

# CONSERVATIVE TREATMENT FOR TALIPES EQUINO VARUS

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## ABSTRACT

*The aim of this work was to compare the effects of stretching and tapping followed by splinting versus manipulation followed by application of plaster cast in correcting club foot deformities in infants. The subjects included were twenty infants (18 boys and 2 girls) with club feet deformity bilateral or unilateral with age ranged from 2 weeks to 6 months. They were divided randomly into two equal groups of equal number. Group "A" comprised ten infants (9 boys and 1 girl) treated by stretching and tapping followed by application of splint to maintain the correction reached. They received their treatment twice weekly, each session lasted thirty minutes. Group "B" included ten infants (9 boys and 1 girl). They received manipulation followed by repetitive application of plaster cast every 2 weeks except the last casting which extended for 3 - 4 weeks. Assessment was done for the infants in both groups before and after treatment which included: clinical and radiological assessment and physical examination. The results showed similar and significant improvement in the two groups with no significant difference between the effect of the two types of applications. However, casting was found to be much more expensive than splinting.*

## INTRODUCTION

**C**ongenital talipes equino varus (T.E.V.) is a complex, deformity. It may be unilateral or bilateral and is not necessarily inherited<sup>4</sup>. It was described by Cummings and Lovell<sup>2</sup> as a deformity in which the forefoot is in adduction position and the hind foot is in varus angulation. The entire talus is in a position of equinus, its head is palpable at the sinus tarsi and the navicular is displaced medially as is the cuboid but to a lesser degree. Ippolito and Ponseti<sup>6</sup> mentioned that it must be differentiated clinically between those children whose congenital T.E.V. deformity is an isolated condition and those who have other anomalies.

Three types of congenital T.E.V. were recognized as mild, moderate and severe, depending on the degree of the original deformity and that this was closely related to the prognosis<sup>3</sup>. Another four types were distinguished according to their response to treatment<sup>5</sup>. On the other hand, the terms "severe", "resistant", "mild", and "postural" had been used<sup>12</sup>.

Talipes equino varus was first described by Hippocrates who demanded instant or gentle treatment, followed by forceful conservative and operative technique<sup>11</sup>. It has been suggested that T.E.V. could be conservatively treated and if the deformity is so mild, it may be left to be revolved without treatment<sup>9</sup>. The incidence of T.E.V. in the United States is

approximately one per 1,000 live births, and the incidence among first degree relatives is even higher. The sex ratio is approximately two boys to one girl. It has been also recommended that the surgical release should be done within the first few days or weeks of life, although it was generally agreed that this is not advisable<sup>2</sup>.

It was apparent from the literature reviewed that the conservative treatment was the treatment of choice, however, the question remains which method of treatment will be the best from medical and economical point of view, so, the idea of the present study was created to answer this question.

### SUBJECTS, MATERIALS AND METHODS

#### *Subjects:*

Twenty infants 18 males and 2 females diagnosed by the medical staff at the Institute of Poliomyelitis and Physical Medicine in Embaba as having club foot were the subjects of the study. Their age ranged between 2 weeks and 6 months. Club foot of secondary origin (meningomyelocele, arthrogryposis, spina bifida, etc.) and abnormal insertion of the tendo achilles were excluded from the sample. The sample was divided randomly into two equal groups of equal number: Group "A" consisted of ten infants (nine males and one female). They were treated by stretching and tapping followed by placing the foot in a splint which was specially designed and constructed for this investigation aiming for correcting the foot deformity. Group "B" consisted of the other ten infants (nine males and one female). This group was treated by manipulation, followed by applying plaster casts to maintain the correction reached by manipulation.

#### *Materials and Methods:*

**Tape measurement:** A tape measurement scaled into centimeters, was used to measure, the size of the foot from medial border and lateral border and also the distance between the first metatarsal and fifth metatarsal "breadth of foot".

The following measurements have been recorded for each infant according to Somppi<sup>11</sup>.

1. The distance from the posterior half aspect from the middle of the heel to the base of first metatarsal (medial border).
2. The distance from the same point of the heel to the base of the fifth metatarsal (lateral border).
3. The distance from the base of first metatarsal to the base of fifth metatarsal (breadth of the foot).

