

## Simple, safe, and fast Ponseti cast removal procedure in pes equina varus patients

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### ABSTRACT

**Objective:** In our study, it is aimed to remove the cast more easily and safely without using the cutting tools by leaving the cast ends marked by folding in the idiopathic clubfoot patients treated with Ponseti method.

**Material and Methods:** Forty feet of 29 patients treated for Pes Equinovarus were included in the study. Patients were followed up in two groups. The group treated with Ponseti method by cast marking were named as “modified group” and cast wrapped group without marking were named as “classical group”. Neurological, teratologic and syndromic clubfoot patients were not included in the study. During the six series of casting, cast removal times for each extremity are recorded in minutes and it is noted that whether any additional cutting tool is used during cast removal or not. A summary of the data was presented as mean, standard deviation and percentage. Comparisons of the categorical characteristics were analysed by using the Chi-square test and the Mann-Whitney test. IBM-SPSS 20 program was used for analysis. In all tests, the level of significance was adjusted to 0.05.

**Results:** Thirteen (44.8%) of the 29 patients were male and 16 (55.2%) were female. While the mean time to start treatment for the 15 patients in the modified group was 3.46 (2-7) days, mean time for the 14 patients in the classical group was 3.78 (2-10) days. While the mean cast removal time of the 20 extremities of 15 patients in the modifying group was 10.9 minutes (8-14.3 min); it was 22.2 minutes (17.1-29.5 min) for the 20 extremities of 14 patients in the classical group. While no additional cutting tool was used during cast removal in the modified group, additional cutting tools were used during removal of cast in 75% (15/20) of the patients in the classical group and statistically significant difference was found between two groups in terms of the use of cutting tools ( $p < 0.001$ ).

**Conclusion:** We found that the cast ends’ being marked by folding during plastering in idiopathic clubfoot patients treated with Ponseti technique is costless, easy to apply, significantly shortens cast removal time, does not require the use of cutting tools, and thus is a notably safe method for these patients.

**Keywords:** congenital clubfoot, Ponseti method, soaking the cast, cast removing

### INTRODUCTION

The idiopathic clubfoot is the most common congenital musculoskeletal disease and is seen at an average of 1/750 in each new-born. Most orthopaedists agree that initial treatment should be initiated immediately after birth and with non-surgical methods. Several studies published in the literature over the past few years have shown that Ponseti method provides 95% successful correction of clubfoot treatment (1-2). This method requires an average of six series of casting so that the deformity can reach the desired correction on each plane. Although all the steps of the casting technique have been described in detail in the literature, the issue of cast removal has been mentioned very little (3-5). Ponseti cast removal is usually done by soaking and then unwrapping the plaster, but it is often very difficult and time consuming to find the end edge of the plaster (6).

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There is a limited number of studies on this subject in the literature. So, we believe that the simple, safe and fast cast removal technique we have demonstrated in this study will help solving the difficulties experienced during cast removal in Pes equinovarus patients treated with Ponseti, method.

## MATERIAL AND METHODS

Forty feet of 29 patients treated for Pes Equinovarus in our hospital between 2015 and 2016 were included in the study. Patients were followed up in two groups. The group treated with Ponseti method by cast marking were named as “modified group” and cast wrapped group without marking were named as “classical group”. All patients were followed prospectively. After reaching 20 idiopathic clubfoot patients treated with casting by Ponseti method in both groups, new patient intake was stopped. Fifteen patients with 20 idiopathic clubfoot in the modified group and 14 patients with 20 idiopathic clubfoot in the classic group were obtained. Neurological, teratologic and syndromic clubfoot patients were not included in the study. During the study all the patients were followed and treated by 2 different orthopaedic specialists. While marking by folding was applied during casting in modifying group (Figure 1A-B-C), casting was applied without marking in the classical group. All the patients were treated with a percutan achillotomy to correct the equinus deformity under local anaesthesia after six series of casting. Then the seventh cast that will stay for three weeks was applied. At the end of the third week, all patients were treated with Denis-Browne abduction orthosis to maintain the position of the corrected foot.

All families have been trained in soaking and unwrapping Ponseti plaster. The families were requested to record the cast removal times for each extremity in minutes during six series of casting (the time passed from soaking the extremity to the complete removal of the cast), and to note whether any additional cutting tools were used during cast removal (Figure 2).

The study protocol was approved by local ethics committee (Date, 16 February 2017; number65, Metin Sabancı Baltalimanı Bone Diseases Training and Research Hospital, Ethical Committee for Clinical Investigations).

**Statistical analysis:** A summary of the data was presented as mean, standard deviation and percentage. Comparisons of the categorical characteristics were analysed by using the Chi-square test and the Mann-Whitney test. IBM-SPSS 20 program was used for analysis. In all tests, the level of significance was adjusted to 0.05.

