

Pirani Score Difference in CTEV Patients Treated with Ponseti's Serial Cast in RSUP dr. Mohammad Hoesin Palembang

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ABSTRACT

Congenital talipes equinovarus (CTEV) is a congenital deformity involving calcaneo-navicular complex. It is best understood with mnemonic CAVE which includes cavus, adduction, varus, and equinus of the foot. Ponseti's method, the gold standard of treating CTEV, includes strapping and tapping technique, manipulation, serial casting, and functional therapy. The purpose of this study is proving that there is a significant Pirani score difference in CTEV patients treated with Ponseti's serial casts. It is an observational study with time series design. Observation and evaluation to the CTEV patients were conducted during the period of August-December 2017 at The Orthopedics Clinic in RSUP dr. Mohammad Hoesin Palembang. All the data were analyzed with Wilcoxon test using IBM SPSS version 24. Total 14 CTEV feet were treated with Ponseti method. From all of the 7 patients, four were females (57.1%) and three were males (42.9%). Every patient had bilateral deformity and less than a year in age. Mean Pirani score of the study group after the second plaster cast were 3.78 ± 2.05 for the left feet and 4.07 ± 1.66 for the right feet. Mean post-treatment Pirani score of the study group, respectively left and right feet, were 0.57 ± 0.60 and 0.28 ± 0.39 . Total 92% of the feet were treated successfully by Ponseti's serial casts. There is a significant difference in Pirani score before and after the treatment of CTEV using Ponseti's serial casts ($p < 0.05$).

Keywords: Pirani Score, CTEV Ponseti's Serial Cast

1. INTRODUCTION

Congenital talipe equinovarus (CTEV) or clubfoot is a congenital deformity involving calcaneo-navicular complex. The term 'talipes' is derived from *talus* (Latin = ankle) and *pes* (Latin = foot). This deformity is well known by its mnemonics, often called as CAVE (*cavus, adductus, varus, equinus*). CTEV affects gait and social life^{1,18}. This deformity can be treated with operative and non-operative technique, depends on patient's current age and the severity of deformity². CTEV occurred in 1-2 /1.000 live

birth with the ratio of 2:1 respectively for male and female^{3,18,22}. Blood siblings have 2-3% risk of experiencing the same deformity. If both parents were CTEV, then their offspring might have 10-20% risk to develop the same deformity. Approximately, 20% of CTEV cases related to congenital deformity; such as spina bifida (variant of neural tube defect), cerebral palsy; and neuromuscular disorder.⁴

Some theories were spoken out to determine etiologic factor of CTEV, including intrauterine mechanical forces, neuromuscular defect, primary plasma cell

defect, intrauterine growth restriction, heredity, and lack of blood supply to fetus. Some studies also demonstrating the ultrastructure and intracellular abnormality of foot muscles in CTEV patients. Internal rotation of calcaneus, navicular, and cuboid medially to the talus; fixated in adduction and inverted are the main deformities of CTEV¹. Moreover, there is also some deformity of first metatarsal bone, which its position is flexed to the plantar⁵. This condition can be caused by positional, congenital, or even associated to neuromuscular abnormality^{1,3,12,20,21}.

CTEV is classified based on its severity using Pirani and/ or Dimeglio score. Dimeglio score consists of comparative investigation of 4 major defects in CTEV. However, Pirani score is universally more general in determining Ponseti's method on treating CTEV.^{7,17,20,21} Pirani score devised a simple scoring system based on the deformities on hindfoot (severity of posterior crease, emptiness of the heel and rigidity of equinus), and midfoot (curvature of the lateral border of the foot, severity of the medial crease and position of lateral part of talus head). Each deformity has the same chance of getting score 0, 0.5, and 1. The maximum score to be achieved is 6, and the lowest is 0 (normal foot).^{6,12,17}

CTEV treatments are based on patient's initial age of starting the serial cast and also the classification reflecting on Pirani score. Non-operative therapy using Ponseti's method is a gold standard in treating CTEV.⁸ Treatments are recommended to begin early, preferably by a day or two of birth, including the use of strapping and tapping technique, manipulation, serial casting, and functional therapy.^{1,3,8,21}

This method is surely suggested to be done as soon as possible in order to achieve complete correction of the deformities.⁸ Treatment should begin

Ponseti's method in treating CTEV is effective rather than early operation method because it gives better result with minimal complications. This treatment, followed by its scoring method by Pirani has been done in RSUP dr. Mohammad Hoesin Palembang, but the treatment evaluation has not been done.

