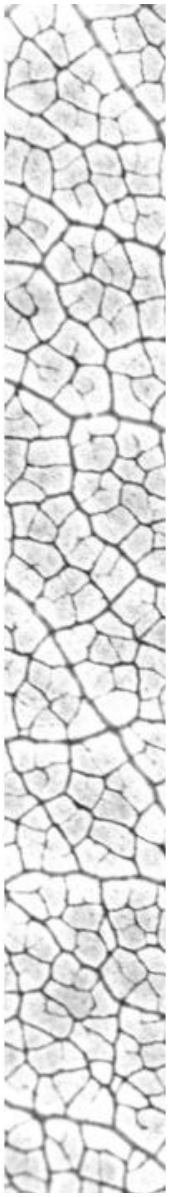

EurAsian Journal of BioSciences
Eurasia J Biosci 14, 3419-3422 (2020)

The pirani score evaluation on patients with clubfoot treated with the ponsety method in public hospital

Tri Wahyu Martanto [1], Henry Dominica [1], Komang Agung Irianto [1], Sulis Bayusentono [1], Dwikora Novembri Utomo [1*]

[1] Department of Orthopaedi and Traumatology, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo Regional Public Hospital, Surabaya 60131, INDONESIA
*Corresponding author: novembri-u@fk.unair.ac.id

Abstract

Background: Congenital talipes equinovarus (CTEV) or clubfoot refers to congenital anomalies in the feet with complex deformities. The non-surgical technique with the Ponseti method for clubfoot treatment has been adopted as initial therapy and proven effective for clubfoot treatment. **Purpose:** This study aims to evaluate the results of Ponseti therapy in patients with clubfoot who came to the Ponseti Clinic at the Dr. Soetomo Regional Public Hospital, Surabaya. **Method:** 14 patients consisting of nine men and five women were involved in the study. Based on the data obtained, ANOVA statistical test was performed on the Pirani score (total score), hindfoot score, and midfoot score. Furthermore, the statistical hypothesis testing was performed by comparing the degree of clubfoot severity with Pirani scores using the independent t-test. **Results**. The mean Pirani Score in the research subjects reached 1.178. The mean Hindfoot score of research subjects reached 0.5. The mean Midfoot Score of the Research Subject was 0.642. The statistical hypothesis testing results revealed that the mean Pirani Score in the degree of severity for the severe category was higher than the mean Pirani Score for the moderate category, which was statistically insignificant with a p-value of 0.126). **Conclusion:** Pirani score can be a reference as a clinical evaluation of patients with clubfoot who undertake conservative treatment with the Ponseti technique. Moreover, the Pirani score can also provide predictions of clubfoot severity.

Keywords: clubfoot, Ponseti method, Pirani score

Martanto TW, Dominica H, Irianto KA, Bayusentono S, Utomo DN (2020) The pirani score evaluation on patients with clubfoot treated with the ponsety method in public hospital. Eurasia J Biosci 14: 3419-3422.

© 2020 Martanto et al.
This is an open-access article distributed under the terms of the Creative Commons Attribution License.

INTRODUCTION

Congenital anomalies are serious problems that can be attributed to genetic and other factors, such as the lack of nutrition in infants, which is the main cause of disability and morbidity (Kusumaningrum, Kurnia, & Doka, 2019, Ponseti, et al. 2002). Congenital talipes equinovarus (CTEV) or clubfoot refers to the congenital anomalies in the foot with a complex deformity consisting of four components, i.e., equinus from hindfoot, adduction from midfoot, as well as varus in the subtalar joint and the cavus (Ponseti, & Campos, 2009). Clubfoot is associated with neuromuscular disorders and other syndromes that are frequently idiopathic (Ponseti, et al. 2002, Kelly, 2017). The incidences of clubfoot vary from 0.6 per 1,000 individuals in Asia, 0.9 per 1,000 individuals in Australia, and more than 6.8 per 1,000 individuals in Hawaii, Polynesia, and Maori. The incidences in male infants are higher than in female infants, in which the rate is reported to reach 4:1. Moreover, the bilateral cases are recorded to reach 50% cases (Ricco, Richards, Herring, 2014).

