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## The effects of taping and foot exercises on patients with Hallux valgus

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### Abstract

**Background:** Hallux valgus is a complex progressive deformity manifesting with lateral deviation of the greater toe and medial deviation of first metatarsal. To decrease or control the hallux valgus angle, various orthosis pulling the hallux laterally and taping and foot exercises can be important in maintaining the mobility of joints.

**Aim:** To determine the effect of taping and foot exercises in relief of pain, improving walking ability and in the angle of hallux valgus.

**Materials and Methods:** The study included 20 female patients. The subjects were divided into 2 groups, the study and control groups. The study group was treated with taping and foot exercises, and the control group was treated only with foot exercises. A goniometer was used to determine the angle of hallux valgus. Foot pain intensity was assessed by the visual analog scale (VAS), and walking ability was evaluated using the walking ability scale (WAS).

**Result and Conclusion:** At the end of the 4-week treatment period, a significant decrease was found in hallux valgus angle, resting pain, and walking pain in both groups ( $P < 0.05$ ). Also, walking ability improved at least 1 grade in the study group. When the post-treatment results between the 2 groups were compared, the results. The result showed statistical improvement in hallux valgus angle, walking ability in the study group when compared to the control group. There was no significant difference found between the study and control group for VAS score.

**Keywords:** Hallux valgus, taping, pain, conservative treatment

### Introduction

Hallux valgus (HV) is a complex progressive deformity manifested with lateral deviation of the great toe and medial deviation of the first metatarsal bone [1, 2]. The condition is frequently associated with a painful soft tissue and osseous prominence commonly referred to as a "bunion," on the medial side of the hallux base [1, 3]. The etiology of hallux valgus is multifactorial. Although inappropriate or constricting footwear appears to be the primary extrinsic cause, intrinsic factors play a role as well [3]. Other intrinsic causes of hallux valgus include muscle imbalance in abductor and adductor muscles, contracture of the Achilles tendon, generalized joint laxity, hypermobility of the first metatarsocuneiform joint and neuromuscular diseases [4, 5].

Previous studies have reported that flat foot has some influence on bunion formation, while others suggested that pronation of the hind foot as a major cause of this condition [4]. Metatarsus primus varus, which is characterized by an increased angle between the first and second metatarsals, is often associated with an HV Deformity [1, 5, 6, 7].

Females are significantly more likely to develop HV as compared with the males with sex ratios as high as 9:1. [1, 6]. Patients generally complain of pressure symptoms over the prominent pseudoexostosis, which together with the thickened bursa constitutes the bunion. Wearing shoes and finding suitable footwear to accommodate the deformity are the major problems [7].

Many patients also complain of general forefoot pain, often as a result of bearing more weight laterally to avoid pressure on the bunion. Radiographic assessment of HV includes the evaluation of the hallux valgus angle (HVA) which was defined as the angle between the first metatarsal and proximal phalanx.

As well as, the first-second inter metatarsal angle (IMA) which was defined as the angle between the first and second metatarsals. An HVA  $<15^\circ$  and a first IMA  $<9^\circ$  are considered to be normal [8]. Conservative treatment is generally proposed for patients with mild to moderate HV. Many patients may find permanent relief with nonsurgical measures [6]. It has 3 objectives: 1) prevent the deformity progression, 2) accommodate the deformity when it is rigid, and 3) distribute the pressure in the region of the lesion [9]. It includes the use of night splints to balance the pull of the surrounding ligaments, foot exercises to increase the muscle strength and orthotic use to correct the foot biomechanics [10].

A conservative approach should also include evaluation of patients' footwear and patient education regarding appropriate footwear [11, 13]. Eliminating friction over the medial eminence can often relieve pain, blistering and bursal inflammation. Pes planus can be managed with insoles or foot orthoses. In order to decrease or control the hallux valgus angle, various orthoses pulling the hallux laterally and taping may be used [4, 13, 14]. Also, foot exercises can be important in maintaining the mobility of the joint, stretching soft tissue around the joint and improving muscle strength [5, 16].

**Aims and Objectives:** The aim of this study was to investigate the effects of a combined treatment program consisting of both exercise and taping on hallux valgus angle, foot pain and walking ability in patients with hallux valgus. Operative management of hallux valgus remains challenging.