## RESULTS

Forty extremities of 29 idiopathic clubfoot patients were included in the study. Thirteen (44.8%) of the patients were male and 16 (55.2%) were female. While the mean time to start treatment for the 15 patients in the modified group was 3.46 (2-7) days, mean time for the 14 patients in the classical group was 3.78 (2-10) days. No statistically significant difference was found between the two groups in terms of the age of treatment ( $p:0.502$ ) (Table 2). Cast removal time for each extremity was recorded in minutes from cast soaking to complete removal of the cast.

While the mean cast removal time of the 20 extremities of 15 patients in the modifying group was 10.9 minutes (8-14.3 min); for the 20 extremities of 14 patients in the classical group, it was 22.2 minutes (17.1-29.5 min). Cast removal time was found significantly short in the group treated with marked technique ( $p<0.001$ ) (Table 3).

While no additional cutting tools were used during cast removal for any patient in the modified group, additional cutting tools were used for 75% (15/20) of the patients in the classical group during cast removal, and statistically significant difference was found between the groups ( $p<0.001$ ) (Table 1).



**Figure 1:** Marking by folding method of the cast ends of the idiopathic clubfoot patient treated with Ponseti technique. A) Marking of the first cast end. B) Marking of the second cast end. C) Marking of the third cast end.



**Figure 2:** Ponseti cast removal steps. A) Finding the first marked cast end after being completely soaked in a bathtub. B) Removal of the first cast. C) Finding the second cast end and removing the cast. D) Finding the third cast end. E) Removal of the third cast. F) Complete cast removal in 7 minutes after being soaked.

**Table 1.** Statistical analysis of the use of the cutting tool between the two groups with \*Pearson-chi square test

Technique		The use of the cutting tool		Total
		Yes	No	
Modified Group	n	0	20	20
	%	0,0%	100,0%	100,0%
Classical Group	n	15	5	20
	%	75,0%	25,0%	100,0%
Pearson chi-square		p<0.001		

**Table 2.** Statistical analysis of the age of treatment between the two groups with Mann-Whitney\* test. No statistically significant difference was found between the two groups in terms of the age of treatment (p>0.502)

Technique	n	Mean (Age of treatment-day)	SD (Standart Deviations)	P *Mann-Whitney Test
Modified Technique Group	15	3,46 days	1.45	,502
Classical Technique Group	14	3,75 days	2.08	

**Table 3.** Statistical analysis of the cast removal time between the two groups with Mann-Whitney\* test. Cast removal time was found significantly low in the modified group (p<0.001).

Technique	n	Mean (Cast removal time-min)	SD (Standart Deviations)	P *Mann-Whitney Test
Modified Technique Group	20	10,940 min	1.702	,000
Classical Technique Group	20	22,295 min	3.424	

## DISCUSSION

Ponseti method is accepted as the gold standard in the treatment of idiopathic clubfoot. The safety and effectiveness of the method has been repeatedly shown in the literature, which has led to increased use of the method throughout the world in the last 20 years (7). Despite the detailed description of the cast application steps of this technique widely used in the treatment, little attention has been paid to cast removal (3-5).

During the Ponseti cast removal; it is suggested that the electrical cast saw should not be used as it may cause skin irritation and frighten the family and the baby. There are two options in the literature about cast removal. In the first option; it has been proposed to wrap the cast with a damp towel after 20 minutes of soaking of the cast, and first to remove above the knee and then below the knee with a plaster knife. The plaster knife should be used obliquely to avoid skin damages. In the other option, it is suggested to soak the cast completely in a bath tub and to unwrap it after being softened enough. It has also been reported that this method is effective but takes longer (4,8,9). In our study, we argued that the end points of the casting should be marked by folding during casting in the clubfoot patients treated with Ponseti technique, which will shorten cast removal time and remove the need of cutting tools for cast unwrapping. In this respect, we compared the cast removal times and the need to use of cutting tools for the patients treated with marking and without marking of the cast.

While the mean cast removal time of the 20 extremities of 15 patients in the marked group was 10.9 minutes (8-14.3 minutes); for the 20 extremities of 14 patients in the classical group, it was 22.2 (17.1-29.5 minutes). Statistically, cast removal time in the treatment group with the marked method was found significantly low ( $p < 0.001$ ). While no additional cutting tool was used during cast removal in the marked group, additional cutting tools were used during removal of cast in 75% (15/20) of the patients in the classical group and statistically significant difference was found between two groups in terms of the use of cutting tools ( $p < 0.001$ ).

## CONCLUSION

We found that the cast ends' being marked by folding during plastering in idiopathic clubfoot patients treated with Ponseti technique is costless, easy to apply, significantly shortens cast removal time, does not require the use of cutting tools, and thus is a notably safe method for these patients.

**Author contributions:** FD, ÖC; Design of the study Patient examination, therapy and data collection. ÖC; review of the literature, analyzes and writing of the manuscript.

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**Ethical issues:** All authors declare originality of research.

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