The purposes of clubfoot therapy are to achieve and maintain clubfoot correction, so that the patients have functional, painless, plantigrade feet with good mobility (Ponseti, & Campos, 2009). The phases of the Ponseti method include preparation, manipulation and casting, cavus correction, Talus Cache localization, manipulation, padding application, plaster cast, adequate abduction, tenotomy, cast after tenotomy, bracing period, and follow-up (Zionts, et al. 2012. Herzenberg, Radler, & Bor, 2002; Sisay, et al, 2018).

There is no generally accepted grading method for assessing the degree of deformity or monitoring the disease course in clubfoot. It is reported that there is a need for a classification that is reliable (Wainwright, et al. 2002). easily adopted and applied in clinical practice, and is able to assess the suitability for therapy. A simple scoring system is utilized to assess clubfoot cases based on six clinical signs of contracture in clubfoot, in

Received: July 2019
Accepted: March 2020
Printed: September 2020

Table 1. The Pirani Results Scores and the Degree of Severity in 14 Patients with Clubfoot

Sample	Total Pirani Score	Hindfoot Score	Midfoot Score	Degree of Severity
Patient 1	0.5	0	0.5	Moderate
Patient 2	0	0	0.5	Severe
Patient 3	0	0	0.0	Moderate
Patient 4	4.5	2	2.5	Severe
Patient 5	1	0	1.0	Severe
Patient 6	0.5	0.5	0.0	Severe
Patient 7	2	0.5	1.5	Severe
Patient 8	2.5	1	1.5	Severe
Patient 9	0.5	0	0.0	Severe
Patient 10	0.5	0.5	0.0	Severe
Patient 11	1	0.5	0.5	Severe
Patient 12	2.5	2	0.0	Severe
Patient 13	1	0	1.0	Severe
Patient 14	0	0	0.0	Moderate
Average	1.178	0.5	0.642	-

which each clinical sign is given a value of 0 if no abnormalities are identified, 0.5 if moderate abnormalities are identified, and one if severe abnormalities are identified. The six clinical signs are divided into three signs related to abnormalities in the hindfoot, i.e., the severity of the posterior crease, the emptiness of the heel, and the rigidity of the equinus. Furthermore, three signs related to abnormalities in the midfoot include left lateral arch, the severity of the medial arch, and the lateral part position of the head of the talus (Pirani,, Hodges, & Sekeramayi, 2008).

Based on those facts, this study aims to evaluate the results of Ponseti therapy in patients with clubfoot who came to the Ponseti Clinic at Dr. Soetomo Regional Public Hospital, Surabaya.

METHOD

This study employed a retrospective descriptive method in patients with CTEV at Dr. Soetomo Regional Public Hospital, Surabaya, Indonesia. The inclusion criteria to involve the patients in this study include the patients with idiopathic clubfoot abnormalities, the patients that had been treated with the Ponseti method for a minimum of four years at the time the evaluation conducted, and the patients who could actively interact during the examination process. In this study, two types of data were employed, i.e., primary data and secondary data. Primary data was collected by conducting anamnesis interviews and direct physical examination of the patients. Secondary data were obtained from the patient medical records at Dr. Soetomo Regional Public Hospital.

The patients consisted of nine men and five women. Thus, the total patients in this study were 14 people. The measurements and examination of Pirani scores, as well as the clubfoot severity of 14 patients, were assessed and evaluated. The Pirani score in clubfoot management based on the Ponseti method consisted of several assessment components, i.e., hindfoot score (HS), midfoot score (MS), and the total score (TS). Percutaneous tenotomy was indicated if HS value was greater than 1, MS value was lesser than 1, and the head of the talus was closed.

Table 2. The Profiles Based on the Need for Tenotomy Procedure

Tenotomy procedure	Total	Percentage (%)
Required	11	79%
Not required	3	21%
Total	14	100%

Based on the data obtained, ANOVA statistical test was performed on the Pirani score (total score), hindfoot score, and midfoot score. Furthermore, the statistical hypothesis testing was performed by comparing the degree of clubfoot severity with Pirani scores using the t-test.

