



# International Journal of Medical and Exercise Science

(Multidisciplinary, Peer Reviewed and Indexed Journal)

## ORIGINAL ARTICLE

### EFFECT OF TAPING AND FOOT EXERCISE ON GREAT TOE ANGLE AND FOOT FUNCTION IN SUBJECTS WITH HALLUX VALGUS

Search engine:  
[www.ijmaes.org](http://www.ijmaes.org)

**M. Manoj Abraham<sup>1</sup>, V. Pradhap Sankar<sup>2</sup>, R. Arputha Roja<sup>3</sup>, R. Nivethitha<sup>4</sup>**

#### Authors:

<sup>1</sup>Principal, K G College of Physiotherapy, Coimbatore, Tamil Nadu, India

<sup>3</sup>BPT Intern, K G College of Physiotherapy, Coimbatore, Tamil Nadu, India

<sup>4</sup>PG Student, K G College of Physiotherapy, Coimbatore, Tamil Nadu, India

#### Corresponding Author:

<sup>2</sup>Assistant Professor, K G College of Physiotherapy, Coimbatore, Tamil Nadu, India,

Email id: [pradhapsankar3@gmail.com](mailto:pradhapsankar3@gmail.com)

## ABSTRACT

**Background:** Hallux valgus (HV) is a progressive foot deformity manifested with the medial orientation of the first metatarsal bone, lateral deviation of greater toe. The prevalence of hallux valgus is 23%, both male and female are affected. The function of Hallux is to resist the overpronation of foot during the normal foot mechanics. Hallux serves as a fulcrum for forward propulsion. Cause of hallux valgus is multifactorial. Various treatment methods available such as foot exercise, manual therapy techniques, kinesiology taping techniques. In this study subjects provided with Taping techniques and Foot exercise. Objective of the study was to determine the effect of Tapping and Foot exercise on great toe angle and foot function in subjects with Hallux valgus. **Methods:** A total of 20 Subjects with Hallux Valgus of both genders, in the age group of 18-65 years were conveniently assigned into 2 groups. Group A (n = 10) received Taping and Foot exercise and Group B (n = 10) received Foot exercise alone, 3 sessions a week for 8 weeks. Foot function were evaluated with Foot function index and Finger Goniometer. **Results:** The difference in the post-test mean scores of group A and group B in Foot Function Index was 18.75 and 15.71 and Goniometer was 17.17 and 13.416 respectively. The result showed a significant improvement in Group A than in Group B at  $p < 0.0001$ . **Conclusion:** The study concludes that the Taping along with foot exercise is better management to improve the Foot Function in subjects with Hallux Valgus.

**Keywords:** Foot Exercise; Foot Function Index; Foot Taping; Goniometer; Hallux valgus

Received on 24<sup>th</sup> April 2023, Revised on 04<sup>th</sup> May 2023, Accepted on 20<sup>th</sup> May 2023  
DOI:10.36678/IJMAES.2023.V09I02.001

## INTRODUCTION

Hallux valgus (HV) or Bunion is a progressive foot deformity manifested with the medial orientation of the first metatarsal bone, lateral deviation of the big toe at the level of the metatarsophalangeal (MTP) joint (Livre de Lyon., et al - 2012). It is accompanied by an overgrowth of bone (Exostosis) and tissue that develops on the dorsomedial eminence of the first metatarsal head. Hallux Valgus deformity causes symptoms such as pain, swelling, balance problem and difficulty in walking <sup>1,2</sup>.

The prevalence of hallux valgus is 23% in adults aged 18 to 65 years and it affects both the male and female. In a survey done by (E. Roddy., et al-2008) The prevalence of hallux valgus is greater in women with 38% prevalence compared to men with 21% prevalence in age above 30 with a ratio of 2:1 - 4:1 higher incidence in female than male. The function of Hallux is to resist the overpronation of foot during the normal foot mechanics. Hallux serves as a fulcrum for forward propulsion<sup>3</sup>.

The cause of HV is multifactorial. The primary cause is reported that flat foot has some influence on bunion formation, Metatarsus primus varus, muscular imbalance in abductor and adductor muscles, contracture of Achilles tendon, joint laxity, hypermobility, of first metatarsals cuneiform joint and heredity<sup>4</sup>.

