

CONGENITAL CLUBFOOT TREATED BY PONSSETI TECHNIQUE

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ABSTRACT

Background: Clubfoot is a disease characterized by complex malformed feet or foot without the malformations of other bones and joints in the body. The objective of the study was to evaluate the conservative treatment of clubfoot in children by Ponseti technique of correction in our population.

Material & Methods: To evaluate conservative treatment by Ponseti technique in clubfoot, the study conducted was consecutive case series done in Orthopedics unit District Headquarter Hospital Dera Ismail Khan. Patients presented to OPD from October 2015 to September 2016 were included in this study. Children with clubfoot with no other congenital foot abnormalities and age less than 18 months were included. Children having clubfoot due to neuromuscular disease, arthrogryposis, mielodysplasia and postural clubfoot were excluded. Pirani scoring system was used in this study to see the effects of treatment before and after the procedure

Results: A total of 100 patients (146 feet) were treated. Follow up was done for a mean period of 24 months. Out of 100 patient's male were 70 and female 30. Forty Six were bilateral and 54 unilateral. In our study we used the Pirani severity scoring system to compare our results. In our series the mean Pirani severity score before treatment was 5.05 ± 1 . The highest was 5.9 and the lowest being 1.9. At the end of serial cast and subsequent tenotomy, the mean Pirani severity score was 0.6 ± 0.06 , while range was 0.5 to 0.75 and the p value was 0.0001 which was highly significant.

Conclusion; Ponseti method of manipulation and plaster casting is very effective in correcting clubfoot deformity.

KEY WORD: Clubfoot; Tenotomy; Orthopedic Surgeons.

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INTRODUCTION

Clubfoot is a disease characterized by complex malformed feet or foot without the malformations of other bones and joints in the body. Regarding the management, most orthopedists are in favor of non-surgical treatment initially after birth in which different modes of treatments are used often involving casting and manipulation from time to time. This type of treatment requires several months and usually ends in defective or incomplete correction.¹ These cases then undergo extensive surgical procedures for correction and most of the time they also end in failure or further complications.²

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Forty seven percent of clubfeet patients require one or more surgical revisions depending upon the procedure already done and the amount of deformity left.³ The objectives of treatment include correction of all types of deformities present, pain free life, good motility with plantigrade foot, no calluses and no need for wearing special shoes. In 1996, the incidence of clubfoot at birth in USA was 0.6% making a total of 2224 newborn cases of clubfoot.⁴

According to Ponseti, this incidence is more than 100,000 in the world and most of them are born in developing countries where they are not treated properly resulting in financial, social, physical and psychological burden on the patients themselves and their families too.⁵ The rate of success of the conservative approach lies between 11-70% although some authors suggest that this is the case with only moderate severity of the disease.⁶ Using Ponseti method the success rate is 98%.⁷ Due to the excellent functional results, the Ponseti Method is gradually replacing the other surgical and conservative managements for treatment of Congenital Clubfoot. It is successfully used in the treatment of

non-idiopathic clubfeet as well – such as in arthrogryposis, myelomeningocele, untreated and later treated children, complex and resistant feet; recurrences, etc. Shortened and modified elements of the foot which have great elasticity in growing children are corrected. Not only stretching the ligaments, tendons and interosseous ligaments occur, but also bone remodeling due to mechanical stimulation. Treatment by Ponseti Method must begin in the first days after birth as plaster casts are changed every 5 to 7 days. The leading cause of physical disability due to congenital malformations is untreated clubfoot. The objective of the study was to evaluate the conservative treatment of clubfoot in children by Ponseti technique of correction in our population.

MATERIAL AND METHODS

This cross-sectional study was conducted in Department of Orthopedics, Gomal Medical College Dera Ismail Khan. The study design was consecutive case series. Sample size was 100 subjects. All patients presented to OPD, from October 2015 to September 2016 were included in this study. Children with clubfoot with no other congenital foot abnormality and age less than 18 months were included. Clubfoot due to neuromuscular disease, diseases like arthrogryposis, myelodysplasia etc and postural clubfoot were excluded.

