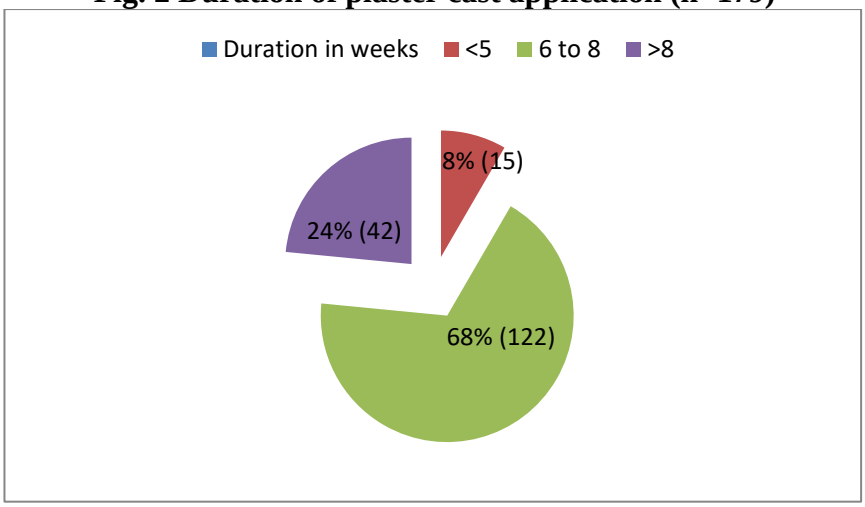
In Category-2 with Scoring of 03 to 04.5 points, 19 feet (10.61%) undergopercutaneous tenotomy, although at the same time Category-3 with Score of.≥ 5 points, 15 feet (8.37%) required the tenotomy. Over all percutaneous tenotomy performed in.34(19%) children (Table. 6).

Table. 6 The requirement for tendon cut in contrasting categories

Category	Tenotomy done		tomy not done		l no of
	Feet	Percentage	Feet	Percentage	
I	0	0%	55	30.72%	55
II	19	10.61%	79	44.13%	98
III	15	8.37%	11	6.14%	26
Total	34	19%	145	81.01%	179(100%)

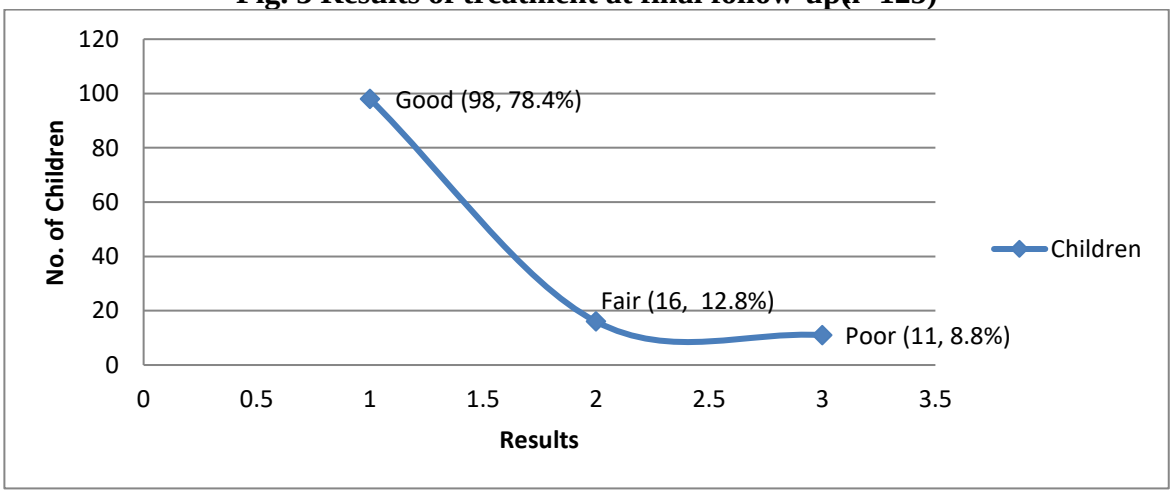
The least period of plaster cast apply was 05 weeks, not more then being thirteen weeks and 68% of the patients would be in plaster applied for 06 to 08 weeks. (Fig. 2).

Fig. 2 Duration of plaster cast application (n=179)



Patients were tagged with a satisfactory outcome if scoring of Pirani is better and in other condition alldeformities rightly improved by only Ponseti technique in last check up. But in case Ponseti technique do not success to fully treat foot not more then one time, those were kept under bad outcome. In this study, about 78.4% of sufferers give satisfactory outcomes and about 12.8% had satisfactory outcome and 8.8% of patients had bad outcome were failed with Ponseti technique (Fig. 3).

Fig. 3 Results of treatment at final follow-up(n=125)



Discussions

Clubfoot is a cryptic malformation of foot that needs very hard and serious work and therapy on the health care side and parents for the good result to correct the deformity. Earlier the surgical approach was the most common therapy to treat this problem. But this surgical options causes stiffness and degenerative changes in the first place. Today , manipulation and serial casting are priority as first line of treatment. The Ponseti method to set right this problem needs series of corrected casts with more time brace compliance for keep going . Therapy requires to be done quickly after birth and should be done by strict survillance [15, 16].

As the feet categorized according to the of the age initially, it was observed that a most of the patients were observed at the initial stage of life. The length of life of patient recruit in this study is not less then three months. The mean age at early manifestation of 1.5±0.4 years is with age prevalance observed bySunil Kumar Bhatiwal[17] who were documented 456 club feet in 300 children at mean age of 1.2, at initial presentation. While another international work conducted by GunalanR on 31 children with 45 clubfeet and reported the mean age was 4.9 months at early presentation[18].