2. METHOD

This is an observational study with time series design⁹, conducted in Orthopedics Clinics of RSUP dr. Mohammad Hoesin Palembang from June – December 2017. All secondary data of Pirani score from every serial cast were noted as the sample. Patients associated with spina bifida, arthrogryposis, muscular dystrophy, and spinal muscular atrophy were excluded. Informed consent was taken from all parents. All relevant data were collected and transformed into pre and post-test table in order to denominate the initial assessment of severity and evaluation after the serial cast was performed. Pirani score from second and sixth serial cast were analyzed in this study. Wilcoxon test⁹ was performed using IBM SPSS 24 for statistical analysis. Results were considered as significant if p value < 0,05.

3. RESULT

13 CTEV patients with total 25 affected feet seek for further treatment in Orthopedics Clinic at RSUP dr. Mohammad Hoesin Palembang. However, only 7 patients met the inclusion criteria. 4 of them were females and the rest is male. Total of 14 feet were classified as subjects. Mean Pirani score post second serial cast was 3.79 ± 2.05 and 4.07 ± 1.67 , respectively for left and right foot. After the sixth serial cast, the mean Pirani score was 0.57 ± 0.60 for the left foot and 0.28 ± 0.39 for the right foot.

The therapy outcome were classified into two categories: (1) success (92.9%) and (2) failed (7.1%). 7 subjects (50%) obtained very good outcome with 0 point in total of

Pirani score, 6 subjects were good with 0.5 – 1 point in Pirani score, and 1 subject (7,1%) was failed to be treated.

Table 1. Distribution of Patient based on Gender, CTEV classification, Pirani Score after 2nd Serial Cast and 6th Serial Cast, and Treatment Outcomes

	n	%
Gender		
Male	3	42.9
Female	4	57.1
CTEV Classification		
Unilateral	0	0
Bilateral	7	100
Left Foot Pirani Score after 2nd Serial Cast		
0,5	1	14.3
2	1	14.3
3	1	14.3
4,5	2	28.6
6	2	28.6
Right Foot Pirani Score after 6th Serial Cast		
1,5	1	14.3
2,5	1	14.3
4	2	28.6
4,5	1	14.3
6	2	28.6
Left Foot Pirani Score after 6th Serial Cast		
0	3	42.9
0,5	1	14.3
1	2	28.6
1,5	1	14.3
Right Foot Pirani Score after 6th Serial Cast		
0	4	57,1
0,5	2	28,6
1	1	14,3
Treatment Outcomes Success		
Very Good (0)	7	50
Good (0,5 – 1)	6	42,9
Failed (> 1)	1	7,1

Normality test with Kolmogorov-Smirnov obtained p value > 0.05 for Pirani score after the second Ponseti's serial cast, both left and right foot, and Pirani score post sixth Ponseti's serial cast for the left foot, so the

data was in normal distribution. On the other hand, normality test of Pirani score post sixth Ponseti's serial cast for the right foot obtained p < 005, meaning that the data was not in normal distribution

Table 2. Normality Test of Pirani Score Post Second and Sixth Ponseti's Serial Cast

Pirani Score	n	Kolmogorov-Smirnov	p
Post Serial Cast ke-2 Left	7	0,207	0,200
Post Serial Cast ke-2 Right	7	0,197	0,200
Post Serial Cast ke-6 Left	7	0,255	0,187
Post Serial Cast ke-6 Right	7	0,338	0,015

Wilcoxon test showing p value of 0.018 < 0.05 (α), meaning that H_0 was denied. Based on this value, with 95% of confidence interval, it can be proven that there was a

significance in difference between Pirani score post second and sixth Ponseti's serial cast.

