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Research Article

EFFICACY OF GREAT TOE MANUAL TRACTION, TOE SPREAD OUT EXERCISE PLUS KINESIOTAPING ON PAIN AND FOOT FUNCTION IN HALLUX VALGUS FEMALE STUDY PARTICIPANTS

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ABSTRACT

Background: Hallux valgus (HV) is one of the most common deformations of the human foot. It causes pain, walking difficulties. Non-pharmacological treatments serve as the first line of treatment and are frequently used for patients with musculoskeletal conditions of the foot and ankle.
Objective: To investigate the efficacy of great toe manual traction, toe spread out exercise plus kinesiotaping on pain and foot function in hallux valgus female study participants.
Methodology: A randomized controlled design. This study was conducted at musculoskeletal physiotherapy outpatient department. A total 30 hallux valgus (HV) individuals were randomly assigned into two groups (manual traction and toe spreadout exercise (control group) and Exercise plus kinesiotaping (experimental group); n=15 in each group. All groups were underwent 5weeks of supervised treatment programs. In this study Visual analog scale for pain intensity, foot function index questionnaire (revised) (FFI-R) for foot functional been used as a outcome measures. VAS and functional disability outcome measures was recorded at baseline and after 5 weeks of interventions.
Results: Comparing pretreatment and 5th week values, significant improvements were found in pain and foot function of both groups ($p<0.05$). The KT group had significantly better than the control group at the end of fourth weeks ($p<0.05$).
Conclusion: The addition of kinesio taping to the CPT was capable of reducing pain and improving foot function in hallux valgus participants.

INTRODUCTION

Hallux valgus defined as a lateral deviation of the great toe at the metatarsophalangeal joint. Hallux valgus is diagnosed when the hallux valgus angle is greater than 15 degrees. Hallux valgus is the commonest forefoot deformity, with an estimated prevalence of 23% to 35%. It causes symptoms on the medial edge of the foot, the sole, and the small toes.[1]

A systematic review of 78 studies showed that the prevalence of hallux valgus is approximately 23 percent among adults aged 18 to 65 years, 36 percent among adults over 65 years, and even 30 percent among adult females.[2]

The precise etiology of hallux valgus deformity is unknown. Much research has confirmed the multifactorial origins of hallux valgus, which include several predisposing extrinsic factors such as high-heeled narrow shoes and excessive weight-bearing. The intrinsic factors are: genetics, ligamentous laxity, metatarsus primus varus, pes planus, functional hallux limitus, sexual dimorphism, age, abnormal metatarsal morphology, first-ray hypermobility and tight Achilles tendon[3,4]

Hallux valgus causes symptoms in three particular ways. First and foremost is pain in the bunion, the pressure-sensitive prominence on the medial side of the head of the first metatarsal. It hurts to wear a shoe. Furthermore, the valgus deviation of the great toe often results in a lack of space for the other toes. They become displaced, usually upwards, leading to pressure against the shoe. This is termed hammer toe or claw toe. Finally, normal function of the forefoot relies heavily on the great toe pressing down on the ground. [5,6] Hallux valgus with a hallux valgus angle of 20° and pain from pressure on the bunion medially. Hallux valgus causes pain particularly in the bunion on the inner side of the foot, on loading under the foot and in the smaller toes.

Musculoskeletal conditions of the foot and ankle are an important public health challenge due to their increasing incidence combined with their substantial negative impact on

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patients' quality of life. Non-pharmacological treatments serve as the first line of treatment and are frequently used for patients with musculoskeletal conditions of the foot and ankle.

The Kinesio Taping (KT) is a newer technique which use to treat various musculoskeletal disorders. It has various therapeutic effects are 1) correcting muscle activity 2) improving active range of motion 3)improving blood and lymphatic circulation 4)decreasing pain by neurological suppression, and repositioning joints.[7]

Specific exercises can also be used to treat HV. Several researchers have suggested that exercise is necessary during the early stages of HV, to prevent further increases in the HV angle. HV patients are characterized by an imbalance in the activities of the abductor hallucis and adductor hallucis muscles.