Both long and short muscles of the foot are vital and maintaining the arches of foot. Insufficiency of those muscles leads to abnormal foot alignment and loading. Associated hallux valgus deformity is with the dysfunction of posterior tibial muscle (Blackwood., et al - 2018) The adductor hallucis is the only muscle that can directly keep the hallux from abducting muscle atrophy in subjects with hallux valgus<sup>5</sup>.

Several methods to evaluate the intervention for hallux valgus deformity on Foot function, Hallux valgus angle and Pain. Various measurements such as Foot function index (FFI), Dynamic gait index (DGI), Activities specific balance confidence scale (ABC), Hallux Valgus Angle (HVA) by Goniometer; and Visual Analogue Scale for Pain (VAS-Pain). In this study Foot Function Index and Goniometer is used. There are several treatment methods to treat the HV such as Foot Exercises, Manual therapy techniques, Stretching and Strengthening techniques, Cryotherapy, Mobilization techniques, soft tissue techniques, Kinesiology Taping Techniques <sup>6,7</sup>.

In this study the subjects are provided with Taping therapy and the Foot Exercises to treat and to correct the Hallux valgus deformity. Number of taping techniques are used such as Rigid Taping commonly used in Athletic injuries. Elastic strapping tape used when less rigidity or support is required. Kinesiology tape (KT) is an improved version of elastic sports tape that acts to dynamically assist your muscle function. Taping on the HV reduces the pain, disability and improves the walking time<sup>8</sup>.

The Kinesio taping (KT) is considered as therapeutic method effects depend as much on the level of tape stretching and in the direction the tape is applied. This technique helps in different mechanisms like analgesic effect, muscle support, drainage and articulate correction<sup>9</sup>.

The analgesic effect occurs due to the action of the Tape on the skin resulting from the stimulation of mechanoreceptors promoting a regulation of painful mechanisms providing pain relief. The supporting action promotes an improvement in Muscular contraction, decreases fatigue, cramp and increases Range of Motion (ROM) <sup>10</sup>.

The evidence for the effectiveness of conservative Treatment approaches for subjects with hallux valgus is very limited. The aim of this study was to investigate the effect of combined Treatment program consisting of both exercise and Taping on Hallux Valgus.

## MATERIALS AND METHODOLOGY

**Design of the study:** Pre and post - test experimental study design. Study Setting was done at Department of Physiotherapy, K.G. Hospital, Coimbatore, Tamil Nadu, India.

The study conducted for a duration of 6 months. Material used for the study were Finger Goniometer, Foot Function Index scoring sheet, Kinesio Tape, TheraBand / Resistance Band, Towel and Stop watch. Sample size of the study was 20 Hallux valgus subjects were divided into 2 groups by convenient sampling method. Each group consists of 10 subjects. Groups are named as Group A and Group B.

### Criteria of selection:

**Inclusion Criteria:** Subjects with Bilateral Hallux valgus. Both males and female subjects, Hallux valgus angle 15 to 40 degree. Muscle strength above 4 in manual muscle testing. Absence of any systemic disease that affects biomechanics.

**Exclusion Criteria:** A diagnosis of Rheumatoid arthritis. A history of previous foot surgery. Previous use of foot surgery. Limitation in the abduction movement of the hallux. Positive Hallux rigidus diagnosis. Neurological disorder cognitive, mental, psychological disorders

**Outcome Measures:** Foot Function and Great Toe Angle are outcome measures.

**Procedure:** A total of 20 subjects with Hallux Valgus deformity were taken and conveniently divided into two groups, Group A and Group B with 10 subjects in each group. On day 1 - pre-

test scores were recorded. After the total treatment session of 8 weeks / 5 days per week/2 times per day for 10 repetitions/ 1 hour session and post test scores were recorded.

### Group A- Taping and Foot exercise

**Taping and Foot Exercises:** In Taping "I or Y" type bandage cut was performed, having 5cm anchor and 5cm tail width. Along with Foot exercise includes stretching techniques such as soleus, Gastrocnemius, Flexor hallucis, tibialis posterior and strengthening exercises includes Toe spread, toe curls, heel raise, hip abductor strengthening, short foot exercises.

