Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i6.6583

EFFECTS OF LOW DYE TAPING TECHNIQUE VERSUS ROBERT DEBRE METHOD ON FOOT POSTURE AND RANGE OF MOTION IN CHILDREN WITH CLUB FOOT. LOW DYE TAPING TECHNIQUE VERSUS ROBERT DEBRE METHOD.

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ABSTRACT

BACKGROUND: Clubfoot is an inborn malformation affecting the foot & ankle, manifesting as ankle equinus deformity, subtalar joint inversion, midtarsal joint adduction, cavus, and internal tibial torsion. The etiology of this condition is thought to be linked to factors like intra-uterine posture, maternal smoking, amniocentesis, distal limb vasculature, male gender, and familial predisposition impacting single lower limb or both limbs.

OBJECTIVE: The study aims to explore the impact of the low dye taping technique in comparison to the Robert Debré method on foot posture and range of motion in children with clubfoot.

METHODS: It was a Randomized clinical trial conducted on children with Congenital Club Foot through non probability convenience sampling technique. The study included 40 children with CTEV, calculated by Epi tool calculator, of both sexes and 10% attrition was added to the total sample size. Exclusion criteria were Benign or non-idiopathic, associated syndrome or neurological condition, positional clubfoot, Children with systemic disease and Juvenile arthritis. Total participants were divide into two equal groups; Group one (G1) following Low Dye Taping technique(LDT), and .

RESULTS: Data was analyzed using SPSS version 22. Statistical significance set at P=0.05. Total number was 40 with Mean ±SD 2.03±0.967. 85% were males and 15% were females out of total population. Within the group analysis was done by Wilcoxon Signed Ranks and Mann- Whitney test was administered as the data was not normally distributed. G1 and G2 Pirani pre- treatment scores were compared by Mann- Whitney test and showed the total mean of 5.6125±0.34876 with z score -2.365 and P=0.018, while post treatment mean was 1.9735±1.02649 with Z score of -4.393 and

P=0.000. G1 and G2 Dimeglo pre-treatment comparison had total mean of 12.9500±0.87560 with z score of -0.057 and P=0.954, while post-treatment values were 5.0000±1.01274 total mean with the z score of -2.395 and P=0.017.
CONCLUSION: This randomized clinical trial shows that both treatments reduce the deformity, but Low Dye Taping technique was more effective in reduction of equinus, varus, derotation and fore foot adductus along with clinically improving activity of posture and range of motion.

KEY WORDS: CTEV, Low Dye Taping, Robert Debre Method, Club Foot, physiotherapy.

ABBREVIATIONS: CTEV, Congenital Telipes Equines Varus; **LDT**, Low Dye Taping; **RDM**, Robert Debre Method; **SPSS**, Statistical Package for Social Sciences; **RCT**, Randomized Controlled Trial; **SVP**, Saint-Vincent-de- Paul.

1. INTRODUCTION:

Clubfoot, also recognized as congenital talipes equinovarus (CTEV), is a developmental anomaly affecting the lower limbs in infants, characterized by the acronym CAVE: Cavus in the midfoot, Adduction in the forefoot, Varus in the hindfoot, and Equinus deformity in the hindfoot. The fixation of the foot in a cavus deformity, resulting from a shortened Achilles tendon, leads to the foot remaining pointed and causes misalignment of both bony and soft tissues. [1] The condition is thought to be triggered by factors such as the fetal intrauterine posture, maternal smoking, and amniocentesis. Another hypothesis, the vascular theory, suggests that CTEV is a consequence of the obstruction of the foot's vascular tree, subsequently manifesting as a knot of fatty infiltration and fibrous tissue. This theory finds support in the observed atrophy of the calf on the same side, attributed to diminished perfusion through the anterior tibial artery. [2]

All three etiological categories of CTEV—Idiopathic (the most prevalent), Neurogenic, and Syndromic—require prompt conservative or surgical intervention. Treatment is classified into five main categories: Treated, involving timely attention; Untreated, left unaddressed; Resistant, non-responsive to conservative interventions; Recurrent, characterized by relapses followed by complete recovery; and Neglected, occurring when a child is over 2 years old, never receiving medical care, eventually leading to severe soft tissue contractures and bony dysfunctions. [3] Diagnosis of clubfoot typically occurs after birth, although it may be identified during the routine ultrasound scan conducted between 18 and 21 weeks of pregnancy. [4] In physiotherapy, commonly employed musculoskeletal parameters include the Pirani Scoring System and Dimeglo Bensahel Classification, both used to evaluate the severity and extent of dysfunctions in newborns. [5]

