

The Factors of the Failure in the Treatment of Congenital Equinus Clubfoot Varus by the Ponseti Method at the Reference Health Care Center (CSREF) of Commune III of Bamako

Seydou Sanogo*, Soumaila Diallo, Boubacar Karembé, Lassine Cissé, Almami Kire, Moussa Cissé, Abdoulaye Coulibaly, Aboubacar Touré, Boureima Traoré, Moustapha Yossi, Moussa Samaké, Drissa Diarra, Mohamed Traore, Seydou Mariko, Issa Fomba, Layes Touré, Adégné Togo

Department of Orthopedic-Traumatology, CSREF CIII, Bamako, Mali

Email: *seydouml@gmail.com

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Abstract

Clubfoot malformation is the most common serious congenital anomaly affecting the foot in children. Its treatment by the Ponseti method is simple, profitable and widely used in the world. **Objective:** The objective of this study was to identify the factors of the failure of its treatment by the Ponseti method. **Material and Method:** We carried out a retrospective and descriptive study of cases of congenital equinus clubfoot varus at the Reference Health Care Center of Commune III of Bamako over 26 months from September 2020 to November 2022. Data were treated with the utmost anonymity. **Result:** This study was performed on 44 children seen for clubfoot: male (68%) and female (32%), with a sex ratio of 2.1. We obtained 13 cases of recidivism including 7 boys and 6 girls. We found 21 cases of unilateral and 23 bilateral; among which 9 recurrences were found against 4 in the unilateral forms. 85% of recurrences did not have good adherence to the splint and 62% did not come regularly for follow-up consultation. We obtained 33 children with idiopathic clubfeet (75%) with a recurrence of 24%, and 7 children with secondary clubfeet with 71 % recurrence. There was no recurrence in the postural type. Among the recurrences, 38.5% started treatment between 1 and 6 months, 23.1% from 0 to 1 month and 15.4% at 2 years and more. 85% of recurrences had a Pirani score between 4.5 to 6 at the start of treatment and 15% at a score of 2.5 to 4. **Conclusion:** The factors of the failure of the Ponseti method are mainly non-compliance with treatment, secondary clubfeet, and a high Pirani score at the start of treatment.

Keywords

Chess' Factors, Club Foot, Ponseti Method, Pirani Score

1. Introduction

Clubfoot, also known as congenital equinus varus clubfoot (CBVE), is a malformation of the foot that presents at birth. Clubfoot malformation is the most common serious congenital anomaly to affect the foot (approximately 1 in 1000 births). In general, it is an isolated anomaly, but it is sometimes associated with other malformations or congenital syndromes [1]. It is a three-dimensional complex deformation associated with osteoarticular deformations and retractions of soft parts [2]. The pathological anatomy of clubfoot is typical of dysplasia, and the tarsal bones are hypoplastic [3].

To explain the cause of clubfoot, many theories have been proposed. According to one of them, a primary defect of the astragalus germplasm causes a maintained plantar flexion with inversion of the bone and secondary to an alteration of the soft tissues, joints and musculotendinous complexes. But it is most often classified as idiopathic [4].

There are a lot of methods of treatment of clubfoot, among which we can mention the surgical method, the method of Illizarof and the method of Ponseti.

Surgical treatment concerns essentially the soft tissues, which are insufficiently stretched by the orthopedic treatment, but also the skeleton. It often comes after recurrences and failure of orthopedic treatment. In addition to the complications inherent in any surgery, the two main causes of failure are under-correction and overcorrection [5].

The Ponseti treatment is simple and cost-effective and is widely used across the world. Many studies by researchers from different countries of the world over the past two decades have shown that more than 90% of cases of newborns with idiopathic clubfoot can be treated using the Ponseti method [1].

In our center, on the other hand, we frequently see cases of therapeutic failure due to the recurrence of the deformities.

Our study aims to elucidate the factors that contribute to the recurrence of deformities after successful treatment by the Ponseti method at the Reference Health Care Center of Commune III of Bamako.

