REVIEW ARTICLE

The Role of Ponseti Method in the Management of Patients with Congenital Clubfoot

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ABSTRACT

Objectives: To evaluate the rate of success of the Ponseti method in the management of patients with congenital clubfoot.

Methods: This prospective study was conducted to evaluate 34 patients presented with 55 congenital clubfeet, managed between January 2014 and October 2017 with the Ponseti method. Achilles tenotomy was performed for patients with whom we could not correct the equinus deformity following manipulation. In addition, for those patients who had persistent residual adduction, a transfer of the anterior tibial tendon was done. Pirani's classification was used to assess the results in patients before and after treatment.

Results: Club foot was found to be more common in male patients than female. The right side was involved more than the left, whereas 61.7% of the cases had involvement of both feet. The plaster of Paris was changed by a mean number of 5.7 times, and in 41 feet, Achilles tenotomy (AT) was needed. The deformity was significantly got better in 47 of the 55 managed feet (85.45%); after the treatment, the mean score of Pirani was enhanced from 5.6 to 3.5.

Conclusion: After evaluating the patients both functionally and clinically, the Ponseti technique was found to be effective with a major statistical significance ($p = 0.0001$), there was an 85.45% success rate, and the Pirani's index has been enhanced by a mean of 65.5% (a reduction from 5.6 to 3.5).

Keywords: Achilles tenotomy, Clubfoot, Pirani scale, Ponseti Method.

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INTRODUCTION

Congenital clubfoot (CCF) is common and one of the most puzzling orthopedic abnormalities in the pediatric age group. Many short-term studies revealed fair clubfoot treatment results, getting up to 97%. In addition to a decreased requirement for surgery by utilizing the conservative Ponseti technique.[1-3] The incidence of clubfoot varies widely in terms of race and gender and rises with the number of affected relatives; this indicates that the etiology is partly affected by genetic factors.[1] Clubfoot is a deformity recognized by a complicated malalignment of the feet, typically with equinus and varus malformation of the hindfoot (traditionally named talipes equinovarus), in addition to adduction and cavus of the forefoot and midfoot. Also, it occurs once in a thousand births, with a higher prevalence in males at 2:1 ratio, and both feet in half of the patients.[1,2] Hippocrates was among the earliest who mentioned managing CCF by frequent and soft manipulations, and then ended by immobilizations.

In 1836, Guerin practiced the use of plaster for the first time. New techniques were invented to maintain the corrections, like Thomas technique. Kite[4] encouraged soft and frequent manipulations; after that, he applied plaster cast, which is later became recognized as the Kite technique.[1] Ponseti established and achieved his treatment technique around 1940. This method is centered on soft manipulations with frequent cast changes, percutaneous Achilles tenotomy (PAT), and the usage of an orthosis that keeps the foot in abduction.[1,5] Numerous classification systems have been used to evaluate how severe the clubfoot deformity is and to assess the influence of the treatment on the outcome of CCF. Until now, no system for classifying the severity of the deformity has succeeded. Yet, the Pirani scale, our main classification, is simple to use and more modern, although it is still in the authentication stage.[6] This system is a simple one, using three parameters in the midfoot and three parameters in the hindfoot. Every parameter is given a mark from 0 to 1.[6] The Ponseti method

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can also be used in patients with neglected cases of CCF after start walking, and it showed satisfactory results (89%), low rate of recurrence (18%), and avoiding surgical techniques possible to cause complications.[7-9] Until recently, the definitive treatment of clubfeet in our country (Iraq) has been mainly surgical. Because of the promising published results of Ponseti treatment, this prospective study was conducted to assess the role of this technique in the management of congenital clubfoot.

PATIENTS AND METHOD

This prospective study analyzed 34 patients with idiopathic clubfoot managed with the Ponseti procedure in our orthopedic clinic between January 2014 and October 2017. When assessed for the first time, the age of our patients ranged from (1 to 25.7 weeks). Patients who have rigid feet were omitted from the study, and we included only the flexible feet. Patients who did not maintain follow-up were excluded from the study. According to Ponseti,[5] the treatment must be started in the first days of life, with gentle manipulations, achieved at intervals of 5 to 7 days, followed by applying a plaster cast, with the knee at 90 degrees flexion. Percutaneous sectioning of the calcaneal tendon was performed by no.11 blade at 1 cm from its insertion. Patients were diagnosed, and their medical history and examinations were documented. The data were meticulously evaluated to identify the improvement of using the Ponseti technique by using the Pirani scale. When the patients were examined for the first time, a diagnosis was made by noticing the typical deformities: equinus, varus, cavus, and adductus. Many parameters were used: sex, age, affected foot, family history, associated deformities, the onset of treatment and its duration, how frequent the plaster changed, the requirement for tenotomy, follow-up time and recurrence, and Pirani scores pre and post-treatment. The score of Pirani was used before starting the planned treatment, and it was repeated after completion of the treatment, by this, we were able to evaluate the results achieved with the Ponseti technique.[6] An expert practitioner in statistics helped us to analyze the data. For paired samples, the test of Wilcoxon ($p \leq 0.0001$) was applied.