Patients were admitted in Orthopedics ward after taking an informed consent from their parents explaining the procedure and its advantages and disadvantages.

Pirani scoring system was used in this study to see the effects of treatment before and after the procedure which is interpreted as follows;

- Each component is given a score of 0, 0.5 or 1.
1. Hind foot contracture score (HCFS):
 - Posterior crease
 - Empty heel
 - Rigid equinus
2. Mid foot contracture score (MFCS):
 - Medial crease
 - Curvature of lateral border
 - Position of head of talus

Ponseti technique was used to correct clubfoot deformity in this study, which is given below;

The main principle is to use several serial plaster castings ending with tenotomy of the Achilles tendon. The steps involved are;

1. Cavus correction by a hyper supination of the forefoot.
2. Slight and constant abduction of the forefoot with counter pressure on the lateral aspect of the talar body.
3. Achilles tendon tenotomy to correct the heel equinus and varus (in 85%).

4. Using abduction foot device - Denis Broun type-firstly all-day long, later only during sleep.

The cast is mid-thigh as the knee joint is in 90° flexion. As it was mentioned first, the cavus is corrected by supination of the anterior plantar compartment. The varus adduction is corrected in the following three or four casts by a counter pressure on the lateral portion of the head of the talus by putting the anterior plantar department in abduction and supination.

In the proper modeling of the cast, the calcaneus does not pass spontaneously into equinus under the talus and in over 85% of the cases, percutaneous Achilles tenotomy was recommended by Ponseti. The symptom for this is the limited dorsal flexion of the foot up to 0° and the visible groove of the heel, caused by this tightness.

This mini intervention is simple which is done under local or general anesthesia in aseptic environment which is then followed by a plaster. The final stage in the treatment of the clubfoot deformity is the splint treatment (Denis Browne splint) which is done immediately after the removal of the last cast, which, if after Achilles tenotomy, is worn for 20 days. This phase lasts up to the 2nd to 4th year unlike the previous phases lasting from 1 to 3 weeks, in the beginning it should be worn 24 hours a day and after the 6th-8th month, the splint is worn only during sleep.

Follow-ups are done every week for changing of cast for first 5-7 visits until the deformity is corrected then after splint instillation every 6 months until 1 and half year after initial treatment. Follow up was done for a mean period of 26 months. While most our patients were referred to us at the time of birth, we preferred to start treatment at 3 weeks of age, because of skin sensitivity. Some patients who presented late had to be serially casted for more number of times.

All our patients underwent a percutaneous tendo achillis tenotomy for equines after correction of all the other deformities. Three patients didn't give consent for the tenotomy and they were lost to follow up. Seven of the remaining 97 developed recurrence of equines deformity at ages 11 months and 13 months respectively. They were then put to a redo- tendo- achillis tenotomy and plaster immobilization for 4 weeks and followed by splintage at nights which showed excellent results in subsequent follow-up. Non-compliance of the splint due to poor understanding by parents and delay in buying the properly fitting shoes for a grown up child due to financial constraints were the main causes of recurrence of the deformity.

A post treatment Pirani severity score of: 0.5 is excellent; 0.5 to 1.0 good and > 1 is considered poor.

Demographics variables were gender and age groups (gender had attributes of male, female whereas age groups had children of 1-3 months, 3.1-5 months and >5 months on predetermined pro-forma. Research variables were pretreatment pirani severity score, post treatment pirani severity score and laterality (right or left foot). Categorical data such as age were analyzed by frequency and percentages while numeric data were analyzed by mean and SD in SPSS version 20. Paired t test was used to see the statistical difference between pretreatment and post treatment pirani severity score.

RESULTS

Out of 100 patients 146 feet were treated. Out of 100 patient's male were 70 and female 30 (Table 1). Forty six patients were bilateral and 54 unilateral. Of the unilateral, 40 were right foot involvement and 14 were left foot involvement (Table 2). We started our treatment at mean age of 3 months. Age distribution is given in (Table 3).

Table 1: Gender distribution.

