

Results of Shortened Program of Ponseti Technique for Congenital Clubfoot

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Objective: To study the results and complications of congenital clubfoot treatment using a shortened (twice a week) program of serial casting using Ponseti technique.

Material and Method: Sixteen patients with congenital clubfoot (26 feet) were treated by serial manipulation and casting twice a week until acceptable deformity correction (60 degrees of abduction with or without equinus deformity) were achieved.

Results: Seventeen patients (65%) required less than three weeks in treatment to improvement in the deformity, while eight patients (30%) required more than three weeks of treatment. This period of treatment is at least two weeks shorter than the conventional Ponseti technique. One patient did not complete treatment due to hospital-acquired pneumonia. Four patients who developed pressure ulcers from the castings were continued in treatment and all achieved successful correction.

Conclusion: A shortened program of clubfoot correction using the Ponseti technique can be effective for correcting uncomplicated clubfoot without serious complications.

Keywords: Ponseti, Clubfoot, Serial casting, Shortened program

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The Ponseti method is one of the most successful non-operative treatments for clubfoot⁽¹⁻³⁾. Good results rely not only on the skill of the doctor and the method of stretching used, but also on the cooperation of the parents as the process is long and drawn out⁽⁴⁾. It can be difficult to maintain follow-up of patients and their parents because of the length of the process. In developing country, this condition in children tends to be ignored or not treated properly because of parent's compliance^(5,6). The Ponseti method is appropriate for children with clubfoot as it is a safe and easy procedure which gives good results at low cost. The standard Ponseti method involves 5 to 7 days of hospitalization plus at least two to three months of treatment⁽⁵⁾. The shortened program may be useful for the compliance and cooperation of the patients' parents. This study hypothesizes that patients with congenital clubfoot can be treated by having their cast changed two times per week without complications.

Material and Method

A prospective study of 16 child patients with 26 congenital clubfoot was conducted at Chiang Mai

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University Hospital during the twelve-month period March 2009 to March 2011.

The patient's parents were informed of the objectives, risks, benefits, and the entire treatment process in the present study program.

All patients received non-operative treatment by a pediatric orthopedist to correct deformities using the Ponseti technique. Dimeglio's classification of clubfoot⁽⁷⁾ was used for evaluation of severity of clubfoot before and after treatment. Clubfeet were manipulated and casts replaced every three to four days until the 60 degrees of foot abduction were reached and a Dimeglio's score of less than 5 were achieved⁽⁷⁾. The measurements are the total time period of treatment, the final Dimeglio's score and any complications from treatment through stretching or placing limbs in casts. The success of shortened program in this study is defined as the duration of reaching 60 degrees of foot abduction in three weeks.

Statistical analysis

For statistical analysis, Wilcoxon sign rank test was used to compare Dimeglio's score between pre-treatment and post-treatment. Fisher exact's test was used to compare the number of patients who received successful treatment between duration less than 3 weeks and longer than 3 weeks. The analysis

was considered significant when *p*-value were less than 0.05. All statistical analyses were performed with STATA software version 10.0 (Stata corp. LP, college station, Texas, USA).

Results

There were 16 patients (9 boys and 7 girls) with 26 clubfeet. Ten patients had bilateral clubfeet. The average age of the patients was 20.91 (4-306) days. Associated conditions found in some patients included 2 cases with constriction ring syndrome, 1 case with syndactyly in the right hand, 2 cases with myelomeningocele, 1 case with hydrocephalus, 1 case with panhypopituitarism and 1 case with short metatarsal bone. The severity score according to Dimeglio's classification ranged from 11 to 19.

One patient was unable to finish the program due to a lung infection and septicemia, 15 patients (25 feet) completed the program (Table 1). Comparison of the severity of idiopathic clubfoot in the patients using the Dimeglio's score before and after the shortened Ponseti program indicated that the treatment decreased the severity of the clubfoot by a significant amount (Table 2).

Among the patients treated, a total of 17 feet (7 severe and 10 very severe feet) were treated within a time period less than 3 weeks and 8 feet (4 severe and 4 very severe feet) needed treatment that took longer than 3 weeks (Table 3).

