Effectiveness of French Physiotherapy in Treating Congenital Clubfoot Deformity

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Introduction

Disability has emerged as a major public health problem worldwide. Childhood disability is one of them and it remains hidden in developing countries like Bangladesh [1]. Importance of conservative treatment in congenital clubfoot has been known since the Hippocrates era (approximately 400 B.C) [2]. Continuous passive movement treatment method of French authors has been added to manipulation, bandage, cast and device applications [3]. There is not a clear opinion in the literature on how to treat overcorrection. In the long-term follow-up studies, weakness in muscle groups around the ankle, joint stiffness was found [4,5]. Laaveg & Ponseti [6] obtained 89% success rate by using the conservative treatment method and minimal invasive surgery if required. Prevalence of congenital clubfoot in Bangladesh is high and most of the cases remain untreated or poorly treated [7]. According to French physiotherapy method (93-96%) so congenital clubfoot is manageable if the treatment can be started before child’s 1st birth day. It is important to identify the effectiveness of French physiotherapy in treating congenital clubfoot deformity than other conservative method like Ponseti Method. In French method the complication should be minimize. As there no study was done in this topic before in our country, I was very much interested to do research on this topic.

Material and Methods

Study design: Randomized clinical trial

Study population: Children with congenital clubfoot deformity who are attending the selective clinics.

Inclusion criteria:

a. Willingly participating patients
b. Age below 3 years
c. Before tenotomy patients

Exclusion criteria:

a) Benign feet
b) Severe clubfoot deformity
Sampling technique

**Treatment allocation:** Treatment procedure was allocated randomly in two groups by tossing. The heads were taken in odd serial i.e. group -1 while the tails were placed in even serial i.e. group 2.

**Group-1:** This group was treated by Ponseti method [8-15].

**Group-2:** This group was treated by French physiotherapy methods. This treatment will carry out by a team with large experience in managing clubfoot with such a method [16,17]. In this study the sample size was taken as 30 for both group i.e Ponseti Method and French Physiotherapy Method.

**Study place:** The study was carried out at-

i. BCCW, Dhaka.

ii. NGO- TLMB (Gaibandha), SEID Trust.

**Study period and duration:** From 14”th January 2013 to 13th January 2014.

**Data collection tool and instrument:**

A. Face to face interview of mother using pre-tested structure questionnaire

B. Applying both the method by randomizing 60 children

**Table 1:** Distribution of respondents by demographic characteristics (n=60).

| Demographic Characteristics | Ponseti Method Group n (%) | French Physiotherapy Group n (%) | Total n (%) | p-Value |
|-----------------------------|----------------------------|----------------------------------|-------------|---------|
| **Sex of the children**     |                            |                                  |             |         |
| Male                        | 21(70)                     | 21(70)                           | 42(70)      | 1.00    |
| Female                      | 9(30)                      | 9(30)                            | 18(30)      |         |
| **First visit age in days** |                            |                                  |             |         |
| 0-90                        | 9(30)                      | 8(26.7)                          | 17(28.3)    |         |
| 91-180                      | 4(13.3)                    | 4(13.3)                          | 8(13.3)     |         |
| 181-270                     | 0(0)                       | 1(3.3)                           | 1(1.7)      |         |
| 271-360                     | 2(6.7)                     | 2(6.7)                           | 4(6.7)      | 0.991   |
| 361-450                     | 5(16.7)                    | 5(16.7)                          | 10(16.7)    |         |
| 451-540                     | 3(10.0)                    | 3(10.0)                          | 6(10.0)     |         |
| 541-630                     | 2(6.7)                     | 1(3.3)                           | 3(5.0)      |         |
| 631-720                     | 2(6.7)                     | 3(10.0)                          | 5(8.3)      |         |
| 721-810                     | 3(10.0)                    | 3(10.0)                          | 6(10.0)     |         |

**Data collection method**

Data were gathered by pre verified semi structured questionnaires and in face to face interview. Information about pregnancy related question, family history & other characteristics was also obtained. The field work was conducted from March to September 2013 at Comilla & Dhaka district. The respondents were selected consecutively who will meet the inclusion and exclusion criteria. Two interviewers were trained for four days by the author. The training was consisted of lectures on how to fill up the questionnaires and mock interviews between participants.