2. Materials and Method

We carried out a retrospective and descriptive study on the failure factors of clubfoot treatment by the Ponseti method at the CSREF of commune III of Bamako. Our population consisted of 65 patients, *i.e.* all patients treated for clubfoot by the Ponseti method at CSREF CIII in Bamako for a period of 26 months from September 2020 to November 2022. The data was collected from clinical records recorded in our database (through the miracle feet CommCare applica-

tion where all children treated as part of the clubfoot treatment program in our health center are recorded and constantly updated during follow-up consultations). Excluded: cases of abandonment, children who died during the study period as well as cases that had not yet reached 6 months after the end of the correction. The sample thus obtained consisted of 44 children (67 feet). The variables studied were: sex, recurrence, number of feet affected, adherence to the splint, follow-up in consultation, type of clubfoot, age at start of treatment, and Pirani score. Our recurrence criterion was determined by the reappearance of one or more deformities initially present in the patient before starting the treatment. The foot severity evaluation measure used is the PIRANI SCORE, which ranges from 0 for a normal foot to 6 for the most severe cases. The data obtained are entered with Word 2010 and processed with Epi Info analysis software (version 6.0). The Chie-2 statistical test was used to compare results that were significant for a probability $p < 0.05$.

Anonymity of children's identity and their parents was guaranteed. The small size of the population, the short duration of follow-up as well as the reduced number of variables studied constitute the limits of our study.

3. Results

We retrospectively collected 44 children meeting our inclusion criteria, the male sex 68% (30 cases) against 32% female (14 cases) with a sex ratio of 2.1 (Table 1). We obtained 21 unilateral cases and 23 bilateral cases (Table 2). All our children were treated by the Ponseti method. We obtained 13 cases of recurrences (29.5%) and 6 of them were girls. 9 bilateral patients relapsed against only 4 unilateral patients. In 85% of recurrences, adherence to the splint was poor and 8 patients (62%) were irregular in the splint control consultation (Table 3). From the distribution of patients according to the types of clubfoot, we have 33 idiopathic cases or 75% of the sample with a recurrence rate of 24% and 7 cases of

Table 1. Distribution of patients according to gender and recurrence.

	Male	Female	Total	%
Presence of recurrence	7 (23%)	6 (43%)	13	29.5
No recurrence	23	8	31	70.5
Total	30 (68%)	14 (32%)	44	100%

Source: Clinical file in the database.

Table 2. Distribution of patients according to the number of foot affected and recurrence.

	Unilateral	Bilateral	Total
Presence of recurrence	4	9	13
No recurrence	17	14	31
Total	21 (47.7%)	23 (52.3%)	44

Source: Clinical file in the database.

secondary clubfoot with 71% recurrence (**Table 4**). There were no cases of recurrence for the 4 postural club feet. Among the recurrences, 38.5% of children started treatment between 1 and 6 months, 23.1% of children from 0 to 1 month, 15.4% at 2 years and older. Among the 13 recurrent cases, 11 (85%) had a Pirani score between 4.5 and 6 at the start of treatment and only 2 patients had a score between 2.5 and 4 (**Figure 1**).

4. Discussion

There are many factors that influence the good result of the ponseti method such as the experience of the practitioner, the working conditions and other factors depending on the patient and his surroundings (family). In the literature the failure rate of the Ponseti method varies between 6.6% [6] and 56% [7] with an average of 25% according to Yeddou *et al.* [8].

The overall rate of failure in our study was 29.5%. This result is different from that obtained by Adakal *et al.* [9] who had 12.7% recurrence, but comparable to that of Boukirma and Elfezzazi (29%) [10].

Clubfoot is a much more common birth defect in males [1] [2] [5] [6]. Among

Table 3. Distribution of recurrences according to adherence to the splint and follow-up in consultation.

	Splint compliance	Followed in consultation
Good	2	5
Poor	11 (85%)	8 (61.5%)

Source: Clinical file in the database.

Table 4. Distribution of recurrences by type of clubfoot.

	Idiopathic	Postural	Secondary	Total
Prevalence	33 (75%)	4	7	44
recurrence	8 (24%)	0	5 (71%)	13

Source: Clinical file in the database.