Several studies have highlighted the importance of strengthening the abductor hallucis and adductor hallucis muscles in HV patients, but few studies have determined which specific exercises should be performed[8,9]. Recently, Keller introduced a novel exercise, the "Toe-Spread-Out" (TSO) exercise, and a subsequent electromyographic (EMG) study revealed greater activation of the abductor hallucis muscle during performance of the TSO exercise than during the short-foot exercise, in mild HV patients.[10]

Need and significance of the study

Many treatments for hallux valgus deformity have been considered in numerous studies. The effectiveness of conservative treatment of hallux valgus is often ignored. Always patient are more preferable for nonsurgical interventions than the surgical interventions to curing the diseases. Various conservative and orthotic management advocated on hallux valgus. But there is less study done on Kinesiotaping in hallux valgus.

The need of the study was to find the efficacy of big toe manual traction, toe spread out exercise plus kinesiotaping on pain and foot function in hallux valgus female participants in local population of Surendranagar, so these same interventions could be followed in clinical practice and thereby greater benefits could be obtained by patients to lead a pain free life in their daily activities.

Aim of the study

To determine the efficacy of great toe manual traction, toe spread out exercise plus kinesiotaping on pain and foot function in early stages of hallux valgus female participants.

Table 1 Demographical detail

Variables	Control Group (n=15)	KT Group (n=15)	p-value
	Mean ±SD	Mean ±SD	p > 0.05
Age (Y)	25.27(5.06)	30.47(5.44)	0.386
Body height(cm)	162.00(5.33)	161.00(7.80)	0.134
Body mass(kg)	57.66(7.76)	59.26(6.60)	0.402
BMI(Kg/m^2)*	22.01(3.01)	22.93(4.16)	0.101
Duration (month)	40.73(21.13)	48.53(22.88)	0.485
Affected Great toe	Right -60% Left -40%	Right -50% Left -50%	

**BMI=Body mass index, KT=Kinesiotaping*

MATERIALS AND METHODOLOGY

Study design; randomized controlled study.(single blinded) , sample design ;simple random sampling method, study population: hallux valgus study participants, sample size: total 30 study participants. (group A= 15 & group B=15), study setting:C. U. Shah physiotherapy college, musculoskeletal and sport physiotherapy OPD, surendranagar, treatment duration: 5 weeks.

Inclusion criteria

Only females participants, Age group between 19-45 years, HV angle of > 15 degrees and less than 30 degrees. The participants those who are willing to participate.

Exclusion criteria

Previously diagnosis with rheumatoid arthritis, Osteoarthritis of ankle and foot, Recent trauma of ankle and foot , Any gout disease, unexplained weight loss, history of cancer, chronic NSAIFD user, any immune suppressed condition, history of foot surgery, previous use of a foot orthosis, central or peripheral nervous system injury, pregnancy. Any history of skin allergy and skin condition over the ankle and foot. [11,12] After institutional ethical approval obtained, prior to participation in this study, all the study participants with hallux valgus patients were recruited from c.u.shah medical college& hospital, c.ushah physiotherapy musculoskeletal OPD. Study participants who fulfill the selection criteria, by using simple random method (computer generated random number list), allocated in to A & B groups then was informed about the study and to sign the Consent Forms. Pre-participation evaluation form consists of specific musculoskeletal examination, and specific primary outcome measure were pain intensity and foot functional disability.

Primary outcome measures

The baseline pre intervention primary outcome measures consisted of pain assessment using visual analogue scale (VAS) and foot functional disability was assessed by using revised foot functional index questionnaire (FFI-R).