### Methodology

**Study Design:** 2 group pre and post Experimental study

**Sample Size:** 20 (As per G power analysis)

**Sampling Method:** Convenient sampling

**Study duration:** 4 weeks

### Inclusion Criteria

- only females
- Bilateral hallux valgus
- 20-30 year of old
- Walking ability scale score (1-3)

### Exclusion Criteria

- A diagnosis of rheumatoid arthritis
- A history of previous foot surgery
- Previous use of foot orthosis
- Limitation in the abduction movement of the hallux

### Procedure

Approval by the institutional ethical committee of the Advisory Board of the institute was obtained before commencing this study. The purpose of this study was explained and a written informed consent was obtained from all the subjects.

The study procedure was conducted through assessing bilateral hallux valgus patients, initial recording, treatment and final recording. Twenty female subjects between the ages of 20 and 40 years with a diagnosis of hallux valgus volunteered to be a part of this study based on the inclusion and exclusion criteria. Inclusion criteria were a hallux valgus angle of at least  $15^\circ$  and bilateral flexible hallux valgus. Exclusion criteria were limitation in the abduction

movement of the hallux, a diagnosis of rheumatoid arthritis, a history of previous foot surgery and previous use of foot orthoses.

Demographic data was collected along with initial assessment of a hallux valgus angle using the universal goniometry, Walking ability was determined according to the walking ability scale (WAS) and VAS for pain. Subjects were allocated into two groups, group A (STUDY) and group B (CONTROL) each containing 10 subjects by using quasi-randomization procedure.

The hallux valgus angle was measured using a toe goniometer. The fixed arm of the toe goniometer was placed on the longitudinal line of the first metatarsal bone, and the movable arm was placed on the longitudinal line of the great toe. The value of the hallux angle between these 2 lines was recorded [14].

The intensity of foot pain was evaluated using the visual analogue scale (VAS) with the far left and right ends anchored with the phrases "no pain" and "the worst pain imaginable", respectively. The subjects were asked to mark their pain at rest on a 10 cm straight line. The same process was repeated for pain in walking. Afterwards, the markings on those 2 lines were measured in centimeters and the results were recorded.

Walking ability was determined according to the walking ability scale (WAS), which is a subjective test graded between 1 and 4. Grade 1 indicates poor walking ability; the subject can walk for less than 10 min. Grade 2 indicates fair walking ability; the subject can walk for more than 10 min, but for less than 1 h. Grade 3 indicates good walking ability; the subject is able to walk well over 1 h. Grade 4 indicates an excellent walking ability; the subject is able to walk normally [15].

Subjects were asked to describe the shoes that they most frequently wore during the daytime. Following the initial evaluations, both groups were given information about appropriate shoe-wear and hallux valgus.

The subjects in the study group (Group A) were treated with foot exercises and taping.

The study group (Group A) was treated with taping in addition to the exercise program. For the taping, a non-allergenic and non-elastic white tape was used. First, an anchor strip 2 cm wide was attached around the distal toe at the base of the toenail, and a 3.8 cm wide strip was attached around the instep and arch of the foot. Then another strip 2 cm wide was attached parallel to the midline of the medial aspect of the foot, from the distal to the proximal anchor, sustaining the hallux in a midline position. The taping was completed with light circumferential strips covering the sites of the original anchors with 2 cm and 3.8 cm tape.

The subjects in the study group were given taping after the exercises in the morning and wear it for 10 h, and then take off the tape for the exercises.

The same foot exercises were given as a home program for both groups. The subjects were asked to do the exercises 2 times a day with 10 repetitions and for 4 weeks.

The exercises consisted of:

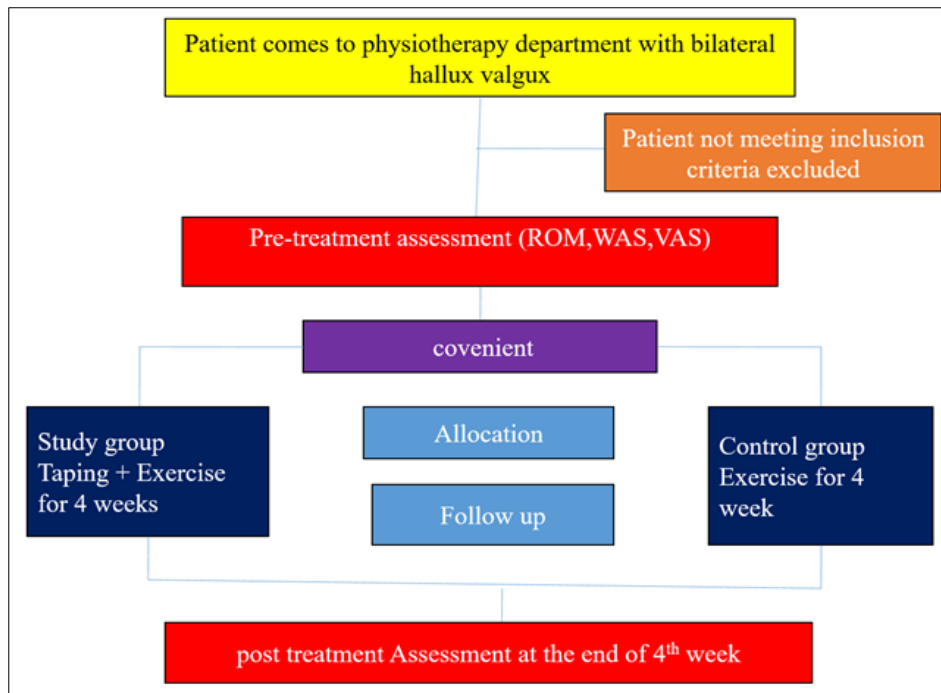
1. Passive abduction of the hallux with traction of the first metatarsophalangeal joint
2. Active abduction of the hallux.