Gender	Frequency	Percentage
Male	70	70%
Female	30	30%
Total	100	100%

Table 2: Side distribution.

Total number of feet	Bilateral	Unilateral	
146	46	54	Right foot=40
			Left foot=14

Tables 3: Age distribution of children with club-foot (n=100).

Age group	Frequency	Percentage
1-3 months	70	70%
3.1-5 months	25	25%
>5.1 months	5	5%
Total	100	100%

In our series the mean Pirani severity score before treatment was 5.05 ± 1 . The highest was 5.9 and the lowest being 1.9. At the end of serial cast and subsequent tenotomy, the mean Pirani severity score was 0.6 ± 0.06 , while range was 0.5 to 0.75. the p value was 0.0001 (Table 4) which was highly significant.

In 97 patients, the pretreatment Pirani severity score of mean value 5.05 was reduced to mean post treatment Pirani severity score of 0.6 and remained so at a mean follow up period of 24 months.

Table 4: Pirani score before and after treatment.

	Before treatment	After treatment	p value
Pirani score	5.05 ± 1	0.6 ± 0.06	0.0001

DISCUSSION

In this study the sample size was 100 patients in which the Ponseti method was applied using several serial casts and then followed by tendo-achilis tenotomy at the end. Mean period of follow up was 24 months. Seventy patients were male and 30 were female, the ratio being 2.3:1 which was 6:1 in a series reported by Ignacio Ponseti in 2009.⁸

Using this method the success rate is also high for the neglected cases till one year of age though these patients often require more numbers of casts. Also sedation may be required to change the cast which is not required normally in infants.

In this study, the minimum pre-treatment Pirani severity score was 1.9 and maximum was 5.9, with mean pretreatment Pirani severity score being 5.05. The minimum number of cast applied was 5 and the maximum of 10 with mean being 6.3.

Kumar R et al, reported that the average number of castings used to correct the deformity was 6.5 times (range: 4 to 12) while tenotomy was performed in 66 (82.5%) feet and most of these had Pirani scores of more than 4.5. 11 (21.15%) patients had previous treatment elsewhere and 2 (3.84%) patients had an Achilles tenotomy. Average Pirani score in this study before casting was 5.3 and post treatment was 0.8. A Pirani score of 1 or less was achieved in 87.6% of feet.⁹

Another study by Segev E et al, compared the results of infants treated by kite method and Ponseti method. Their observations at the end of mean follow up period of 29.2 months was that the Ponseti group, 45 (94%) clubfeet were fully corrected at last follow-up (average 29.2 months, range 16-45) while 3 (6%) clubfeet had residual deformity and required surgery.¹⁰

In another study, significant difference was found by Dyer and Davis between the mean initial Pirani scores for the tenotomy (4.96; 2 to 6) and non-tenotomy (4; 1 to 6) groups, respectively ($p=0.012$).¹¹

Hegazy M et al reported results of Thirty-two feet in 20 infants (12 males; eight females) with idiopathic congenital clubfeet using Ponseti method. The presentation age on average was 7 months (range from 4 to 13 months). They also used the Pirani scoring system to assess the feet. After an average follow-up of 19 months, the ultimate overall results were satisfactory in 31 feet. The Pirani score improved from an average of 4.3 (range: 3-6) at presentation to a final follow-up average of 0.5 (range:

0-1). Only one foot had unsatisfactory result.¹²

In this study the plaster was changed at an interval of 7 working days. At the end of a mean number of 6.3 casts in our series all the deformities were corrected except the equinus.

Similarly, in a study by Pulak and Swamy, the average number of casts applied before full correction was 4.9.¹³

Our results are therefore comparable to the results published earlier by authors with similar comparable materials and methods. However, long term follow up is required to assess the results regarding the recurrence, suppleness and function of these feet at a later date.

CONCLUSION

Ponseti method of manipulation and plaster casting is very effective in correcting clubfoot deformity.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

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None declared.

AUTHORS' CONTRIBUTION

Conception and Design:	SAS
Data collection, analysis & interpretation:	SAS, AA, MAA, SM
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