**Duration:** Each exercise was done for 5 minutes with 1 minute rest in between in 1- hour treatment session.

**Group B- Foot exercise alone with stretching and strengthening techniques** as same as mentioned above mentioned exercises.

**Duration:** Each exercise was done for 5 minutes with 1 minute rest in between in 1- hour treatment session

At the end of 8 weeks, foot function and great toe angle is measured with Foot function index and goniometer is compared with the respective pre intervention scores to know the effect of exercises.

**Data Analysis:** Student 't' test was used for statistical analysis. Unpaired 't' test has been used to find significance of the study parameters between groups. While paired 't' test has been used to find significance of the study within the groups. This study results shows that there is statistically significant improvement in Foot function index and Goniometer between pre and post – test mean values in group A and group B. Group A shows greater significance than group B in post mean values of foot function and great toe angle.

Age (years)	Taping and Foot Exercises (Group A)		Foot Exercise (Group B)	
	Numbers	Percentage	Number	Percentage
18 – 30	6	60	6	60
30 – 40	2	20	2	20
45 – 60	2	20	2	20
Total	10	100	10	100

**Table 1: Age distribution of subjects**

The table 1 shows that majority of subjects, such that 60% in 18 – 30 years, 20% in 30 – 40 years, and 20% in 45-65 years in both group A and group B respectively.

Gender	Taping and Foot exercise (Group A)		Foot Exercises (Group B)	
	Number	Percent	Number	Percent
Males	5	50	5	50
Females	5	50	5	50
Total	10	100	10	100

**Table 2: Gender distribution of subjects**

The table 2 shows that 50% males and 50% females present in both group A and group B respectively.

Foot Function Index	Pre-test Mean	Post-test Mean	Mean Difference	Pre-test Standard Deviation	Post-test Standard Deviation	't' values
Group A	114	185	71	17.76	21.12	18.75
Group B	84	159	75	9.66	9.94	15.71

**Table 3: Paired 't' test values of Foot Function Index in group A and group B.**

The table 3 shows the analysis of Foot Function Index in group A and group B. Using paired 't' test with 9 degrees of freedom and 5% level of significance the calculated 't' value is 18.75 in group A and 15.71 in group B, which were greater than the tabulated 't' value 2.262. The results shows that there is a marked difference between pre and post-test values in group A and group B.

Foot Function Index	Mean	Mean Difference	Standard Deviation	't' value
Group A	185	4	21.12	3.5
Group B	159		9.94	

**Table 4: Unpaired 't' test values of Foot Function Index in Group A and Group B.**

The table 4 shows the analysis of Foot Function Index in group A and group B. Using unpaired 't' test with 18 degrees of freedom and 5% as a level of significance the calculated 't' value is 3.509, which was greater than the tabulated 't' value 2.101. The result shows that there is a marked difference between post-test values of group A and group B.

Goniometer	Pre-test Mean	Post-test Mean	Mean Difference	Pre-test Standard Deviation	Post-test Standard Deviation	't' values
Group A	25.50	17.80	7.70	2.76	1.87	17.17
Group B	25.30	21.30	4	3.09	2.63	13.41

**Table 5: Paired 't' test values of Goniometer in Group A and Group B.**

The table 5 shows the analysis of Goniometer in Group A and group B. Using paired 't' test with 9 degrees of freedom and 5% level of significance the calculated 't' value is 17.17, in Group A and 13.416 in Group B, which were greater than the tabulated 't' value 2.262. The results shows that there is a marked difference between pre and post-test values in Group A and Group B.

Goniometer	Mean	Mean Difference	Standard Deviation	't' value
Group A	17.80	3.7	1.87	3.43
Group B	21.30		2.63	

**Table 6: Unpaired 't' test values of Goniometer in group A and group B.**

The table 6 shows the analysis of Goniometer in group A and group B. Using unpaired 't' test with 18 degrees of freedom and 5% level of significance the calculated 't' value is 3.43, which was greater than the tabulated 't' value 2.101. The results shows that there is a marked difference between post-test values of Group A and Group B.