#### **Roentographic technique and measurements:**

Standard radiographs were taken as follow: Antero-posterior radiograph with the foot in 30 degrees of planter flexion with the tube directed cranially 30 degrees from the perpendicular position. A lateral view was then taken with the foot in 30 degrees of planter flexion. Measurements were then taken to measure the angular relationships between the long axis of the calcaneus and the talus.

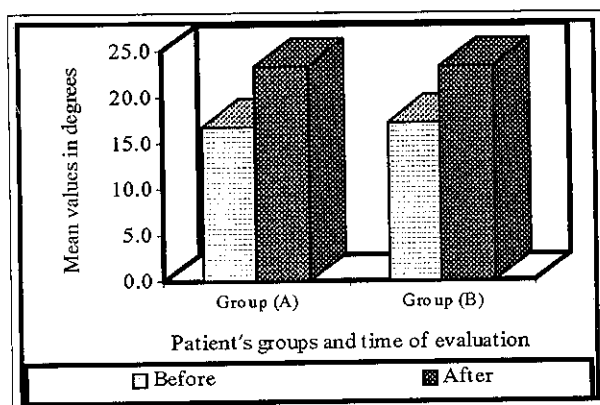
In the antero-posterior view lines were drawn longitudinally through the talus parallel to its medial border, and through the calcaneus parallel to its lateral border. In the lateral view, lines were drawn longitudinally through the central axis of the talus and parallel to the lower border of the body of the calcaneus. These two angles were then added together and their summation were called the talo-calcaneal index<sup>1</sup>.

significant improvement. On the other hand it could be noticed that significant improvement is also recorded from group "B" as the talo-calcaneal angle was  $17.30 \pm 4.65$  degrees and following treatment this angle moved toward the normal standard to become  $23.4 \pm 4.79$  degrees. Comparing the level of improvements in both groups showed no significant difference. The plaster cast group showed an improvement of 35.26% while the splint group improved by 37.87%.

**Table (2): The mean values of the talo-calcaneal angles from antero-posterior X-ray view before and after treatment in both groups.**

Time of evaluation	Group(A)	Group (B)	P. value
	Mean $\pm$ S.D.	Mean $\pm$ S.D.	
Before treatment	16.9 $\pm$ 5.74	17.30 $\pm$ 4.65	>0.5 (N.S.)
After treatment	23.3 $\pm$ 6.60	23.4 $\pm$ 4.79	>0.5 (N.S.)
Percentage of improvement	37.87 %	35.26 %	

N.S. : Non-significant



**Fig. (2): The mean values of the talo-calcaneal angles from antero-posterior X-ray view before and after treatment in both groups.**

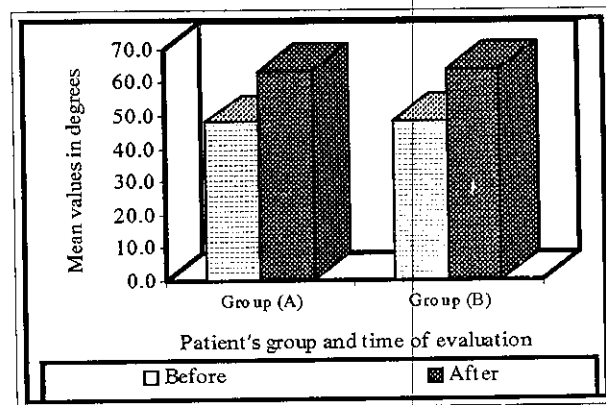
Table (3) and demonstrated by fig. (3) show comparison of changes in the talo-calcaneal index before and after treatment in both groups. In group "A" the talo-calcaneal index

was  $48 \pm 13.17$  degrees before treatment and it became  $63.30 \pm 9.52$  degrees following treatment. In group "B" the talo-calcaneal index was  $48.30 \pm 12.12$  and  $63.90 \pm 9.85$  degrees before and after treatment respectively. Significant improvement was recorded in both groups ( $P < 0.05$ ). However, comparing the level of improvement in both groups, no significant difference was detected ( $P > 0.05$ ). The improvement in the splint group was 31.87% while it was 32.30% in the plaster cast group.