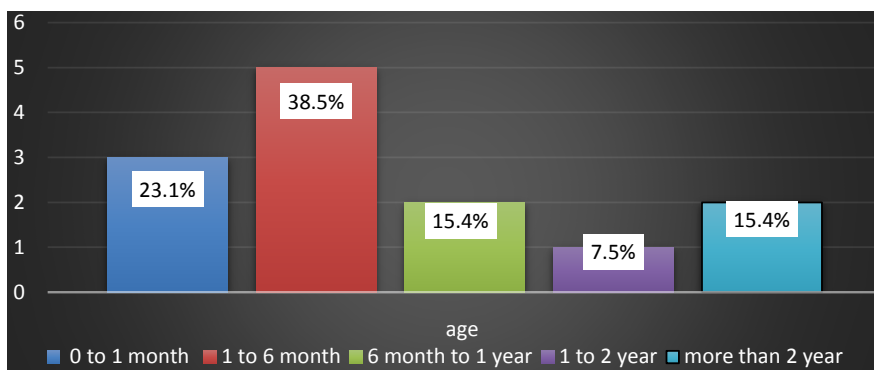


Figure 1. Distribution of recurrence cases according to age at start of treatment. Source: clinical file in the database. Source: Clinical file in the database.

the female sex, 6 patients out of 14 (43%) relapsed against 7 boys out of 30 (23%). We thus found that the recurrence is more frequent in the female sex. Some authors like Ralahy [11] have found that the anomaly is more severe in girls than in boys. Boukirma and Elfezzazi [10] in their study found that female sex is a success factor for the treatment of clubfoot by the Ponseti method; which is different from the findings in our study.

Bilateral malformations represented 52.3% of the sample and 69% of recurrences. Unilateral respectively 47.7% of samples and 31% of recurrences. In the literature, no study similar was found on this subject. We therefore believe that bilateral clubfoot constitutes a risk factor for recurrence.

Splint compliance failed in 85% of cases with recurrences at some time during treatment. This observation highlights the role of wearing a splint in the occurrence of recurrences. Yeddou *et al.* [8] in their study established a direct relationship between adherence to the splint and the occurrence of recurrences. Morcuende [12] noted that recurrences were present in only 6% of cases in families who adhered to the wearing of the splint and more than 80% of the cases in families who did not adhere to the wearing of the splint.

Regular monitoring of splint control consultations is another significant factor for the success of the Ponseti method; 62% of recurrences in our study were irregular in their splint control consultations. Hamadi [5] and Moulot *et al.* [13] also mentioned treatment compliance as a success factor for the Ponseti method.

The idiopathic clubfoot according to all the bibliographies represents the most frequent form. Our study is no exception with 75% of patients and 24% of recurrences. The secondary type with 7 cases (16%) recorded 5 recurrences (71%). In secondary or syndromic clubfeet, other birth defects are present. Clubfoot is part of the syndrome. In this case, the Ponseti method remains the standard management, but may be more difficult with a less predictable treatment response. The final result may depend more on the overall context than the clubfoot itself [12].

As for postural or positional clubfoot, there has been no recurrence in children with this form of clubfoot. In these cases the deformation is very flexible, probably due to intrauterine stresses. The correction is very easy and is often done with one or two casts. In our study, we treated 4 cases of postural clubfoot using the Ponseti method without recurrence.

The majority of recurrence cases (38.5%) were children, who started the treatment between one to six months, much more than children who started at two years old (15.4%). From 0 to one month, recurrence cases represented 23.1%. Age of patients, at the beginning of treatment, does not seem to have much influence on the Ponseti method if the standards of the technique are respected. For time being, it has been demonstrated that the treatment is more effective if it is started before the age of 2 years [14]. The high number of children aged one to six months in our study can be explained by the fact that many children come to consultations at this age, after having exhausted traditional methods and unsuccessful demystification sessions.

Without any doubt, the Pirani score, also called the Pirani severity score, has a direct relationship with recidivism in our series. It assesses the severity of clubfoot based on a scoring system that evaluates 6 clinical indicators of foot contracture. The more it is high, the more the foot is severed. 85% of our recurrence cases had a score between 4.5 and 6, and only 15% between 2.5 and 4. There were no recurrences for score inferior or equal to 2.

5. Conclusion

The correction of clubfoot by the Ponseti method is a relatively easy and inexpensive technique, but its success depends necessarily on maintaining the correction with a suitable splint. The factors leading to its failure in our center are mainly non-compliance with treatment, secondary clubfeet and a high Pirani score at the start of treatment.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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