## RESULT

Total 20 subjects were randomly divided into two groups, Group A and Group B – 10 subjects were taken in each group. Age group of subjects are 18 – 65 years. The measurement and pre- test assessment was taken with Goniometer and Foot Function index. The treatment session includes Taping along with Foot exercises for group A and Foot exercise for group B for 8 weeks and the post – test assessment was taken with Goniometer and Foot function index.

The paired 't' test for both pre – test values of Foot Function Index for group A & B was shown in table in table 3. The unpaired 't' test for the post – test values of Foot Function Index for Group A & B were shown in table 4. The paired 't' test for both pre – test values of Goniometer measurement for Groups A & B was shown in table 5. The unpaired 't' test for the post – test values of Goniometer measurement score for group A and B were shown in table 6.

In this group A shows an improvement than that of group B. The unpaired 't' test values of group A & group B in Foot function index and goniometer measurement is **3.5** & **3.43** respectively.

## DISCUSSION

The analysis of pre-test means of Group A and Group B reveals that there is no significant difference. Analysis of pre-test and post-test values of group A at 5% level of significance showed significant improvement in foot function index and goniometer.

The 8 weeks study concluded that a combined treatment program consisting of both taping and Foot exercise had more beneficial effects than exercise alone on Foot function and hallux valgus.

The taping technique counts on the supporting action promotes an improvement in muscular contraction and increases range of motion, helps to adjust malalignment, reposition structures, relieves muscular tension and normalize the articulation movement<sup>11-13</sup>.

Taping indicated in improvement in function of the joints of the lower limb and a resulting improvement of lymphatic flow. The benefits of kinesiology taping showed improvement in the condition of the subjects suffering from pain and local inflammation associated with Hallux valgus. Subjects experienced a significant reduction in pain symptoms during the treatment session<sup>14-16</sup>.

The foot exercises recruit the muscles inside the foot resulting activation of the foot muscle leads to elevation of the arch and thus the deformity is corrected. (Ward M. Glasoe–2016). The foot exercise training increases the muscle strength, increases the joint stability, and increased range of motion<sup>17, 18</sup>.

## SUMMARY AND CONCLUSION

This study therefore rejects null hypothesis and supports alternate hypothesis. There is a significant difference between group A and Group B in improving the foot function in subjects with hallux valgus. Therefore, the study concludes that the taping and the foot exercise treatment is better management to

improve the great toe angle and foot function in subjects with hallux valgus.

**Limitations:** The study period allotted is insufficient for the inclusion of greater number of subjects. There was a lack of long term follow up.

**Recommendation:** Large sample size can be used to demonstrate the effect of intervention. Long term follow up should be made. Can use other forms of outcome measures to assess. Can use insoles and modified foot wear for further correction.

**Ethical Concern:** The study was approved by the college ethics committee, K.G. College of Physiotherapy, Coimbatore with letter with Ref: Number: KGHEC 480, dated 23/06/2022.

**Conflict of Interest:** There was no personal or institutional conflict of interest for this study.

**Source of Funding:** Self-funded study

**Acknowledgment:** The authors sincerely thank Dr. G. Bakthavathsalam, Chairman, Mrs. Vasanthi Ragu, Vice Chairman, Mr. Prabhu Kumar, CEO, Prof V. Mohan Gandhi Chief Physiotherapist, KG Hospital, Coimbatore for their support and logistical help to conduct this research.