In this study there were 94 boys and 31 girls female children that is 75.20% and 24.8% respectively. The prevalence of gender based ration in this study was not very different from other reported series. Compared with study of Sunny Agarwal[19] in the series of 68 clubfeet reported 25(59.52%) boys and 17(4047%) girls. Raju Rijalet al. in his series reported 76.2% males and 33.8% females[20]. M Changulani et al. in his series reported 75.7% males and 24.3% females[21].

With respect to concerning , 15 of our cases were 54(43.20%) bilateral deformities, and 71 (56.80%) unilateral deformities (43(34.4%) right and 28(22.4%) left sided) that is according to the series of values given in, Vinoth K R (116(84.1%) bilateral and 22(15.9%) unilateral)[22]. In the advanced research report by Raju Rijal et al., it was reported 68.75% unilateral and 57.89% bilateral[20]. In the study of Herzenberg et al[23] the usually occurrence of unilateral clubfoot (74%) than bilateral clubfoot (26%) was observed.

In this study upon contracting of mobility of feet, at the age was not more then 2 years with those come with complain of not more than 6 months of age. The age factor had a very important impact on the severity of foot presenting at the time of case report. This is the confirmation with the hypothesis for etiology and pathogenesis ofclubfoot showing that clubfoot is a inborn defect,, and so as the time passes with no therapy, the foot become more hard and deform[24]. In this study, it was shown at time of first exposition soft mobility of foot was 135 (75.41%) while rigid mobility of foot was 44(24.58%).

In this study work this defect is divided, in terms to the Pirani scoring system into 3 categories. Category -I with a Score of 1.5 to 2.5 points was seen in 55 feet (30.72%), Group-II the most common category, with a scoring of 3 to 4.5 points is observed in 98 feet (54.74%) and category-III with a Score of ≥ 5 points is observed in 26 feet (14.52%). As a result the initial Pirani Score of 4.12±0.2 is written for all foot. Compare the study of Vinoth K R[22] reported initial Pirani Score were 3.0 in 15(10.8%), 3.5 in 24(17.3%), 4.0 in 33(23.9%), 4.5 in 30(21.7%)and 5.0 in 15(10.8%) cases.

It was observed that these foot belonging to category I and II were more controllable to make right, showed quite early decline pirani score when contrasting tothose belonging to group III. Raju Rijal et al. showed in his work, quick number ofdecrease in pirani score treated by Ponseti technique, mean pirani scores become better early similar in this study[20].

The figures of cast over each subject in our work is from five weeks to thirteen weeks (mean 7.15 weeks). As the time passes, with advance research work, patients those changing the casts the plaster one casts in little time and little casts on every feet make good outcome. Those foot that need many casts in this work they had quite bigger Pirani score at the start of therapy. It has been noted that as there is late case report the number of casts are much greater. The amount of time at start is more which become less and less as the time passes by[25]. In our work, numerical of casts need for fully treated is about from 5 to 13 and in many sufferers it need averagely number of 7.15 casts. In this work we used Pirani scoring system which is according to Lehman et al series, which shows Pirani scoring is not difficult to consume and it is very easy to use . In another study by Laaveg et al.[26] the average amount of casts in this therapy was seven. Morcuende [27] documented that 90%

of the people needs five or fewer casts.

The main goal in treatment is to decide when enough setting right has been achieved to do a percutaneous tenotomy to obtain dorsiflexion and to achieve required results. Additionally , the disfigurement ,but not equinus has been best results. At the moment the anterior calcaneus is move away below the talus. This moving away permit the feet to be in safe way dorsiflexed without damaging the talus bone in between the calcaneus and tibia [28, 29]. In this study, category -II with Score of 3 to 4.5 points, 19 feet (10.61%) undergo percutaneous tenotomy, while in category-III with Score of ≥ 5 points, 15 feet (8.37%) needs the tenotomy. Over all percutaneous tenotomy was performed in 34(18.99) children. However, the study of Mayank Dutta reported only 2 patients (3feet) 5.45% needs tenotomy which is not get good results by casting. Usually big number of casts was done to obtain whole correction without tenotomy[30]. The main things were observed from our work is the identification that feet needs tenotomies are on equal basis set right therapeutically in the last casting as compare to those who donot need tenotomies.

Main problem were little abrasions 22(12.29%) observe in small age group that may be due to delicate cutis. In eight patient having marked equinus, going down slippage 8(4.46%) of the cast was observed. However in comparison with aninternational study reported are epidermis blisters in 3(14.3%) cases, slippage of cast 6(28.5%) cases and atopic dermatitis in 3(14.3%) cases[22].

In present study, overall 98(78.4%) of the children showed good results. Compared with international study conducted in Malaysian, 45 feets with no known cause CTEV were given treatment to by Ponseti Protocol and documented above 91.1% good results[18]. Another international study were showed success rate in 82.6 % of the sufferers with no main bad results and the end results are no doubt encouraging[22].

Conclusions

The best method to treat the club foot is ponseti method. As the concluded therapy of club foot by Ponseti method is very satisfactory and have excellent results so from now onwards in our institution we prefer Ponseti method to treat club foot .In a under emerging country, where a lot of people are living below poverty line and many advance health care provisions are not accessible in backwoods, this technique is very affording and feasible for club foot therapy.Although it is time taking but with good consultation with parents we can prevent relapse,which is very easily manageable.

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