Tabel 3. Statistical Test on Pirani Score Post Second and Sixth Ponseti's Serial Casts

Pirani Score	n	mean \pm sd	p
Post Serial Cast ke-2 Left	7	3,78 \pm 2,05	0,018
Post Serial Cast ke-6 Left	7	0,57 \pm 0,60	
Post Serial Cast ke-2 Right	7	4,07 \pm 1,66	0,018
Post Serial Cast ke-6 Right	7	0,28 \pm 0,39	

4. DISCUSSION

A total of 13 cases of CTEV were obtained at the Orthopedic Surgery Clinic of RSUP dr. Mohammad Hoesin Palembang in the span of August-December 2017, both new and old cases. Of the 13 patients, 4 were male and 9 were female. Furthermore, only one patient had a unilateral abnormality. During the consultation and therapy process, 1 patient died, 1 patient dropped out and did not receive initial therapy, 3 patients switched to operative therapy, the postero-medial release (PMR), and 1 patient was not advised to be managed by the Ponseti method due to foot conditions which was so rigid (this patient were set to have PMR). 7 patients met the inclusion criteria and all had bilateral abnormalities. In the end, 14 CTEV legs were obtained which were used as research subjects with the age of all patients less than 2 years.

During this study period, a total of 7 patients with 14 clubfeet were treated with Ponseti's serial cast. 3 patients were males

(42,9%) and the rest were females (57,1%), all of them had bilateral involvement of CTEV. This deformity mostly occurs in males with 2:1 in comparison. Bilateral and unilateral involvement have remained in the same portion with 1:110.

Mean Pirani score post the second serial cast for left and right feet respectively 3,78 \pm 2,05 and 4,07 \pm 1,66. It was estimated that 6 plaster casts were used to correct hindfoot and midfoot deformities, each was replaced every 2 weeks. However, it is recommended to replace the plaster cast every 5 – 7 days. In this case, we consider the replacement in every 2 weeks because the distance of our health facilities is far from rural area, which our patients mostly come from that part. However, there was a study in 2014 which applied the same method as we do. The aim of changing plaster cast every 2 weeks is to help the process of stretching, remodeling, and preventing soft tissue swelling¹⁴.

The total of plaster cast used also depending on the severity of foot rigidity. Ponseti himself recommend 5 – 10 plaster

casts (mean 7,2 plaster casts) to treat affected foot¹¹. Mean Pirani score after the sixth serial cast on left and right foot serially $0,57 \pm 0,60$ and $0,28 \pm 0,39$. This number was close to the study in Dhaka Shishu Hospital in 2013 with $0,36 \pm 0,433$. 92,9% (13 feet) were successfully treated with Ponseti serial casts. Only one foot was not successful during the treatment (7,1%). Ponseti method has 90% in successful percentage⁶. Pulak in 2013 stated that more than 95% of CTEV patients were treated perfectly using this method¹¹.

From the analysis, we found out there was a significance difference in Pirani score post second serial cast and sixth serial cast in our clinic, with p value $<0,005$ using Wilcoxon test⁹.

This treatment is recommended to CTEV patient. It is believed that Ponseti method results in good outcome without invasive intervention, and even practically easy to be done.²² By using the Ponseti's serial cast, cavus was corrected by elevating the first metatarsal head, along with aligning the forefoot with the hindfoot by supinating the forefoot, then followed by application of the long cast. Afterwards, correction of adduction and varus of the heel was performed by abducting the foot in supination and plantar-flexion while using thumb pressure over the lateral side of talus as a fulcrum.^{20,21}

This Ponseti's serial casts not only correcting the calcaneo-navicular complex, but also enhance the remodelling process of bones from the mechanical stimulus which come from the plaster casts pressure⁶. It is also recommended to do the manipulation for 5 minutes twice with 1 – 2 minutes interval between each round of manipulation²⁰ before starting to apply the serial cast^{10,11,20}. Pirani score also very useful to predict the need of total plaster cast and percutaneous Achilles tenotomy^{12,21}.

This treatment could possibly lower 94% risks of postero-medial release or another operative treatment in the future^{15,16}. However, more attention must be given in using Dennis-Brown bar and shoes or another abduction orthosis to prevent the relaps.^{3,10,11,17,19}.

5. CONCLUSION

This study conclude that there is significance of Pirani score after CTEV patient treated with Ponseti's serial casts in RSUP dr. Mohammad Hoesin Palembang ($p = 0,001 < 0,05$).

CONFLICT OF INTEREST

Pirani scores were obtained after the second Ponseti's serial cast, so it is not the first initial Pirani score obtained before the treatment. It is better to observed comprehensively from implementation of Pirani score, complete assessment with Ponseti's serial cast, the practice of percutaneous Achilles tenotomy, and utilization of abduction orthosis. Basically, more samples were needed. The timeline was so short so we could not follow-up the patient in such a long time.

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