For centuries, the Ponseti Method has stood as the benchmark for treating a certain condition, surpassing other interventions. This method involves two primary phases: the initial corrective phase, which includes Manipulation, casting, and Tenotomy, and the subsequent Maintenance Phase, where a foot abduction brace is employed to prevent relapse. Cases with soft deformities typically exhibit a quicker recovery period and a 99% reducibility. [6] However, if the foot has become rigid, the chances of successful treatment drop to 50%. Deformities that do not respond to conventional methods necessitate surgical correction. Recent advancements in research have introduced two evidence-based practices for this condition: the "Robert Debré Method" and the "Low-Dye Taping Technique."[7]

The Low-Dye Taping Technique is a traditional method that effectively reduces motion in the subtalar joint, alleviates pain, and addresses excessive pronation by creating an off-loading effect to support the footarches. It achieves two primary objectives: first, correcting pronation, and second, adjusting the forefoot's adduction. The first layer of tape is wrapped around the heel, extending to the back of the big toe, followed by the overlapping second layer in the same sequence. The third layer is firmly pressed against the bottom of the foot, contacting the palmar surface. This application relieves pressure by evenly distributing forces, enhancing patient comfort. [8]

The second intervention, the Robert Debré Method, is somewhat akin to the Ponseti Method and is also known as the French functional method. Boasting a success rate of 93%, this approach involves stretching the triceps, manipulations, stimulation, and strengthening of the muscles surrounding the foot. The process is concluded with temporary immobilization of the foot, typically lasting 6-8 weeks on average. This method successfully corrects all deformities except for equinus, and surgical correction remains a viable option for addressing this specific issue. However, it is essential to note that extensive open surgeries may lead to post-operative complications and scarring. Additionally, complex congenital talipes equinovarus (CTEV) can be treated using the Gradual Distraction Method, employing circular external fixators. [9]

The objective of this study was to observe and compare the effectiveness of two treatment methods, namely the Low-Dye Taping Technique (LDT) and the Robert Debré Method (RDM). The focus was to assess which of these treatment approaches is more beneficial and time-saving providing valuable insights into selecting the most effective and efficient treatment option for the specific deformities under consideration.

2. MATERIALS AND METHODS:

The study included 40 children with club foot, calculated by Epi tool calculator, of both sexes and 10% attrition was added to the total sample size. Exclusion criteria were Benign or non-idiopathic, associated syndrome or neurological condition, positional clubfoot, Children with systemic disease and Juvenile arthritis. Total of 40 participants were divide them into two equal groups; Group one (G1) following Low Dye Taping technique(LDT), and Group two (G2) was made to go through Robert Debre Method(RDM).

Null Hypothesis was “There is no difference in effects of LDT and RDM on foot posture and range of motion in children with club foot”, while the Alternate Hypothesis was “There is a difference in effects of LDT and RDM on foot posture and range of motion in children with club foot”. Diagnosis of and assessment of Club foot was performed by Pirani Scale and Dimeglo Classification. Both groups were counselled about club foot deformity, daily foot care, and were made to follow treatment for 6 weeks daily 30 minutes’ sessions with standard stretching and manipulation.

The study protocol was reviewed and approved by the Ethics Committee of Riphah International University, Islamabad. All participants provided the written informed consent.

STATISTICS

Non-probability convenient sampling technique was used in this 6 months long Randomized clinical trial. Non parametric Kolmogorov-Smirnov was used to test the normality of data. Data was analyzed using SPSS version 22. Statistical significance set at P=0.05.

3. RESULTS:

Ages of children having club foot were from 1month to 6 months. Total number was 40 with Mean ±SD 2.03±0.967. 85% were males and 15% were females out of total population. There was no significant difference at baseline. Within the group analysis was done by Wilcoxon Signed Ranks and Mann- Whittney test was administered as the data was not normally distributed. G1 Pirani Pre-treatment mean was 5.4750±0.37958 and post- treatment was 1.2250±0.86565 with Z score of 5.5000 and 1.0000 respectively. G1 Dimeglio Pre-treatment mean was 12.9000±0.71818 and post-treatment was 4.6000±0.68056 with the overall Z score of -3.969. G2 Pirani Pre-treatment mean was 5.7500±0.25649 and post-treatment mean was 2.6500±0.58714. G2 Dimeglio Pre-treatment mean was 13.0000±1.02598 and post-treatment was 5.4000±1.14248 with the Z score of -3.969.