RESULTS

The results of Pirani scores measurement and examination and the severity of 14 patients with clubfoot are listed in **Table 1**. The study results suggested that the mean Pirani Score signified higher results than the Midfoot Score and Hindfoot Score. The mean Pirani Score in the research subjects was 1.178, and the mean Hindfoot score of research subjects was 0.5. Furthermore, the mean Midfoot score of the research subject was 0.642. Based on **Table 2**, tenotomy was performed in 11 patients (79%), while the patients who did not undertake tenotomy were three patients (21%).

The sample normality test used the Shapiro-Wilk test on Pirani Score, Hindfoot Score, Midfoot Score with a p-value greater than 0.05. It indicated that the data represented the population and could be continued for parametric tests. The statistical calculations employing the ANOVA test identified that there were no significant differences in Pirani Score, Hindfoot Score, Midfoot Score with a p-value of 0.153.

Hypothesis testing was continued by using an independent t-test that compared the degree of clubfoot severity with Pirani Scores. The statistical hypothesis testing results revealed that the mean Pirani Score in the degree of severity for the severe category was higher than the mean Pirani Score in the degree of severity for moderate category, which was statistically insignificant (p=0.126). The results in **Table 3** suggested that the

Table 3. The Hypothesis Testing Results

No	Degree of Severity	Mean Pirani Score	P
1	Moderate	0.1667 ±0.288	0.126
2	Severe	1.4545±1.312	

greater the Pirani Score, the heavier the clubfoot severity was. Thus, the Pirani Score could be used to assess the clinical picture of clubfoot.

DISCUSSION

In this study, the mean Pirani scores on the degree of severity for the severe category were higher than the mean Pirani score of moderate category, which was statistically insignificant. Other studies revealed the different results in which the mean Pirani scores on mild clubfoot, moderate clubfoot, and severe clubfoot had a significant difference. The higher the Pirani scores was, the more severe the clubfoot condition was with a p-value of 0.001 (Mejabi, et al. 2016). The differences in the study results could be caused by the limited number of samples, in which the only categories reviewed in this study were the degree of severity for moderate and severe categories. Besides, there was also the possibility of other factors that could not be controlled.

The Ponseti method becomes a standard to treat clubfoot (Agarwal, & Gupta, 2014). The method of manipulation and serial plastering developed by Ponseti for the congenital clubfoot is emphasized in the effort to achieve plantigrade, a functional foot without the need for surgical procedure (Changulani, et al. 2006). The previous studies reported that surgery could be avoided in 89% of cases with manipulation, plastering, and limited surgery techniques (Ponseti, & Smoley, 2009).). During January 2014-December 2017, there were 14 patients with CTEV that met the study criteria at polyclinic of Dr. Soetomo Regional Public Hospital, Surabaya. There were more men than women with a ratio of 1:1.8, based on the findings from other comparable research studies (Pavone, et al. 2012).).

Pirani scoring system can explain the need for tenotomy, and predict the number of casts needed every week (Dyer, & Davis, 006).). Compared to the hindfoot and midfoot scores, Pirani scores provide better predictions for tenotomy and cast needs (Dyer, & Davis, 2006).). In this study, the results indicated that tenotomy was performed in 11 patients (79%), and those who did not take tenotomy reached three patients (21%). Pirani can also predict the clubfoot severity by calculating the needs of cast and tenotomy. Pirani score could help the management of patients and parents to be better prepared to undertake the therapy, so that the adherence and success of the therapy could increase.

The lack of adherence in applying Denis Browne splint was due to several factors. Many parents reported difficulties in maintaining the use of splints. Some parents found it difficult to place the splints, while others reported that their children could not kick their legs freely and roll in bed with the splint applied in their legs. These problems caused the frustration in the family and frequent sleepless nights which led to poor adherence (Changulani, et al. 2006).

In terms of the study limitation, the study solely evaluated the results of Ponseti therapy in patients with clubfoot who came to the Ponseti Clinic at Dr. Soetomo Regional Public Hospital, Surabaya. Accordingly, the results in this study could not be generalized for more general research references.

