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THE CORRELATION BETWEEN INITIAL PIRANI SCORE AND NUMBER OF CASTS IN TREATMENT OF IDIOPATHIC CLUBFOOT BY PONSETI METHOD

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Abstract

Background: Clubfoot is a common congenital deformity of the lower limbs. It should be treated as soon as possible so that its correction is more easily achieved and the Ponseti method is the gold-standard treatment for idiopathic clubfeet, with good results reported globally. **Materials and Method:** The present study includes 44 children with clubfoot. All the patients were below the age of six months. The participants were treated by the technique of Ponseti methods and casting every week. The scoring of Pirani was used for the determination of deformity level. The scoring was done before and after the treatment. The Pirani score before and after the treatment was compared. **Results:** There were 68.18% male and 31.82% female patients in our study. There were unilateral 20 (45.45%) children while 24 (54.55%) patients with bilateral clubfoot. In our study, most of the cases (29 cases, 65.91%) were below one month of age. Forty-Three percent of the feet were corrected with fourth serial casting. The majority of the feet in the study had an initial Pirani score between 3 and 4. The range of Pirani score were 1.5-6, and around 8 (11.76%) feet in our study had the maximum Pirani score of '6' **Conclusion:** The number of casts for correction in idiopathic Clubfoot is influenced by initial Pirani score. The repair of a club foot deformity using Ponseti's manipulation technique and casting has proven to be quite successful. After treatment, the majority of patients', Pirani scores showed excellent results.

Keywords: Idiopathic Clubfoot, Pirani Score, Casting, Ponseti Technique.

1. INTRODUCTION

The classification of clubfoot deformity is important to portray initial severity and subsequently, to follow progress of treatment. In recent times, the Pirani and the Dimeglio classification systems have gained widespread acceptance for this purpose because of their established inter and intra observer reliability (1, 2). One of the most frequently asked question by the care receivers is the total number of casts required for deformity correction. One such attempt to answer this question involves correlating the number of corrective casts used in Ponseti technique to initial severity (2, 3). Flynn et al further confirmed that Pirani scoring system had very good intra-observer reliability after the initial learning phase (1). The Ponseti technique remains the most accepted and reliable method of management of clubfoot today and it has also reduced the need for major foot surgery significantly (4).

Congenital talipes equinovarus (CTEV) or clubfoot is a common paediatric condition with a reported incidence of 1-2 per 1000 new born (5). The Ponseti method is the most popular worldwide for non-surgical correction of idiopathic clubfoot, with excellent long-term outcome (30 years) (6). Pirani et al devised a simple scoring system and reported good intra-observer reliability for their scoring system based on six clinical signs - three each for midfoot and hind foot (forefoot adduction, midfoot cavus, hind-

foot equinus, and hind-foot varus). Each foot received a midfoot and hind foot score between 0 and 3 and a total score between 0 and 6. Each was scored according to the degree of abnormality (0; being no abnormality, 0.5; moderate abnormality, 1; severe abnormality) (4, 7). The technique consists of frequent weekly manipulation and casting followed by an Achilles tenotomy and brace wearing until the walking age (8, 9). In practice, the casting period and the recurrence of the deformity are among the common concerns of the parents. However, there are controversies about the correlation between these two parameters and the initial severity of the deformity measured by Dimeglio and Pirani scoring systems (10-12)

Lack of data on these aspects makes it difficult to prognosticate parents regarding the duration of treatment which is closely related to financial and motivational aspects. The aim of this study is to assess the severity and monitor progress of treatment using the Pirani score.

2. MATERIALS AND METHODS

The present study was done from July 2022 to September 2023, with approval from the Kurdistan Board of Medical Specialties. Prospective analysis of 44 cases of idiopathic clubfoot up to one year of age was done.

Exclusion Criteria included children more than one year of age at the start of treatment, non-idiopathic cases and previously treated or operated cases.

Inclusion criteria: idiopathic club foot, age less than one year & untreated clubfoot.

A standarized data collection sheet was used to follow each patient in Helena center in Erbil city following enrollment in the Clubfoot department. The data sheet indicated the demographic data of the patient, the type of clubfoot, Pirani scores at presentation and during follow ups and number of corrective casts for each patient. After conducting a complete general, systemic and local examination, the severity of the deformity was assessed using Pirani scoring system and the recording of Pirani score was done during each visit. The Pirani system has 6 components on a grade of 0, 0.5 or 1 depending on the increasing severity. These components are rigidity of equinus (RH), emptiness of heel (EH), posterior crease (PC), reducibility of lateral head of talus (LHT), curvature of lateral border of foot (CLB) and medial crease (MC). A higher score indicates a more severe deformity. A successful outcome was considered achieved when there were at least 10 of ankle dorsiflexion pre bracing. The number of cast required was counted from application of primary cast to the time of initiation of the foot abduction orthosis. After achieving complete correction, a dennis brown splint with 70 degrees external rotation on the affected foot and 40 degrees external rotation on the normal foot and 15 degrees bend of the connecting bar to maintain dorsiflexion was given. The brace was advised to be worn full time for the first three months and then to use the brace for 12 hours at night and two to four hours in the day for a total of 14 to 16 hours during the 24-hour period until the child was 3 to 4 years of age. During each visit, the corrected foot was examined in detail and strict bracing protocol was advised7. Follow-up of minimum one year was available for all cases. Percutaneous Achilles tenotomy was done for all cases.