The average treatment times of all patients were 21-24 days. The average period of complete treatment for patients who finished in less than three

Table 1. Characteristics and results of participating patients

No.	Age (D)	Sex	Associated diseases	Side	Pre-score	Post-score	Duration (D)	Cast	Complications
1	4	F	None	Rt.	16	4	13	5	None
				Lt.	16	4	13	5	None
2	60	M	None	Rt.	16	4	14	6	None
				Lt.	16	4	14	6	None
3	30	F	Constriction band syndrome	Rt.	16	4	18	6	None
				Lt.	16	4	18	6	None
4	9	F	Syndactyly Rt. hand	Rt.	13	4	19	5	None
5	18	M	None	Rt.	14	4	10	3	None
				Lt.	14	4	10	3	None
6	16	F	None	Rt.	13	4	14	4	None
				Lt.	14	4	14	4	None
7	14	F	None	Rt.	17	4	20	6	None
				Lt.	17	4	20	6	None
8	74	M	None	Rt.	15	3	18	5	None
				Lt.	15	3	18	5	None
9	64	M	None	Rt.	18	3	20	5	None
10	48	F	None	Rt.	14	5	35	6	Pressure ulcer
11	21	M	None	Rt.	15	5	34	6	Pressure ulcer
				Lt.	15	5	34	6	Pressure ulcer
12	33	F	Myelomeningocele	Rt.	19	5	29	6	None
				Lt.	19	5	29	6	None
13	30	M	Hydrocephalus, Myelomeningocele	Rt.	18	4	24	6	None
				Lt.	18	4	24	6	None
14	306	M	Panhypopituitarism	Rt.	15	Loss FU	Loss FU	Loss FU	Pneumonia
15	36	M	Short 1 st MT	Rt.	11	5	56	6	Pressure ulcer
16	17	M	Constriction band syndrome Rt. calf	Rt.	16	5	13	6	None

D = days; Pre-score = pre-Dimeglio's score; Post-score = post-Dimeglio's score; FU = follow-up; Rt. = right; Lt. = left; F = female; M = male; MT = metatarsal

Table 2. Results of treatment of idiopathic clubfoot using a Shortened Ponseti program evaluated using Dimeglio's score

Group (score)	No. of feet	Mean pre-score	Mean post-score	p-value
Severe (10-15)	11	13.91	4.18	<0.05
Very severe (15-20)	14	17.10	4.14	<0.05

Table 3. Treatment time for each of the groups of patients in the shortened Ponseti program

Group	No. of feet	Duration <3 weeks	Duration >3 weeks
Severe	11	7	4
Very severe	14	10	4

weeks was 15.6 (range 10-20) days. The average period of complete treatment for patients who finished in more than three weeks was 31.1 (range 24-35) days (Table 1). The number of the patients who finished in less than three weeks (68%) was higher than those who finished in longer than three weeks (32%) with statically significant.

Five feet suffered complications during treatment. Four feet had pressure ulcers (three feet had grade 1 pressure ulcers, and one had grade 2 pressure ulcers). For feet with ulcers, treatment was postponed until the ulcers healed, at which time participation in the program was resumed.

Discussion

According to a report by Morcuenede A et al the efficacy of changing the patient's cast every five days or every seven days is the same: the results are good. However, changing the cast every three or four days causes the patient additional discomfort and may cause their feet and toes to swell, a common complication in serial casting. Thus the report recommends that the appropriate length of time between changing the patient's cast should be five days⁽⁸⁾.

A report by Sharma Pulak and MKS Swamy on the treatment of idiopathic clubfoot by Ponseti technique of manipulation and serial plaster casting, indicated the duration of casts for more than 85% feet was less than 7 weeks⁽⁹⁾.

In the present study, there were 25 feet with congenital idiopathic clubfoot (15 patients). Severity of deformity was scored according to Dimeglio's

classification. Sixty-eight percent of patients completed treatment before the end of three weeks, including seven feet in the severe group and ten feet in the very severe group. The average length of treatment was 15.6 days. The group that completed treatment after three weeks (32%) included four feet from the severe group and four feet from the very severe group with an average period of treatment of 33.1 days. These results show that both types of patients (severe and very severe) are able to complete treatment in less than three weeks. Intervals between treatments can be decreased from every five days to two times a week for both types of patients. Outcomes with a shortened Ponseti's method still deliver good results.