G1 and G2 Pirani pre- treatment scores were compared by Mann- Whittney test ans showed the total mean of 5.6125±0.34876 with z score -2.365 and P=0.018, while post treatment mean was 1.9735±1.02649 with Z score of - 4.393 and P=0.000. G1 and G2 Dimeglo pre-treatment comparison had total mean of 12.9500±0.87560 with z score of -0.057 and P=0.954, while post- treatment values were 5.0000±1.01274 total mean with the z score of -2.395 and P=0.017.

4.1. TABLES (Pirani Scale)

Pre-Treatment				
	Mean±SD	Median	Z-score	P value
Mid Foot	2.8125±0.24515	3.0000	-1.612	0.107
Hind Foot	2.8125±0.24515	3.0000	-1.612	0.107
Total	5.6125±0.34876	5.5000	-2.365	0.018
Post-Treatment				
Mid Foot	1.1875±0.72224	1.0000	-3.514	0.000
Hind Foot	0.7625±0.551812	1.0000	-4.688	0.000
Total	1.9735±1.02649	2.0000	-4.393	0.000

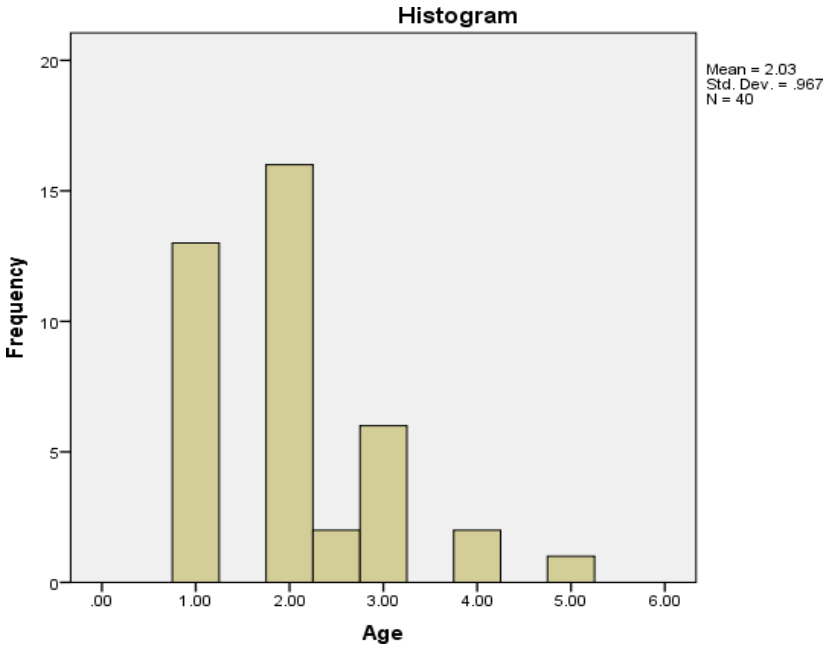
Table 4.1.1: Between the group analysis Mann- Whittney test Dimeglio Bensahel classification)

Pre-Treatment				
	Mean±SD	Median	Z score	P value
Equinus	3.2750±0.45220	3.0000	-0.350	0.727
Varus	3.2000±0.40510	3.0000	0.000	1.000
Derotation	3.22250 ±0.4229	3.0000	-1.122	0.262
Forefoot	3.1250±0.33493	3.0000	-2.360	0.018
Total pre	12.9500±0.87560	13.0000	-0.057	0.954
Post-Treatment				
Equinus	1.3500±0.48305	1.0000	-1.964	0.050
Varus	1.2500±0.43853	1.0000	-1.442	0.149
Derotation	1.1750±0.38481	1.0000	-2.054	0.040
Forefoot…….	1.250±0.43853	1.0000	-0.721	0.471`
Total pre	5.0000±1.01274	5.0000	-2.395	0.017

Table 4.1.2: Between the Group analysis Mann- Whittney test. (Kolmogorov-Smirnov)

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mid Foot-pre	.403	40	.000	.614	40	.000
Hind Foot-pre	.403	40	.000	.614	40	.000
Pirani Total-pre	.251	40	.000	.792	40	.000
Equinus-pre	.453	40	.000	.559	40	.000
Varus-pre	.489	40	.000	.491	40	.000
Derotation-pre	.478	40	.000	.517	40	.000
Fore Foot relative to Hind Foo-pre	.521	40	.000	.389	40	.000
Dimeglio Total-pre	.227	40	.000	.841	40	.000

Table 4.1.3: Test of Normality (Kolmogorov-Smirnov)



4.2. FIGURES

Figure 4.2.1.: Ages of children having club foot were from 1month to 6 months. Total number was 40 with Mean ±SD 2.03±0.967.