**Data analysis:** Computer technology (SPSS 20.0) version was used for classification, presentation and analysis of data.

The Pirani score is a simple. The components are scored as follows:

a. Each component may score 0, 0.5 or 1

b. Hind foot contracture score (HCFS): Mid foot contracture score (MPCS):

c. Posterior crease Medial crease

d. Empty heel Curvature of lateral border

e. Rigid equinus Position of head of talus (Table 1).
The mean age of the participants was 405 days, n=17 (28%) participants in between 0-90 days of age, n=8 (13%) in between 91-180 days of age and n=1 (2%) in between 181-270 days. n=4 (7%) participants in between 271-360 days of age, n=10 (17%) in between 361-450 days of age and n=6 (10%) in between 451-540 days. n=3 (5%) participants in between 541-630 days of age, n=5 (8%) in between 631-720 days of age and n=6 (10%) in between 721-810 days. Result shows that 0-90 days are more common age those who had taken French physiotherapy & ponseti method. In control group the participants 21 out of 30 (70%) were male and 9 out of 30 (30%) were female. Result shows that male was more affected than female. In intervention group the participants 21 out of 30 (70%) were male and 9 out of 30 (30%) were female. Result shows that the male was more affected than female (Table 2).

Table 2: Socio-economic characteristics of parents (n=60).

| Socio-Economic Characteristics | Ponseti Method Group n (%) | French Physiotherapy Group n (%) | Total n (%) | p-value |
|---------------------------------|-----------------------------|----------------------------------|-------------|---------|
| Father Occupation               |                             |                                  |             |         |
| Service                         | 5(16.7)                     | 5(16.7)                          | 10(16.7)    | 0.569   |
| Business                        | 13(43.3)                    | 13(43.3)                         | 26(43.3)    |         |
| Farmer                          | 4(13.3)                     | 8(26.7)                          | 12(20.0)    |         |
| Day labor                       | 7(23.3)                     | 3(10.0)                          | 10(16.7)    |         |
| Others                          | 1(3.3)                      | 1(3.3)                           | 2(3.3)      |         |
| Father Education                |                             |                                  |             |         |
| illiterate                      | 4(13.3)                     | 6(20.0)                          | 10(16.7)    | 0.292   |
| PSC                             | 4(13.3)                     | 5(16.7)                          | 9(15)       |         |
| JSC                             | 9(30.0)                     | 4(13.3)                          | 13(21.7)    |         |
| SSC                             | 4(13.3)                     | 7(23.3)                          | 11(18.3)    |         |
| HSC                             | 4(13.3)                     | 6(20.0)                          | 10(16.7)    |         |
| Bachelor                       | 5(16.7)                     | 1(3.3)                           | 6(10.0)     |         |
| Masters                         | 0(0)                        | 1(3.3)                           | 1(1.7)      |         |
| Mother Occupation               |                             |                                  |             |         |
| House maker                     | 29(96.7)                    | 30(100)                          | 59(98.3)    | 0.313   |
| Day labor                       | 1(3.3)                      | 0(0)                             | 1(1.7)      |         |
| Mother Education                |                             |                                  |             |         |
| illiterate                      | 6(20.0)                     | 7(23.3)                          | 13(21.7)    | 0.982   |
| PSC                             | 6(20.0)                     | 5(16.7)                          | 11(18.3)    |         |
| JSC                             | 14(46.7)                    | 15(50)                           | 29(48.3)    |         |
| SSC                             | 3(10.0)                     | 2(6.7)                           | 5(8.3)      |         |
| HSC                             | 1(3.3)                      | 1(3.3)                           | 2(3.3)      |         |

In terms of father occupation in ponseti group, out of 30(100%), 5(16.7%) were service holder while the equal number of service holders in French physiotherapy method group, 13(43.3%) were business holders in ponseti group while the equal proportion of respondents were business holders in French physiotherapy method group. Only 13% were farmers in ponseti group whereas the double proportion of farmers were farmers in France physiotherapy method group. Of the fathers in ponsity group 23% were day labor while the half of proportion were day labor in French group. In terms of father education almost equal proportion of fathers was same education level in both groups. Mother occupation indicates that almost all were house makers in both groups. Educational status was also same in both groups (Figure 1).