The correlation between pretreatment Pirani score, child's age in months at presentation and number of corrective casts was calculated after doing the prism (graph pad (8)) regression analysis.

3. RESULTS

We studied a total of 68 feet in 44 patients of idiopathic clubfoot during the period of July 2022–September 2023. All the subjects of the study were treated by Ponseti technique of manipulation and casting. Of these, 31 children presented with left sided, 37 rights sided. Thirty patients (68.18%) were male and 14 patients (31.82%) were female. Male-to-female ratio in our study was found out to be 2.1:1. Furthermore, Twenty-four patients (54.55%) had bilateral clubfoot and 20 patients (45.45%) had unilateral clubfoot as shown in table 1. The minimum follow-up duration was 9 months and maximum follow-up duration was 15 months for cases registered early in the study. Most of the cases (29 cases, 65.91%) were below one month of age. The youngest child in the study was of three days of age and the oldest was of five months. The average number of corrective casts required for the different age groups is given in Table 1. Most of the cases were in the age group less than one month 14(31.82%) required 4 casts to correct the feet from 29 cases as shown in table 2. On the other hand, the number of casts required to achieve complete correction increased with increase in the initial Pirani score (Table 3). The majority of the feet in the study had an initial Pirani score between 3 and 4 (Figure 1). The initial Pirani score and number of casts show a positive correlation. The range of Pirani score were 1.5-6, and around 8 (11.76%) feet in our study had the maximum Pirani score of '6' as shown in figure 2.

Table 1: Summary of Patient Demographics Data

Variables		Ages (Month)								P Value
		<1 month	%	1-3 month	%	>3 month	%	Total	%	
Gender	Male	23	52.27	6	13.64	1	2.27	30	68.18	0.0489
	Female	6	13.64	5	11.36	3	6.82	14	31.82	
Pattern of deformity	Unilateral	11	25.00	7	15.91	2	4.55	20	45.45	0.3392
	Bilateral	18	40.91	4	9.09	2	4.55	24	54.55	

Table 2: Correlation of Age with Total Number of Cast Applied in Study Subjects

No. of Casts	Ages (Month)						
	<1 Month	%	1-3 Months	%	>3 Months	%	Total
6	2	4.55	2	4.55	1	2.27	5
5	3	6.82	2	4.55	1	2.27	6
4	14	31.82	4	9.09	1	2.27	19
3	8	18.18	2	4.55	1	2.27	11
2	2	4.55	1	2.27	0	0.00	3
Total	29	65.91	11	25.00	4	9.09	44

Table 3: Correlation of Pirani Score at Presentation and Number of Corrective Casts

Pirani score at presentation	Pattern of deformity	Minimum number of casts	Maximum number of casts	Mean ± SD
1.5	4	2	4	2.5±1
2	2	3	3	3±0
2.5	5	2	4	3.2±0.8367
3	11	3	4	3.364±0.5045
3.5	6	3	4	3.667±0.5164
4	15	4	5	4.133±0.3519
4.5	7	4	5	4.429±0.5345
5	10	5	6	5.1±0.3162
6	8	6	6	6±0

Figure 1: Series of 5 Consecutive Clubfoot Casts from the Same Patient, Showing Correction of all Deformity