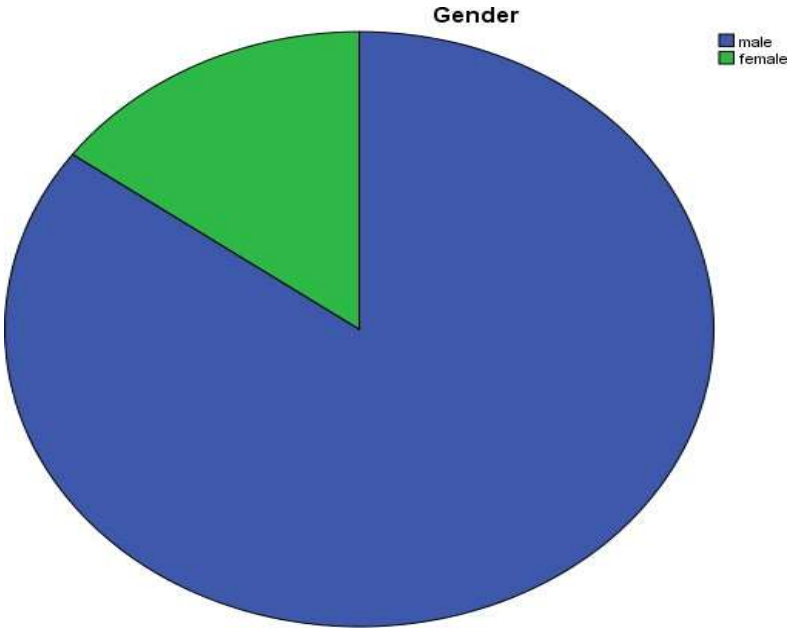


Figure 4.2.2: There were 85% male and 15% of female patients treated.

4. DISCUSSION AND CONCLUSION:

Several Randomized Clinical Trials (RCTs) and cohorts were conducted to determine the most effective treatment protocol for CTEV. Comparisons between the Robert Debré Method (RDM) and the Ponseti Method favored Ponseti, indicating better effects (33). The addition of manipulation to ongoing treatment techniques showed positive results, resulting in a consistent decrease in the Pirani score without the need for tenotomy.(34) A retrospective study was performed to compare the efficiency of RDM with Saint-Vincent-de-Paul (SVP) and SVP was found to be superior to RDM in addressing clubfoot deformity.[10]

The current study was a Randomized Clinical Trial involving Two groups G1 and G2 were involved in this study, receiving the Low Dye Taping Technique and Robert Debre technique respectively.

Patients underwent 30 minutes' session for 6 weeks and then assessed again as for post- treatment. Both groups were assessed by using Pirani Scoring System and Dimeglio Bensahel Classification. Pre and post assessment was done at the beginning and end of treatment sessions. Non parametric Kolmogorov-Smirnov was used to test the normality of data. Data was analyzed using SPSS version 22. Statistical significance set at P=0.05.

In Conclusion: As the data was not normally distributed, Within the group analysis was done by Wilcoxon Signed Ranks and Mann- Whittney test. This randomized clinical trial shows that both treatments reduce the deformity, but Low Dye Taping technique was more effective in reduction of equinus, varus, derotation and fore foot adductus and clinically improve activity of posture and range of motion.

5. ACKNOWLEDGMENTS:
I would like to express my heartfelt gratitude to everyone who played a part, directly or indirectly, in the completion of this research. I extend my sincere appreciation to my Supervisor Dr. Nazeer Ahmad, whose expertise, insightful feedback and constructive criticism greatly enriched the quality of the study.
I am also thankful to the Riphah International University for providing the necessary resources, facilities, and a conducive environment for carrying out this research. My gratitude extends to my colleagues and peers for their valuable discussions, feedback, and collaborative efforts throughout the research process. The exchange of ideas and perspectives significantly contributed to the depth and breadth of the study.
Lastly, I express my deepest appreciation to my family and friends for their unwavering support, and encouragement during this challenging yet rewarding journey. Their belief in me has been a constant source of motivation.

Sources of Funding: This study received no form of funding from any state agencies, nonprofit organizations, and pharmaceutical or other commercial sources.

Disclosure and conflicts of interest: The authors declare no conflict of interest.

7.LIMITATIONS:
- Due to Covid-19 pandemic physical access was difficult.
- There was limitation of time.
- Resources were limited

8. RECOMMENDATIONS:
It is recommended that a future therapist should explore the more effects of Low Dye Taping Technique and Robert Debre Method. Therapist should use these techniques for safe and maximum recovery of congenital club foot. More work should be done to explore the relationship between surgical and conservative treatment methods

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