## REFERENCES

1. Banu BAYAR, Suat EREL, İbrahim Engin ŞİMŞEK, Erkan SÜMER, Kılıçhan BAYAR. (2011) The effects of taping and foot exercises on patients with hallux valgus: a preliminary study. Turkish Journal of Medical Sciences; 41(3): 403-409.
2. Elly Budiman-Mak, Kendon J. Conrad and Kathryn E. Roach. (1991) The Foot Function Index: a measure of foot pain and disability. Journal of Clinical Epidemiology; 44(6): 561-570.
3. Coughlin M.J. (1996) Hallux valgus. Journal of Bone and Joint Surgery; 78-A: 932-966.
4. Mark E. Easley, M.D.; Hans-Joerg Trnka, M.D. (2007) Current Concepts review: hallux valgus part 1: Patho mechanics, clinical assessment, and Nonoperative management. Foot & Ankle International; 28(5): 654-659.
5. Mi Yang Jeon, HyeonCheolJeong, Mi Suk Jeong, Young Ja Lee, Jeong Ok Kim, Sung Tae Lee, Nan Young Lim. (2004) Effects of taping therapy on the deformed angle of the foot and pain in hallux valgus subjects. Journal of Korean Academy of Nursing; 34(5): 685-692.
6. Akaras Esedullah, Guzel Nevin, Kafa Nihan, Özdemir Yaprak. (2020) The acute effects of two different rigid taping Methods in patients with hallux valgus Deformity. Journal of Back and Musculoskeletal Rehabilitation; 33(1): 91-98.
7. Gabriela Lago Schmitt, Bruno Dos Santos Souza, Gabriel Gustavo Lunardi De Almeida, João Carlos Comel. (2019) Does the Kinesio Taping Method Associated with Exercises Reduce when Hallux Valgus Angle? A Therapeutic Proposal. International Journal of Latest Engineering Research and Applications; 4(2): 1-8.
8. Gozde Gur, Ozden Ozkal, Burcu Dilek, Songul Aksoy, Nilgun Bekand Yavuz Yakut. (2016) Effects of Corrective Taping on Balance and Gait in Subjects with Hallux Valgus. Foot & Ankle International; 38(5): 532-540.
9. Erin S. Hart, Richard J. de Asla, Brian E.

- Grottkau. (2008) Current concepts in the treatment of hallux valgus. *Orthopaedic Nursing*;27(5):274-280.
10. Jeon MY, Jeong HC, Jeong MS, Lee YJ, Kim JO, Lee ST, Lim NY. (2004) Effects of taping therapy on the deformed angle of the foot and pain in Hallux valgus subjects. *Europe Pub med central*; 34(5): 685-692.
  11. Jin Zhou Petr, Hlavaeck BO XU, Wuyoung Cheen. (2014) New Approach for measuring the angle of hallux valgus. *Journal of orthopaedic and sports Physical therapy*; 47.
  12. Jung DY, Koh EK, Kwon OY. (2011) Effect of foot orthoses and short-foot exercise on the cross-sectional Area of the abductor hallucis muscle in subjects with pes planus: a randomized controlled trial. *Journal of Back and Musculoskeletal rehabilitation*; 24:225-231.
  13. Karabicak GO, Bek N, Tiftikci U. (2015) Short-Term Effects of Kinesiotaping on pain and Joint alignment in conservative treatment of Hallux valgus. *Journal of Manipulative and Physiological Therapeutics*; 38(8):564-71.
  14. Kavlak Y, Simsek E, Erel S, Mutlu A, Bek N, Yakut Y, et al. (2006) Effect of structural foot deformities on foot function in the elderly. *Fizyoterapi Rehabilitation*; 17(2): 84.
  15. Mann RA, Coughling M J. (1981) Hallux valgus-etiology, Anatomy, treatment and surgical considerations. *Clinical Orthopaedic & Related Research*; 157:31
  16. Nakagawa R, Yamaguchi S, Kimura S, et al. (2019) Efficacy of foot Orthoses as nonoperative treatment for hallux valgus: a 2-year Follow-up study. *Journal of Orthopaedic Science*; 24:526–531.
  17. Nix S, Smith M, Vicenzino B. (2010) Prevalence Of hallux valgus in the general population: A systematic review and meta-analysis. *Journal of foot and ankle research*;3(21).
  18. Ward Mylo Glasoe, Scott Getsoian, Matthew Myers, Matthew Komnick, Denny Kolkebeck, Wolfgang Oswald, Photine Liakos. (2005) Criterion-related validity of a clinical measure of dorsal First ray mobility. *Journal of Orthopaedic & Sports Physical therapy*; 35:589-593.

**Citation:**

**M. Manoj Abraham, V. Pradhap Sankar, R. Arputha Roja, R. Nivethitha (2023).** Effect of Taping and Foot exercise on Great Toe Angle and Foot Function in subjects with Hallux Valgus, *ijmaes*; 9(2); 1466-1473.