The average age for the group that finished in less than three weeks was 30.6 days old; the average age for the group that took longer than three weeks was 33.6 days old. This indicates that age is not a significant factor for the end results.

The most frequent complication occurring during treatment was pressure ulcers in the popliteal fossa and the anterior aspect of the ankle joint. Four feet developed pressure ulcers, all of which were in the severe group and all took more than three weeks to complete treatment. This complication delays treatment significantly, making it an important factor to consider when estimating the length of treatment. When this complication occurs, treatment must be postponed until the pressure ulcer is fully healed. Each patient in the present study with pressure ulcers was able to complete treatment without further complications such as edematous toes and swelling of the foot which is in agreement with a report by Jose A Mocuende⁽⁸⁾. Another complication, which is more dangerous, is Hospital-Acquired Pneumonia that can occur when a patient must stay in the hospital for an extended period of time. Thus, extended hospital stays is a disadvantage to this type of treatment.

The present study did not follow-up with patients after treatment to see if they had a relapse in their condition or to determine the long-term outcome of the treatment program. A comparative study between the conventional Ponseti method and the shortened method to understand better the relevant factors, e.g. the skill of the doctors and nurses involved, would add value to the present study.

Conclusion

The shortened program of the Ponseti casting technique was able to reduce treatment time by decreasing the interval between cast changes from

5-7 days to 3-4 days and achieve good result as standard program. There were few complications comparable to cases using the longer interval. The decreased time of treatment is beneficial for the compliance of parents and patients.

What is already known on this topic?

The previous studies in Ponseti manipulation and serial plaster casting technique for congenital clubfoot recommend changing the cast every five or seven days to prevent the complications such as swelling and discomfort. The duration of casting is five to seven weeks. This study shows the effectiveness and safety of shortened program of serial casting.

What this study adds?

The current study demonstrate that treatment of congenital clubfoot by manipulation and casting (twice a week) can be effective and results in no serious complications. This technique can be reduce the time of treatment.

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Potential conflicts of interest

None.

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การรักษาโรคเท้าปุกในเด็กด้วยการใส่เฝือกคัดเท้าโดยวิธี Ponseti แบบเร่งรัด

นันทวิช สุคนธเวศ, ไชยฤทธิ ชีววัฒนชัย, ทรงศักดิ์ ขุนศรี, ศิริชัย ลือวิฑูรเวชกิจ

วัตถุประสงค์: เพื่อศึกษาผลการรักษาและภาวะแทรกซ้อนของการรักษาโรคเท้าปุกในเด็กด้วยการใส่เฝือกคัดเท้าโดยวิธี Ponseti แบบเร่งรัด (สองครั้งต่อสัปดาห์)

วัสดุและวิธีการ: ผู้ป่วยที่มีโรคเท้าปุก 26 ราย ถูกรักษาโดยการตัดและเปลี่ยนเฝือกต่อเนื่องสัปดาห์ละ 2 ครั้ง จนกระทั่งการบิดรูปดีขึ้นจนยอมรับได้ (abduction 60 องศา โดยมีหรือไม่มี equinus foot) ผู้ป่วยนอนโรงพยาบาลตลอดช่วงเวลาของการรักษา

ผลการรักษา: ผู้ป่วย 17 ราย (65%) ใช้ระยะเวลารักษาน้อยกว่า 3 สัปดาห์ และ 8 ราย (30%) ใช้เวลามากกว่า 3 สัปดาห์ ผู้ป่วยหนึ่งรายไม่สามารถแก้ไขได้สำเร็จเนื่องจากมีภาวะติดเชื้อในปอดจากการนอนโรงพยาบาล ระยะเวลาในการรักษาน้อยกว่าวิธีการดั้งเดิมของ Ponseti อย่างน้อย 2 สัปดาห์ หรือ ประมาณ 2 เท่าของวิธีเดิม ผู้ป่วย 4 ราย มีผลกดทับจากเฝือกและได้รับการรักษาจนสามารถแก้ไขการผิดรูปจนสำเร็จ

สรุป: การแก้ไขโรคเท้าปุกโดยวิธี Ponseti แบบเร่งรัดได้ผลการรักษาที่ดีและไม่มีผลแทรกซ้อนที่รุนแรง