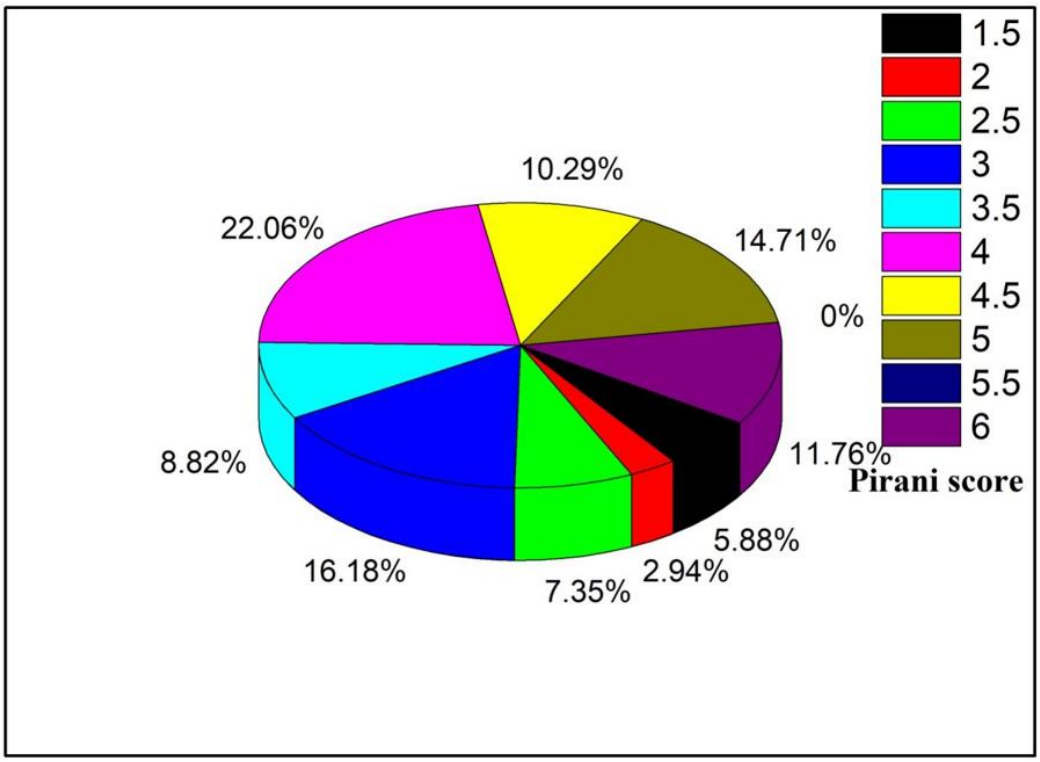

Figure 2: Correlation of Number of Foot with Pirani Score at Presentation

4. 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. The Ponseti method (13, 14) of correction of clubfoot deformity requires serial corrective casts with long-term brace compliance for maintaining correction.

The guidelines regarding patient selection and treatment protocol vary between investigators (14) but in general the treatment needs to be started as soon as possible and should be followed under close supervision (15). In our presentation, the highest rate was found in males patients 30(68.18%) as compared to females patients 14 (31.82%). the result agreed with Sharma et al. (16), which revealed that, the male to female ratio is high (male: female 4:1), as well as, Cowell and Wein (17). Social bias and attention towards males in our region can account for the higher incidence in males in our study. Furthermore, most of the cases (29 cases, 65.91%) were below one month of age. the result agreed with Debnath and Chatterjee, (18) which showed that, the mean age of presentation of the patients was 6.73 ± 3.42 weeks (range 1–11 weeks). 9/30 (30%) infants were between 1 week and 4 weeks. Growing awareness and education of parents relates to the early presentation in these countries. The average number of casts required in newborns is around 5 with a correction rate around 90% (19). In the present study, estimated number of casts required to correct the deformity of the feet was different depending on the severity. Average number of casts required to correct moderate grade feet was ranged from 3 to 4. In the literature search the average number of casts required for correction of deformity was also changing with the mean initial Pirani score with range of average number of casts required was 2-6 and mean Pirani score range was 2-6 in different studies (20-22). They also observed a high degree of positive correlation between the initial Pirani score and the number of casts required similar to present study (23).

In the current study we observed that the number of casts increased with increasing ages. the result disagreed with Ayehualem et al. (12), which indicated that, There is no discernible difference in the total number of casts needed to correct clubfoot between children under 6 months of age and those between 6 and 24 months of age. Similarly, Awang et al. (24) reported no significant association between age and number of cast. However, research (25-28) conducted elsewhere found a substantial association between age and the number of casts needed to rectify a deformity. These studies also suggested that, in order to ensure high success rates, casting and manipulation should begin as soon as possible after delivery. This difference may be related to anatomical and physiological condition of child including flexibility of soft tissues and the club foot was more flexible.

The Ponseti method is nearly as successful on clubfoot in newborns at preventing the need for surgical intervention. Agarwal and Shanker, (2) commented that Pirani scoring is not a sensitive enough tool for assessing the deformity in children of older age group and gives fallacious low values, due to low scores for empty heel, posterior and medial crease, despite resistant, rigid deformities. As well as, Sharma et al., (4) explained that, the short follow up period, so we have focused only on the importance of Pirani's scores during the treatment in predicting the number of casts. Only children below age of one year and idiopathic cases have been included in our study to remove confounding factors in syndromic cases.

In our study Ponseti method proved successful, with 100% of cases (68 Clubfoot) achieving an excellent to good outcome when evaluated by the Pirani scoring system. Porecha et al., (20) reported an excellent to good outcome in 86.56% of cases. In a report by Bor et al, (29), the Ponseti method proved largely successful, with 89.2% achieving a good outcome. In Ponseti group, 785 of the feet achieved excellent or good results compare with only 43% in the Non-Ponseti group (30).

5. CONCLUSIONS

The Ponseti technique is a very safe, efficient, and acceptable economical treatment for the correction of idiopathic clubfoot that gives excellent results on conservative treatment and in most of the cases avoid surgical intervention if protocol followed as prescribed. The initial high Pirani score signifies a longer duration of treatment, the need for greater number of casts to achieve correction and probable need for tenotomy. The number of casts required in achieving complete correction increases with increase in the initial Pirani score.

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