The subjects in the control group (Group B) were treated only with foot exercises by the therapist. The subjects were

also asked to do the same home exercises 2 times a day with 10 repetitions and for 4 weeks. The subjects in the control group were treated only with foot exercises. The subjects in the control group were treated only with foot

exercises by the therapist. The subjects were also asked to do the same home exercises 2 times a day with 10 repetitions and for 4 weeks

**Flowchart**



**Fig 1:** Flowchart showing random allocation of subjects in Group A, B and C



**Fig 2:** Taping for Hallux Valgus

**Results and Discussion**

The normality of the data was checked. Since the outcome measures were measured within-group pre-test and post-test values. Descriptive statistics including mean and standard deviation were analyzed and Between-group differences at the follow-up period were compared. Statistical significance was set at  $p < 0.05$  for all statistical analyses and the confidence interval was set at 95%. All the data analysis was done in IBM SPSS version.

**Table 1:** Shows the Physical characteristic of patients with hallux valgus

	Study group (n = 10) X ± SD	Control group (n = 10) X ± SD
Subject	10	10
Age	51.4 ± 4.61	53.0 ± 5.92
Height (cm)	157.6 ± 4.43	149.4 ± 5.37
Weight (kg)	57.7 ± 10.99	51.4 ± 8.40

**Table 2:** Normality of Data

Outcome	Shapiro-Wilk test		
	Statistic	Df	Sig.
HVA ROM	.829	10	0.033
HVA VAS	0.59	10	0.074
HVA WAS Scale	.839	10	0.023

Table- 2 shows a test of Normality of 20 subjects from both the Post isometric Relaxation Technique (MET) group and Positional Release Therapy group which were included in the present study. In this Shapiro-Wilk test is used and according to that data were not normally distributed so Non-parametric test were used for further analysis.

**Table 3:** Wilcoxon Signed Rank test for within group comparison of ROM and VAS in Group A (n=23)

	Hvartpost hvartpre	Hvaltpost-hvaltpre	Waspost-waspre	Vaspost-vaspre
Z ASYMP. SIG (2-tailed)	-2.970 <sup>b</sup>	-2816 <sup>b</sup>	-2.972 <sup>c</sup>	-2.762
	0.003	0.005	0.003	0.006

Table 3 shows there was a significant difference within Group A in pre-post value in Right and left hallux valgus

angle, vas and walking ability.

**Table 4:** Wilcoxon Signed Rank test for within control group comparison of ROM and VAS in Group B (n=23)

	Hvartpost-hvartpre	Hvaltpost-hvaltpre	Waspost-waspre	Vaspost-vaspre
Z ASYMP.	-2.126 <sup>b</sup>	-2.310 <sup>b</sup>	-3.162 <sup>c</sup>	-2.530 <sup>b</sup>
SIG (2-tailed)	0.003	0.021	0.002	0.011

Table 4 shows there was a significant difference within Group B in pre-post value in Right and left hallux valgus angle, vas and walking ability.

**Table 5:** Mann Whitney U test for Comparison for Right and Left Hallux Valgus angle, VAS and WAS Score Between two groups (Group A and Group B)

	Hvartpost-hvartpre	Hvaltpost-hvaltpre	Waspost-waspre	Vaspost-vaspre
Z	3.000	6.000	10.000	30.500
ASYMP. SIG (2-TAILED)	-3.643	-3.473	-3.559	-1.643
	0.000	0.001	0.000	0.100

Table 5 shows there was a significant difference between both the Groups (A, B) in pre-post value in Right and left hallux valgus angle and walking ability. But there was no significant difference found between Vas score in the both groups.