The above figure shows that almost equal proportion of father were same occupation in ponseti and French group. The majority were involved in business (Table 3).
Table 3: Distribution of the respondents by affected limb (n=60).

| Subject          | Ponseti Method Group n (%) | French Physiotherapy Group n (%) | French Physiotherapy Group n (%) | p-value |
|------------------|----------------------------|----------------------------------|----------------------------------|---------|
|                  | Right Limb                | Left Limb                         | Both Limb                        |         |
| Affected limb    | 9 (30)                    | 13 (43.3)                         | 8 (26.7)                         |         |
|                  | 14 (46.7)                 | 11 (36.7)                         | 5 (16.7)                         | 0.378   |
|                  | 23 (38.3)                 | 24 (40)                           | 13 (21.7)                        |         |

**Results**

Result shows that among all the participants in Group A, unilateral n=47 (78%) among them n=23 (38%) were right limb affected & n=24 (40%) were left limb affected and bilateral n=13 (22%) were involvement of the affected limb of the participants. Result shows that unilateral limbs were more affected than bilateral limbs (Table 4).

Table 4: Distribution of respondents by family history of Clubfoot (n=60).

| Family history of Clubfoot | Ponseti method | French Physiotherapy | Total |
|----------------------------|----------------|----------------------|-------|
| Yes                        | 2 (6.7%)       | 1 (3.3%)             | 3 (5.0%)         |
| No                         | 28 (93.3%)     | 29 (96.7%)           | 57 (95.0%)        |

Result shows that among all the participants approximately 5% (3 of 60) had past family history of clubfoot and 95% (57 of 60) had no past family history of club foot. Of them 2 (6.7%) were in ponseti group and 1 (3.3%) were in French Physiotherapy group (Table 5).

Table 5: Distribution of the respondents by birth history (n=60).

| Birth History          | Ponseti Method n (%) | French Physiotherapy n (%) | Total n (%) | p-value |
|------------------------|----------------------|-----------------------------|-------------|---------|
| Delivery Time          |                      |                             |             |         |
| Before                 | 3 (10.0)             | 3 (10.0)                    | 6 (10.0)    | 0.838   |
| After                  | 1 (3.3)              | 2 (6.7)                     | 3 (5.0)     |         |
| In Time                | 26 (86.7)            | 25 (83.3)                   | 51 (85)     |         |
| Mode of delivery       |                      |                             |             | 0.592   |
| Normal                 | 18 (60)              | 20 (66.7)                   | 38 (63.3)   |         |
| Cesarean               | 12 (40)              | 10 (33.3)                   | 22 (36.7)   |         |
| Problem during pregnancy|                     |                             |             |         |
| Yes                    | 0 (0)                | 1 (3.3)                     | 1 (1.7)     | 0.313   |
| No                     | 30 (100)             | 29 (96.7)                   | 59 (98.3)   |         |
| Place of delivery      |                      |                             |             | 0.701   |
| Home                   | 15 (50)              | 17 (56.7)                   | 32 (53.3)   |         |
| Hospital               | 11 (36.7)            | 8 (26.7)                    | 19 (31.7)   |         |
| Clinic                 | 4 (13.3)             | 5 (16.7)                    | 9 (15)      |         |
| Health workers during delivery |      |                             |             | 0.606   |
| Yes                    | 16 (53.3)            | 14 (46.7)                   | 30 (50)     |         |
| No                     | 14 (46.7)            | 16 (53.3)                   | 30 (50)     |         |
| Problem during delivery|                      |                             |             | 0.161   |
| Yes                    | 0 (0)                | 1 (3.3)                     | 1 (1.7)     |         |
| No                     | 30 (100)             | 29 (96.7)                   | 59 (98.3)   |         |
| Same Problem in family member |       |                             |             | 0.554   |
| Yes                    | 2 (6.7)              | 1 (3.3)                     | 3 (5.0)     |         |
| No                     | 28 (93.3)            | 29 (96.7)                   | 57 (95.0)   |         |
| Any other disability   |                      |                             |             |         |
| Yes                    | 1 (3.3)              | 0 (0)                       | 1 (1.7)     | 0.313   |
| No                     | 29 (96.7)            | 30 (100)                    | 59 (98.3)   |         |
In both group 10% baby was preterm while 86% was born in time in poseti group and 82.3% was in French group, the rest 3.3% in poseti group and 5% was in France group was born in post term. Of the children with clubfoot deformity 60% had normal mode of delivery in poseti group while 66.7% had in French group. Cesareae delivery had 40% in poseti group and 33.3% had in French group. Problem during pregnancy occurred 0% in poseti group and 3.3% in French group. Place of delivery was home, hospital and clinic, the majority of the children’s place in delivery was home in both groups. It was about fifty percent. Only 13.3% had clinic in poseti group and 16.7% in French group. Only 3.3% mothers had suffered problems during delivery while the rest had not suffered any problems during delivery. Of the mothers almost fifty percent had health workers during delivery, others had no health workers. Out of 30(100%) children, only 3.3% had other disability and it was in poseti group (Table 6).