**Table (3): The mean values of talo-calcaneal index before and after treatment in both groups.**

Time of evaluation	Group(A)	Group (B)	P. value
	Mean $\pm$ S.D.	Mean $\pm$ S.D.	
Before treatment	48.00 $\pm$ 13.17	48.30 $\pm$ 12.12	>0.5 (N.S.)
After treatment	63.30 $\pm$ 9.52	63.90 $\pm$ 9.85	>0.5 (N.S.)
Percentage of improvement	31.87%	32.30%	

N.S. : Non-significant



**Fig. (3): The mean values of talo-calcaneal index before and after treatment in both groups.**

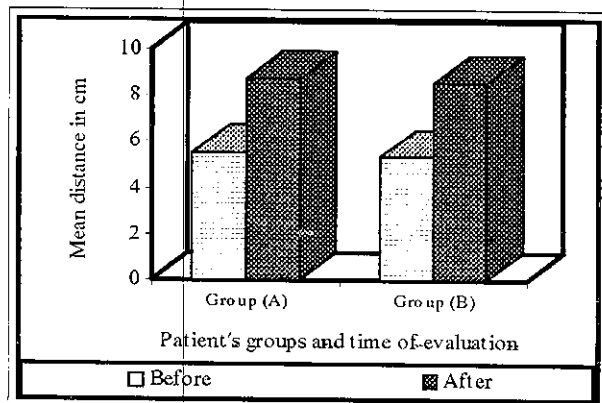
The distance between the heel and the first metatarsal bone was measured and compared before and after treatment in both groups. Table (4) and fig. (4) show that in group "A"

the distance was  $5.50 \pm 0.91$  cm before treatment and became  $8.70 \pm 0.35$  following treatment. While the same distance in group "B" was  $5.30 \pm 1.03$  and  $8.55 \pm 0.64$  before and after treatment respectively. The percentage of improvement was 58.18% and 61.32% in groups "A" and "B" respectively. No significant difference was recorded between the two groups.

**Table (4):** The mean values of the distance between the heel and first metatarsal head in both groups before and after treatment.

Time of evaluation	Group(A) Splint	Group (B) Plaster	P. value
	Mean ± S.D.	Mean ± S.D.	
Before treatment	$5.50 \pm 0.91$	$5.30 \pm 1.03$	>0.5 (N.S.)
After treatment	$8.70 \pm 0.35$	$8.55 \pm 0.64$	>0.5 (N.S.)
Percentage of improvement	58.18 %	61.32 %	

N.S. : Non-significant



**Fig. (4):** The mean values of the distance between the heel and first metatarsal head in both groups before and after treatment.

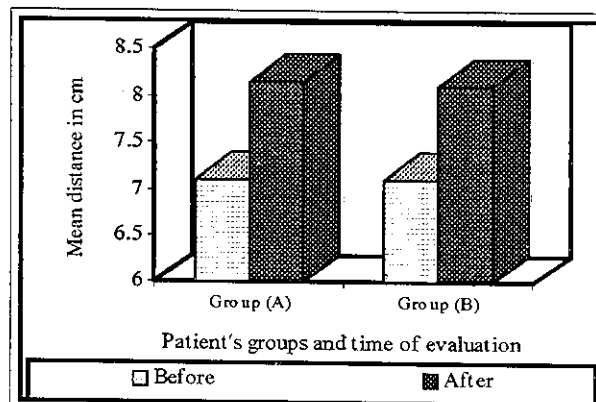
The distance between the heel and the fifth metatarsal bone before and after treatment was measured in both groups and compared in table (5) and demonstrated in fig. (5). In group "A" the distance was  $7.10 \pm 0.74$  and  $8.15 \pm$

$0.67$  before and after treatment respectively, while in group "B" it was  $7.10 \pm 0.61$  and  $8.10 \pm 0.61$  respectively. The percentage of improvement was 14.79% and 14.08% in groups "A" and "B" respectively with no significant difference between the two groups ( $P > 0.05$ ).

**Table (5).** The mean values of the distance between the heel and fifth metatarsal bone in groups (A) and (B) before and after treatment.