RESULTS

After evaluating 34 patients with CCF, 21 (61.7%) were male and 13 (38.3%) were female. Twenty-one patients (61.7%) had both feet, while 13 (38.3%) were unilateral. There was the involvement of the right side in 42 feet (76.4%), while the left side was involved in 13 feet (23.6%). Thirty patients (88.2%) had not received treatment before, while four had been submitted to previous treatment (11.8%) (i.e., methods other than the Ponseti method). Thirty-one patients (91.2%) had no concomitant deformity, and a family history of congenital club foot was positive in three patients (8.8%) (Table 1). Achilles Tenotomy was required in 25 patients (41 feet) (74.54%) (Table 2). The average number of pop cast changes to the time of tenotomy was (5.7) (range was shown to be between 4 and 10 times) (Table 3). Recurrence was noticed in five patients (8 feet) (14.54%). Two of them (3 feet) were managed by manipulation and application of pop cast while transposition of tibialis anterior was necessary for the other 3 patients (5 feet) (Table 1). The mean age at the primary assessment was 2.8 weeks (range: 1 to 25.7 weeks). The follow-up time was at a mean of 25.3 months (range: 6–45), as illustrated in Table 4. There was an improvement of the deformities in 47 of the 55 managed feet (85.45). The primary score of Pirani was 5.6 (range: 3.5–6); following treatment, the average was 3.5 (range: 3–5). The *p*-values for these results were <0.0001 (Table 3).

Table 1: Patients common features

Parameters	*Number*	*%*
Sex		
Female	13	38.3
Male	21	61.7
Side		
Right	42 feet	76.4
Left	13 feet	23.6
Congenital clubfoot history		
Yes	3	8.8
No	31	91.2
Recurrence		
Yes, and manipulation and application of POP cast	2 (3 feet)	5.45
Yes, and transposition of tibialis anterior applied	3 (5 feet)	9.09
No	29 (47 feet)	85.45

Table 2: Achilles tenotomy feature.

Tenotomy	*Number of patients*	*%*	*Unilateral*	*Bilateral*	*Total number of feet*
Yes	25	74.54	9	16	41
No	9	25.45	4	5	14
Recurrence	5	14.54	2	3	8

Table 3: Pirani scale assessment

	Number of feet	*Minimum number*	*Maximum number*	*Mean*
How many times POP cast has changed until the time of tenotomy	55	4.0	10.0	5.7
Pirani scale assessment:				
Pirani scale at first assessment	55	3.4	6.2	5.6
Pirani scale at the end of treatment	55	3.1	5.0	3.5

Table 4: Age of patients and duration of follow-up

	Number of patients	*Minimum age*	*Maximum age*	*Mean age*
Age at initial evaluation (in weeks)	34	1	25.7	2.8
Period of follow-up (in months)	34	6	45	25.3

DISCUSSION

The dominance of the involved side and gender were in concurrence with most of the other works of literature. In our study, the ratio of males and females was 1.6:1, while in other articles, the ratio was 2:1,[2,10-12] and there is higher involvement of the right side.[2,7,13] However, our study spotted a little higher bilateral involvement (61.7%) than what is stated in the literature (50%).[7,14] It was necessary to do AT in 25 patients (41 feet) (74.54%), which is compatible with the recent wprks of literature from 70 to 90%.[2,4,5,14,15] In this study, before the usage of tenotomy, the average number of POP cast changes was 5.7 (range between 4 and 10 times), which agrees with the literature.[5,14,16-18] Recurrence was detected in five patients (8 feet) (14.54 %). In three of them, the cause was idiopathic, while the improper usage of the orthosis was the cause behind the other two recurrences; this is also in agreement with the works of literature.[5,7,8] For all three idiopathic recurrence cases, the tendon of the tibialis anterior was transposed to the third cuneiform together with elongation of Achilles tendon. Denis Browne bar was utilized 6 weeks after surgery and was applied for 6 months. The rate of success in our study was near those mentioned in the literature and original article of Ponseti.[19-23] Clinical and functional improvements were detected in our managed patients, with an 85.45% success rate 47 of the 55 feet managed, and the Pirani scale has an average improvement of 65.5% (a reduction from 5.6 to 3.5).

CONCLUSION

The Ponseti method was found to be efficient in treating congenital clubfoot based on considering clinical and functional outcomes. Its efficacy was confirmed by the improvements in the Pirani scale used here and tended to be statistically significant.

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