CONCLUSION

Clubfoot clinical evaluation results suggest that the Pirani Score can be a reference as a clinical evaluation of patients with clubfoot who undergo conservative therapy with the Ponseti technique. Pirani score can also predict the club foot severity.

REFERENCES

Agarwal, A., & Gupta, N. (2014). Does initial Pirani score and age influence number of Ponseti casts in children?. International orthopaedics, 38(3), 569-572.

Changulani, M., Garg, N. K., Rajagopal, T. S., Bass, A., Nayagam, S. N., Sampath, J., & Bruce, C. E. (2006). Treatment of idiopathic club foot using the Ponseti method: initial experience. The Journal of bone and joint surgery. British volume, 88(10), 1385-1387.

Dyer, P. J., & Davis, N. (2006). The role of the Pirani scoring system in the management of club foot by the Ponseti method. The Journal of bone and joint surgery. British volume, 88(8), 1082-1084.

Herzenberg, J. E., Radler, C., & Bor, N. (2002). Ponseti versus traditional methods of casting for idiopathic clubfoot. Journal of Pediatric Orthopaedics, 22(4), 517-521.

Kelly, D (2017). Congenital Clubfoot (Talipes Equinovarus). In: Campbell's Operative Orthopaedics. 13th ed. Azar F, Beaty J, Canale S, editors. Philadelpia: Elsevier; 1031-45 p.

Kusumaningrum, T., Kurnia, I. D., & Doka, Y. P. (2019, March). Factors Related to Mother's Competency In Caring For Low Birth Weight Baby Based on Theory of Planned Behavior. In IOP Conference Series: Earth and Environmental Science (Vol. 246, No. 1, p. 012029). IOP Publishing.

Mejabi, J. O., Esan, O., Adegbehingbe, O. O., Orimolade, E. A., Asuquo, J., Badmus, H. D., & Anipole, A. O. (2016). The Pirani scoring system is effective in assessing severity and monitoring treatment of clubfeet in children. Journal of Advances in Medicine and Medical Research, 1-9.

Pavone, V., Bianca, S., Grosso, G., Pavone, P., Mistretta, A., Longo, M. R.,... & Sessa, G. (2012). Congenital talipes equinovarus: an epidemiological study in Sicily. Acta orthopaedica, 83(3), 294-298.

Pirani, S., Hodges, D., & Sekeramayi, F. (2008, March). A reliable & valid method of assessing the amount of deformity in the congenital clubfoot deformity. In Orthopaedic Proceedings (Vol. 90, No. SUPP_I, pp. 53-53). The British Editorial Society of Bone & Joint Surgery.

Ponseti, I. V., & Campos, J. (2009). The classic: observations on pathogenesis and treatment of congenital clubfoot. Clinical orthopaedics and related research, 467(5), 1124-1132.

Ponseti, I. V., & Smoley, E. N. (2009). The classic: congenital club foot: the results of treatment. Clinical orthopaedics and related research, 467(5), 1133-1145.

Ponseti, I. V., Cummings, R. J., Davidson, R. S., Armstrong, P. F., & Lehman, W. B. (2002). The ponseti technique for correction of congenital clubfoot. JBJS, 84(10), 1889-1891.

Ricco, A., Richards, B., Herring, J (2014). Tachdjian's pediatric orthopaedics. 5th ed. Herring J, editor. Philadelpia: Elsevier; 785–818 p.

Sisay, T., Verma, D., Berhane, N., & Tsegaw, M. (2018). Vaccine Development Strategies, Progresses and Challenges for Human Immunodeficiency Virus (HIV): A Review. The International Journal of Biotechnology, 7(1), 8-16.

Wainwright, A. M., Auld, T., Benson, M. K., & Theologis, T. N. (2002). The classification of congenital talipes equinovarus. The Journal of Bone and Joint Surgery. British volume, 84(7), 1020-1024.

Zionts, L. E., Frost, N., Kim, R., Ebramzadeh, E., & Sangiorgio, S. N. (2012). Treatment of idiopathic clubfoot: experience with the Mitchell-Ponseti brace. Journal of Pediatric Orthopaedics, 32(7), 706-713.