Revised foot functional index questionnaire. it is the is a subjective assessed questionnaire for a patient with Hallux valgus. It comprising of 34 items in five dimensions: pain, stiffness, difficulty, activity and social. pain (7 items), stiffness (7 items), difficulty ((11 items). Activity (03 items) & social (06 items) the revised FFI has been validated and determined to be reliable scale for functional assessment in hallux valgus. [13]

Interventions

Group A(Control group)

Great toe manual traction (passive force applied to straighten the deformed big toe.(3rep x10sec hold). TSO exercise following the method described by Keller. The subjects was instructed to lift all toes while keeping the metatarsal heads and heel on the floor, and to then push the little toe downward, in a lateral direction, while pushing the big toe slowly downward in a medial direction.[7] Prior to the commencement of the experiment, training exercises was performed for 5days, for a total of 2 and of hours.

The exercise was given thrice a day for total 5 weeks.

Group B (Experimental group)

The group B study participants was treated with Kinesiotap in addition to the manual traction and exercise program. According to kenz kase guidelines, 2 strips of KT tape was taken for the treatment.1 full 10" strip cut in half horizontally 1 full 10" strip cut in half vertically[7]

Step 1: Anchor -Narrow strip on back of the outer side of the heel and lay tap around heel without stretch (no tension), then applying 80% of the tension from mid arch to big toe. After application rub tape vigorously to activate adhesive.

Step 2: Anchor: Middle of half strip of tape over point of pain (80% of tension), Apply: ends without stretch (for additional support, a second half strip can be applied over the first) and all the patients were instructed to maintain a taping for 24 hours.

The treatment was given for thrice in a week and total 5 weeks. All subjects were re-evaluated at the end of an 5thweeks.

Statistical Analysis

All statistical analysis was done using SPSS 16 for windows software. The level of significant was set at p=0.05. Descriptive analysis was used to calculate mean and standard deviation. The inter group comparison of demographic details were performed using independent's-t- test & Non parametric Mann Whitney 'U' test &for intra group comparison paired't'-test & Wilcoxon Signed Rank test was used**.**

RESULTS AND TABLES

The demographic details (Age =0.386, Body Height: p=0.134,Body Mass :p=0.402,BMI: p=0.101&Duration of the condition (p=0.485)of groups were homogenous with>0.05(Table-I). pre treatment VAS(p=0.367)and revised foot functional index (FFI-R)(p= 0.053) shows no significant difference (p>0.05)and proves the pre treatment group homogeneity (Table-II)(Figure 1). Pre and post treatment comparison for VAS (group A:P=0.008,Group B:P=0.008) and Revised FFI(group A:P=0.001,Group B:P=0.001) did shows significant difference.(Table-IV&V).It indicates that control group & kinesiotaping group was effective on pain & foot functional in hallux valgus subjects. Post treatment inter group comparison of VAS(p=0.047) & revised FFI(p=0.001)shows significant difference (p<0.05) among groups.(Table–III).The additional KT group proves more significant improvement in VAS and FFI-R compared to the control group.

Table II pre treatment group comparison(A&B)

Control Group(A)			Kinesiotaping Group(B)		
Scales	**Mean**	**±SD**	**Mean**	**±SD**	**p-value**
VAS	3.93	1.38	3.73	1.53	0.367
FFI-R	35.39	6.58	33.90	4.28	0.053

Table III post treatment group comparison (A&B)

Control Group(A)			Kinesiotaping Group(B)		
Scales	**Mean**	**±SD**	**Mean**	**±SD**	**p-value**
VAS	3.00	1.36	2.5	2.06	0.047
FFI-R	29.75	6.45	22.93	4.00	0.001

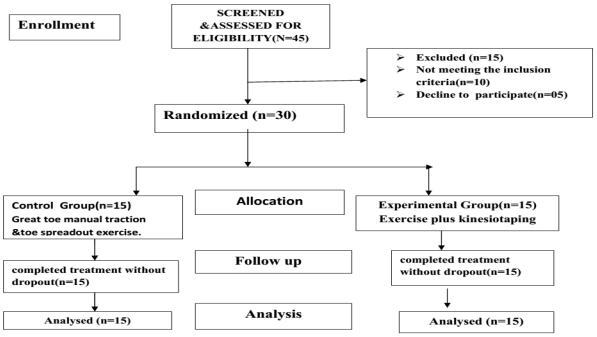

Figure 1 Consort format: Randomization table

Table IV Pre &post treatment group comparison (group A)