Time of evaluation	Group(A) Splint	Group (B) Plaster	P. value
	Mean ± S.D.	Mean ± S.D.	
Before treatment	$7.10 \pm 0.74$	$7.10 \pm 0.61$	>0.5 (N.S.)
After treatment	$8.15 \pm 0.67$	$8.10 \pm 0.61$	>0.5 (N.S.)
Percentage of improvement	14.79 %	14.08 %	

N.S. : Non-significant



**Fig. (5):** The mean values of the distance between the heel and fifth metatarsal bone in groups (A) and (B) before and after treatment.

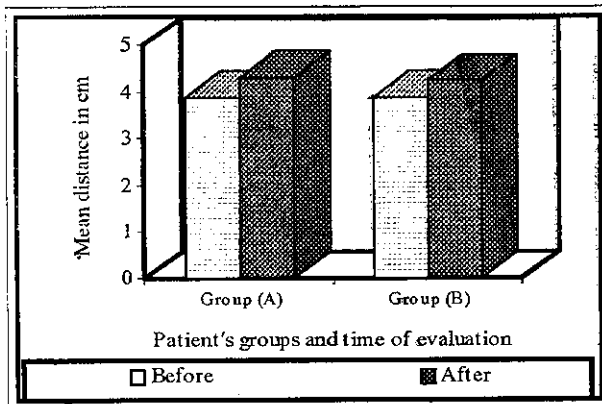
The distance between the first and fifth metatarsal bone was measured before and after treatment in both groups. Comparison between the two groups is presented in table (6) and demonstrated in fig. (6). This table shows that in group "A" the distance between the first and fifth metatarsal bones before treatment was

3.85 ± 0.34 cm. Following treatment the distance increased to 4.29 ± 0.12 cm. In group "B" the same distance was 3.85±0.34 cm before treatment and increased following treatment to 4.23 ± 0.25 cm showing significant improvement in both group (P<0.05). Improvement was 11.43% and 9.87% in groups "A" and "B" respectively with no significant difference between the level of improvement in the two groups (P>0.05).

**Table (6): The mean values of the distance between the first and fifth metatarsal heads before and after treatment in both groups.**

Time of evaluation	Group(A)	Group (B)	P. value
	Mean ± S.D.	Mean ± S.D.	
Before treatment	3.85 ± 0.34	3.85 ± 0.34	>0.5 (N.S.)
After treatment	4.29 ± 0.12	4.23 ± 0.25	>0.5 (N.S.)
Percentage of improvement	11.43%	9.87%	

N.S. : Non-significant



**Fig. (6): The mean values of the distance between the first and fifth metatarsal heads before and after treatment in both groups.**

Table (7) summarizes the comparison between the effect of designed splint and the repeated plaster cast in correcting the club foot deformity in young infants in relation to the

duration of application and total cost. The time needed for correcting the deformity was about the same in both groups but the total cost was significantly less in group "A" than in group "B" supporting use of splint in conservative treatment of club foot.

**Table (7): Comparison between the designed splint and the plaster casting as regards to the duration, number of splints used during treatment and their costs.**

Type of treatment	Duration	No. of splint or plaster casting	Total cost L.E.
Splinting	10 weeks	1	25
Plaster casting	12 weeks	6	93

### DISCUSSION

Congenital talipes equino varus or club foot deformity is one of the most common foot abnormalities confronting the orthopedic surgeon and physiotherapist. According to Shaw<sup>10</sup> stretching and tapping gave 75% success, on the other hand applying Denis Brown splint gave only 25% success while sole manipulation did not show any improvement. Harold and Walker<sup>3</sup> treated 103 feet with serial plaster and they reported satisfactory success on the severity of the deformities at birth.

On the other hand, McKay<sup>8</sup> estimated only a 5% success rate with conservative treatment. More recently, Yamamoto and Furuya<sup>14</sup> conducted a study on 91 feet, they reported that 66% responded to treatment with modified Denis Brown splint and their radiological assessments showed good alignments.

This study was conducted on twenty patients (18 boys and 2 girls) collected from subjects suffering from club foot and were divided into two groups: Group "A" which included (9 boys and 1 girl) was treated with manipulation followed by plaster cast to maintain the correction. It has been noticed from the results of the present research that the score of physical examination, showed a significant increase of the average in both groups comparing their measurements before and after treatment. These results of this study come in agreement with the results of Somppi<sup>11</sup> who compared the primary operative versus conservative type of therapy within grade 3 "moderate" and he reported that the quality of foot in the primary conservative therapy was significant in both scores as regard to shape and size.