Table 6: Comparison between Ponseti and French physiotherapy in pre-intervention total score (n=60).

| Category          | Ponseti Method | French Physiotherapy | Total | \(\chi^2/\text{Fisher} \) | p value |
|-------------------|----------------|-----------------------|-------|---------------------------|---------|
| Mild deformity (1-5) | 0(0)          | 0(0)                  | 0(0)  | 0.000                     | 1.0     |
| Moderate (1.5-4)  | 2(6.7)         | 2(6.7)                | 4(6.7)|                           |         |
| Severe deformity (5+)| 28(93.3)     | 28(93.3)              | 56(93.3) |                             |         |

Results shows that out of 60(100%) children with clubfoot deformity equal numbers of them were in both group with severe and moderate deformity. There was no significance difference between two groups before intervention (p>0.05) (Table 7).

Table 7: Comparison between Ponseti and French physiotherapy in post-intervention total score (n=60).

| Category          | Ponseti method | French Physiotherapy | Total | \(\chi^2/\text{Fisher} \) | p value |
|-------------------|----------------|----------------------|-------|---------------------------|---------|
| Complete cured    | 8(26.7)        | 17(56.7)             | 25(41.7) | 7.859                    | 0.02    |
| Moderate cured    | 11(36.7)       | 10(33.3)             | 21(35.0) |                           |         |
| Partial cured     | 11(36.7)       | 3(10.0)              | 14(23.3) |                           |         |

Results shows that out of 30(100%) children with clubfoot deformity, 17(56.7%) were completed cured under French Physiotherapy while 8(26.7%) were completed cured under Ponseti method, almost equal number of children were in both group improved to moderate cured. There was significance difference found between two groups after intervention (p<0.05). France physiotherapy was more effective method for the treatment of clubfoot over the Ponseti method (Table 8).

Table 8: Mean difference between Ponseti and French physiotherapy in post-intervention total score (n=60).

| Methods          | n   | Mean | SD    | t    | p    |
|------------------|-----|------|-------|------|------|
| Ponseti method   | 30  | 1.10 | .803  | 2.947| 0.005|
| French Physiotherapy | 30 | 0.53 | 0.681 |      |      |

The above table shows that there was significance difference found between two methods in terms of clubfoot treatment (t=2.9, p=0.005). The calculated mean score was 1.1 and .53 in Ponseti and French physiotherapy method respectively. French Physiotherapy was more effective treatment for clubfoot deformity.