## Discussion

Hallux valgus is a complex progressive deformity manifesting with lateral deviation of the greater toe and medial deviation of the first metatarsal [1]. The etiology of hallux valgus is multifactorial [2]. Although inappropriate or constricting footwear appears to be the primary extrinsic cause, intrinsic factors play a role as well [3].

Cürsoy Coşkun et al performed a take a look at on 32 women on the Effects of hallux valgus deformity on rear foot position, ache, characteristic, and satisfactory of lifestyles of women and concluded that increasing HV angle and pathomechanical changes within the rear foot are correlated, ensuing in growing pain and for this reason lowering functional status in addition to decreasing high-quality of existence. Although all the individuals have been right-dominant, their left foot problem than the other Hallux. The present study supports this article and aims to correct the pathomechanical changes that occur during Hallux valgus, therefore the present study was intervention based which helped in reducing hallux valgus angle, pain and improving walking ability. During the assessment in the present study it was found that Right hallux was more affected than left the reason may be the individuals were right-dominant.

The present study only includes female HV patients because it's far known that HV is greater familiar among women than amongst adult males. This distinction in occurrence may be because of tight shoes being preferred by using women [1, 3]. During the intervention phase (4 weeks) in the present study all the participants female were given awareness regarding improper foot wear and were instructed to avoid use of narrow toe boxes shoe Roddy *et al.* investigated the relation between age and HV in women and found that, compared to the below-40 age group, HV prevalence was 1.76 times higher in the 40–49 age groups and 3.5 times higher in the 50–59 age groups. Studies have shown that HV deformity turns into more popular in older age corporations. The present study had

target young females with flexible hallux valgus so that the intervention given can improve pain, hallux valgus angle, walking ability and prevent the deformity at older age, Mann and Coughlin [3] reported that pes planus has some influence on bunion formation, while Inman suggested pronation of the hind foot as a major cause of this condition [4, 5]. Metatarsus primus varus, which is characterized by an increased angle between the first and second metatarsals, is often associated with a hallux valgus deformity. Other intrinsic causes of hallux valgus include muscle imbalance in abductor and adductor muscles, contracture of the Achilles tendon, generalized joint laxity, hypermobility of the first metatarsocuneiform joint and neuromuscular diseases. Heredity is also thought to be a factor in the development of hallux valgus deformity [3, 6]. Nonoperative management of hallux valgus can improve a patient's symptoms [2].

The study attempted to find out the effectiveness of combined technique of taping and exercise and only exercise on Hallux Valgus. In the present study it was found that there is a statistically significant improvement in pain, hallux valgus angle, and walking ability within both the groups, Group A (combined technique of taping and exercise) and Group B (only Exercise). Between the groups analysis found that there is no statistically significant difference between Group A and Group B in improvement of pain, but there is statistically significant difference in improvement of Hallux valgus angle and walking ability for subjects with Hallux valgus.

Banu Bayar [3] *et al.* conducted a study on the effects of taping and foot exercises on patients with hallux valgus, the study included 20 female patients. The subjects were divided into 2 groups, the study and control groups. The study group was treated with taping and foot exercises, and the control group was treated only with foot exercises. Foot pain intensity was assessed by the visual analog scale (VAS), and walking ability was evaluated using the walking ability scale (WAS). It was 8 week protocol and the study concluded that a combined treatment program consisting of both taping and exercise had more beneficial effects than exercise alone on hallux valgus angle, foot pain, and walking ability in patients with hallux valgus. The present study support the article as it shows similar result, in present study there was an improvement in hallux valgus angle, pain and walking ability within both the groups but when compared between the groups (Group A and Group B) there was no significant improvement seen in reduction of pain, while it showed there was statistical improvement seen in the hallux valgus angle and walking ability.

## Limitations

- It is a short duration study in which follow up was not done, therefore long term effects were not known.
- Less sample size
- Absence of third group receiving only taping
- Future research is required.

## Conclusion

The present study concluded that both study and control group are shown to have effect on hallux angle, improving pain, and walking ability.

But there was no significant found in VAS Score in both the groups (group A, B).

**Future Recommendation:** Further studies are required. Study should be done taking with larger sample size and defined with Taping and exercise for long term follow up.

**Ethical Clearance:** Taken from institutional advisory board.

**Conflict of interest:** None

**Source of funding:** Self

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