CONTROL GROUP(A)					
	Pre		Post		
Scales	**Mean**	**±SD**	**Mean**	**±SD**	**p-value**
VAS	3.93	1.38	3.00	1.36	0.008
FFI-R	35.39	6.58	29.75	6.45	0.001

Table V Pre &post treatment group comparison (group B)

Kinesiotaping Group(B)					
	Pre		Post		
Scales	**Mean**	**±SD**	**Mean**	**±SD**	**p-value**
VAS	3.73	1.53	3.00	1.36	0.008
FFI-R	35.90	4.28	22.93	4.00	0.001

Table VI Inter& Intra Group NPRS and FFI-R Comparison

	Control Group(A)				Kinesiotaping Group (B)		
Scales		**Mean**	**±SD**	**P-Value**	**Mean**	**±SD**	**P-value**
VAS	PRE	3.93	1.38		3.73	1.53	
	POST	3.00	1.36	0.008	2.53	2.06	0.008
FFI-R	PRE	35.39	6.58		35.90	4.28	
	POST	29.75	6.45	0.001	22.93	4.00	0.001

Fig 1 Hallux valgus

Fig 2 KT Application–First strip

Fig 3 KT Application – Second Strip

Fig 4 Toe spreadout exercise-first step-all toe raising

Fig 5 second step- flexing little toe towards laterally

Fig 6 final step-flexing medial great toe medially

DISCUSSION

5 weeks of additional KT conventional PT exercise led to the findings that KT treatments groups improved significantly in foot function and reduction in pain (VAS),when compared to alone conventional physiotherapy exercise group(A). After analysis of pre and post treatment scores, it results interpreted that significant improvement ($p<0.05$) in KT groups. There was significant difference ($p<0.05$) in post treatment comparison between with KT group and control group. The findings of this study suggested that additional KT along with conventional PT is more beneficial in the treatment of hallux valgus. The additional KT training shows more effectiveness than that of control group in VAS &revised FFI score.

The present study also showed that KT group had a more significant functional improvement (a decrease in pain from 3.73 to 1.53 points compared to 3.93 to 1.38 points for the control group) and decrease in revised FFI (from 35.90 to 22.93 points compared to 35.39 to 29.75 points in the control group). The current study primarily evaluated the effects of additional KT over conventional PT on pain & foot functional disability in hallux valgus patients. The results indicate that additional KT significantly improves the foot functional ability and reduction of pain respectively in hallux valgus.

In our study, 30 patients were randomly divided into 2 groups in which the study group was treated with kinesiotaping and the control group was treated only with exercise. Muscle imbalance in abductor and adductor muscles is cited as a major factor in the production of hallux valgus. Thus, in order to increase muscle strength and attain joint mobility, all subjects were given active big toe exercises to perform. The aim of Hallux taping was to reduce the stress on the big toe by pulling the toe outwards and correct the position of the hallux.

The additional Kinesiotaping is more beneficial to correct the deformity and exercise to improve the strength of intrinsic muscles of the foot. There by pain will be relieved and foot function improves while weight bearing activities [kim MH(2013), Banu Bayar (2011) & Gul OZnur Karabicak(2015)] in Hallux valgus study participants.

Limitations

1. Small sample size.
2. Longterm follow up was not done.
3. Hallux-valgus angle was not measured in this study.

Suggestion

1. This same study can done on different age group of subjects with Hallux valgus.
2. Study can done to find relation between intrinsic factor of excessive pronation of the hind foot and Hallux valgus deformity.

CONCLUSION

The addition of kinesio taping to the conventional physiotherapy was capable of reducing pain and foot functional ability in hallux valgus study participants.

Acknowledgement

Our best wishes to those valuable hallux valgus study participants & supporter of this study.

Conflict of Interest

We declare that there were no conflicts of interest in the entire journey of the study.

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