Discussion

The present study showed French physiotherapy was more effective method for the treatment of clubfoot over the Ponseti method. A study reporting early results of the Ponseti treatment, 95% of the deformities were corrected without need for extensive surgery [18]. This recovery rate is consistent with the results, reported by Herzenberg et al. [19], whose study included similar population and follow-up. Though it was not a new treatment method, Ponseti method had not been adopted by many and surgical treatment methods had been used as standard treatment until recent years. Initially, extensive surgical methods aimed physical improvement but owing to long term follow-up studies the importance of functional outcomes and maintenance of movement were recognized [20,21]. Muscular weakness and biomechanical changes [22-23], observed in patients who were considered as corrected initially, increased the popularity of conservative treatment methods again. Cooper & Dietz [24], found functionally and clinically perfect and good outcomes in 78% of deformities in patients, who were treated by Ponseti, in their average 30 years, follow-up study. This success rate was 85% in control group, consisting of the patients without congenital foot deformity. In their magnetic resonance imaging study, Pirani et al. [25] detected improvement in both the relation of tarsal bones and the forms of osteochondral outlines of the bones in patients, treated by Ponseti method. These findings support the Ponseti’s hypothesis, which asserts that with a proper treatment method that considers the functional anatomy of foot and uses biological potential in the tissues of a newborn, an appropriate improvement can be obtained in most of the deformities which is contradictory with the present study. The present study shows that there was significance difference found between two methods in terms of clubfoot treatment (t=2.9, p=0.005). Different conservative treatment methods have

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been suggested in the literature. One of the popular methods in Europe is the method of Dimeglio et al. [26] consisting of daily physiotherapy and continuous passive motion machine.

With this method, only 28% of the cases required surgical treatment. However, difficulties in long term physiotherapy, and its high cost makes adoption of this method problematic in many countries, including our country. In many countries, especially in the USA, Kite’s method has been used widely for a long time [27]. Kite, who tried to correct the components of the deformity separately and patiently, obtained improvement within 36 weeks. Ponseti attributes such a delay in improvement to the effort for correction of forefoot by counter pressure from calcaneocuboidal joint, which was Kite’s error according to Ponseti. Because kinematics of the foot does not allow evertion of calcaneus before abduction (outward rotation) of it, correction of varus became time consuming for Kite [28]. In a careful study, by Tümer et al. [29] where Kite’s and Ponseti’s manipulation methods were used concomitantly, it was reported that 33% of the cases were treated by only using plaster cast. This success rate reached at 41% with addition of the patients who underwent posterior release surgery. Bursalı [30] reported that they obtained correction in all of the untreated cases and in 75% of the cases, treated previously elsewhere, by using Ponseti’s method strictly.

**Limitation**

100% accuracy was not possible in any research so that some limitation may exist. Regarding this study, there were some limitations or barrier to consider the result of the study. The first limitation of this study was sample size. It was taken only 30 samples in each group. A very few researches have been done on a few of research among the effectiveness of French physiotherapy in management of clubfoot patients. So there was little evidence to support the result of this project study in the context of Bangladesh.

**Conclusion**

This study demonstrates that French physiotherapy method is an effective and reproducible method for correction of idiopathic Congenital Clubfoot deformities. Furthermore, it may be used in our country widely. For successful outcomes, this technique should be applied carefully and the patients should use the foot abduction orthosis with full compliance. For patient compliance, besides parent training, producing proper and comfortable shoes is required.