In the current work, the scores in shape (radiological assessment) were measured in both groups before and after treatment and was recorded in three angles: Talo-calcaneal angle (antero-posterior view) (T.C.A. ant. post.) and Talo-calcaneal angle (lateral view) (T.C.A. lat. view) and Talo-calcaneal index (T.C.I.): which is the sum of the T.C.A. ant. post. and T.C.A. lat. view. In the splinted group the average measurements in T.C.A. ant. post., T.C.A. lat. views and T.C. index have been increased following the treatment. The same significant increase has been recorded also in the plaster group. On the other hand, there was no significant difference between the scores in the shape of club feet in both groups following treatment. These results are in agreement with the results obtained by Yamamoto and Furuya<sup>14</sup> who treated the club foot deformity conservatively by using splint.

The results of the present study are supported also by the research work conducted by Taylor et al.<sup>13</sup> who recommended that in

normal feet the talo-calcaneal angle, from the ant-post view was 30 degrees but in severe club feet this angle was greatly diminished, that is because the anterior part of the calcaneus moves medially under the Talus, and in the lateral view the talo-calcaneal angle in normal subjects was 30 degrees. However, in club feet the posterior end of the calcaneus may be held up by tight calf muscles, this causes a decrease in the talo-calcaneal angle.

Both groups showed a significant improvement when the measurements before treatment were compared to that following the treatment, although there was no significant difference between both modalities indicating that both of them gave similar results. It seems that the splinting method of treatment remains the method of choice due to the fact that the cost of splint is much less than the application of the plaster cast.

At the same time it should be mentioned that application of plaster cast needs an experienced person to apply which is not required in cases of splints, where the parents can be easily taught how to use it for their infants. The third factor that makes us tend to prefer splinting over the plaster cast is the complications that may arise from the use of plaster cast. Finally, the application of splints may give the therapist the chance to try another modulations of treatment such as tapping, frequent and repeated stretch, electrical stimulation etc.

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## المؤلف العربي

## دراسة العلاج التحفظي للقدم الحنفاء

الهدف من هذه الدراسة هو المقارنة بين تأثير الشد والنقر معقوبا بالسناد والمعالجة اليدوية معقوبة بالجبيرة في معالجة تشوهات القدم الحنفاء عند الأطفال الرضع .

وقد أجريت الدراسة على ٢٠ طفلا ( ١٨ ولد وبناتان ) عندهم تشوه القدم الحنفاء بالطرفين أو بطرف واحد وتتراوح أعمارهم بين أسبوعين إلى ستة أشهر، وقد تم تقسيم هؤلاء المرضى عشوائيا إلى مجموعتين متساويتين في العدد .

المجموعة الأولى ( أ ) وتشمل عشرة أطفال ( ٩ أولاد وبنات واحدة ) عولجوا بالشد والنقر معقوبا بالسناد للمحافظة على الوضع النهائي الذي وصل إليه بالمعالجة وكان العلاج بواقع مرتين في الأسبوع ومدة الجلسة الواحدة ثلاثون دقيقة .

والمجموعة الثانية ( ب ) وتشمل أيضا عشرة أطفال ( ٩ أولاد وبنات واحدة ) وعولجوا بالمعالجة اليدوية معقوبة باستخدام الجبيرة .

والقدم عولجت يدويا وتم تغيير الجبيرة لها دوريا كل أسبوعين تقريبا بجبيرة جديدة والجبيرة الأخيرة استمرت لمدة أطول تمتد من ثلاثة أسابيع إلى أربع أسابيع واستمرت هذه الدراسة لمدة ثلاثة شهور وقيم هؤلاء الأطفال في المجموعتين قبل وبعد العلاج ويشمل التقييم : تقييم طبي وأشعة وفحص طبي

وقد أظهرت النتائج تحسن مشابه ولموس في المجموعتين بدون أي فرق جوهري بين تأثير تطبيق النوعين من العلاج . وقد وجد أن الفرق في تكلفة الجبيرة أعلى بكثير من تكلفة السناد ، بالإضافة إلى ذلك ، فالسناد يمكن استخدامه لأكثر من مريض بدون تكاليف إضافية .