**References**

1. Shawky S, Abulkhair B, Soliman N (2002) An epidemiological study of childhood disability in Jeddah, Saudi Arabia. Paediatr Perinat Epidemiol 16(1): 61-66.
2. Translated by Adams F. Hippocrates. On the articulations. [87 screens].
3. Diméglò A, Bonnet F, Mazau P, De Rosa V (1996) Orthopaedic treatment and passive motion machine: consequences for the surgical treatment of clubfoot. J Pediatr Orthop B 5(3): 173-180.
4. Davies TC, Kiefer G, Zernicke RF (2001) Kinematics and kinetics of the hip, knee, and ankle of children with clubfoot after posteromedial release. J Pediatr Orthop 21(3): 366-371.
5. Aronson J, Puskarich CL (1990) Deformity and disability from treated clubfoot. J Pediatr Orthop 10(10): 109-119.
6. Laaveg SJ, Ponseti IV (1980) Long-term results of treatment of congenital club foot. J Bone Joint Surg Am 62(1): 23-31.
7. www.globalclubfoot.org/clubfoot/ Accessed on 02 April 2016.
8. Ponseti IV (1992) Treatment of congenital club foot. J Bone Joint Surg Am 74(3): 448-454.
9. Coss HS, Henrikkus WL (1996) Parent satisfaction comparing two bandage materials used during serial casting in infants. Foot Ankle Int 17(6): 483-486.
10. Pittner DE, Klingele KE, Beebe AC (2008) Treatment of clubfoot with the Ponseti method: a comparison of casting materials. J Pediatr Orthop 28(2): 250-253.
11. Dobbs MB, Rudzki JR, Purcell DB, Walton T, Porter KR, et al. (2004) Factors predictive of outcome after use of the Ponseti method for the treatment of idiopathic clubfeet. J Bone Joint Surg Am 86(3): 22-27.
12. Gurnett CA, Boehm S, Connolly A, Reimschisel T, Dobbs MB (2008) Impact of congenital talipes equinovarus etiology on treatment outcomes. Dev Med Child Neurol 50(7): 498-502.
13. Ponseti IV, Zhivkov M, Davis N, Sinclair M, Dobbs MB, et al. (2006) Treatment of the complex idiopathic clubfoot. Clin Orthop Relat Res 451: 171-176.
14. Barker SL, Lavy CB (2006) Correlation of clinical and ultrasonographic findings after Achilles tenotomy in idiopathic clubfoot. J Bone Joint Surg Br 88(3): 377-379.
15. Changulani M, Garg NK, Rajagopal TS, Bass A, Nayagam SN, et al. (2006) Treatment of idiopathic club foot using the Ponseti method. Initial experience. J Bone Joint Surg Br 88(10): 1385-1387.
16. Richards B, Wilson H. POSNA (2002) Effect of continuous passive motion in the non-operative treatment of clubfeet: Early results; p. 66.
17. Richards BS, Johnston CE, Wilson H (2005) Non-operative clubfoot treatment using the French physical therapy method. J Pediatr Orthop 25(1): 98-102.
18. Göksan SB (2002) Treatment of congenital clubfoot with the Ponseti method. Acta Orthop Traumatol Turc 36(4): 281-287.
19. Herzenberg JE, Radler C, Bor N (2002) Ponseti versus traditional methods of casting for idiopathic clubfoot. J Pediatr Orthop 22(4): 517-521.
20. Hutchins PM, Foster BK, Paterson DC, Cole EA (1985) Long-term results of early surgical release in club feet. J Bone Joint Surg Br 67(5): 791-799.
21. Catterall A (2002) Early assessment and management of the clubfoot. In: Benson MK, Fixsen JA, et al. [Eds], Children’s orthopaedics and fractures (2nd edn). London: Churchill Livingstone pp. 464-477.
22. Davies TC, Kiefer G, Zernicke RF (2001) Kinematics and kinetics of the hip, knee, and ankle of children with clubfoot after posteromedial release. J Pediatr Orthop 21(3): 366-371.
23. Aronson J, Puskarich CL (1990) Deformity and disability from treated clubfoot. J Pediatr Orthop 10(1): 109-119.
24. Cooper DM, Dietz FR (1995) Treatment of idiopathic clubfoot. A thirty-year follow-up note. J Bone Joint Surg Am 77(10): 1477-1489.
25. Pirani S, Zernik L, Hodges D (2001) Magnetic resonance imaging study of the congenital clubfoot treated with the Ponseti method. J Pediatr Orthop 21(6): 719-726.

26. Diméglio A, Bonnet F, Mazeau P, De Rosa V (1996) Orthopaedic treatment and passive motion machine: Consequences for the surgical treatment of clubfoot. J Pediatr Orthop B 5(3): 173-80.

27. Kite JH (1972) Nonoperative treatment of congenital clubfoot. Clin Orthop Relat Res 84: 29-38.

28. Cooper DM, Dietz FR (1995) Treatment of idiopathic clubfoot. A thirty-year follow-up note. J Bone Joint Surg Am 77(10): 1477-1489.

29. Tümer Y, Biçimoğlu A, Açıkgoz T, Dinçer D (1982) Doğustan pes ekin varus'un konservatif tedavisi. Acta Orthop Traumatol Turc 16: 148-59.

30. Bursalı A (2001) Pes ekin varus (PEV) tedavisinde Ponseti metodunun erken sonuçları. In: Alpaslan AM, (Eds), XVII. Ulusal Ortopedi ve Travmatoloji Kongresi Kongre Kitabı; 24-29 Ekim 2001; Antalya, Türkiye. 2001. İstanbul: Turgut Yayıncılık; pp. 338-339.