

JPOST Journal of Prosthetics Orthotics Science Technology  
 Volume 1, Number 1 Year 2022  
 ISSN (online): 2962-8016  
 DOI: [10.36082/jpost.v1i1.653](https://doi.org/10.36082/jpost.v1i1.653)

## DEGREE OF CORRECTION IN BUNION USING DYNAMIC SPLINTS

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<b>Article History</b>  Received date: 06-07-2022 Revised date: 08-07-2022 Accepted date: 08-07-2022	<b>Abstract</b>
<b>Keywords:</b>  bunion, dynamic splints, correction, orthosis	<p><b>Background.</b> Hallux valgus or bunions are the most widely recognized issue of the forefoot in grown-ups. A Hallux valgus angle more prominent than 15 degrees is viewed as unusual. However, at such a point, the proximal phalanx may be consistent with the metatarsal head when seen on radiographs. Orthoses have been proposed to lessen the raised plantar weight under the medial ray in patients with bunion and diminished pain when joined with a toe separator. The orthosis may assist with remedying alignment. <b>Objectives.</b> To evaluate the clinical effects of dynamic splints on Hallux valgus and to measure the degree of correction by using the dynamic splints. <b>Methods.</b> Hallux valgus patients with age from 15-60 years, Mild, moderate Hallux Valgus, Hallux valgus angle &lt; 40 degree. <b>Results.</b> The total sample size was 8, of which 6 (75%) were female, and 2 (25%) were males. The mean of the angle before using the splint was (20.75) and the standard deviation among the angle was (2.315). After using the device for 15 days, the mean angle was (19.88), and the standard deviation of the total population was (2.58), while the correction achieved in the degree of angle has a mean of (1.00) and a standard deviation of (0.535). Data were recorded and analyzed through SPSS. <b>Conclusion.</b> The orthosis effect is a parameter to evaluate changes during the wash-out period. It concludes that there is a change in the angle with the time wearing.</p>
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## Introduction

Hallux valgus or bunions the most widely recognized issue of the forefoot in grown-ups (Mann & Coughlin, 1981). The deformity of Hallux valgus is reformist, and includes a few phases, yet starts with lateral deviation of the big toe (Hallux) and medially deviation of the first main metatarsal bone. An Hallux valgus angle more prominent than 15 degrees is viewed as unusual yet at such a point the proximal phalanx may in any case be consistent with the metatarsal head when seen on radiographs (Hardy & Clapham, 1951).

In its later stages, Hallux valgus includes gradual subluxation of the first metatarsophalangeal (MTP) joint (Mann & Coughlin, 1981). The cause of Hallux valgus has been a discuss topic for years, but is likely associated with genetic predisposition, restrictive footwear, other foot deformities such as pronation of the hind foot furthermore, (pes planus, hyper mobility, contracture of the Achilles ligament, and neuromuscular problems, for example, cerebral paralysis and stroke (Paikray et al., 2021).

No association has been made between Hallux valgus and either corpulence or occupation (aside from artful dance moving) ballet dance. Grown-ups are more usually influenced than kids, albeit adolescent Hallux valgus happens. Ladies are analyzed more every now and again than men, with a proportion as high as 15:1 (Piqué-Vidal et al., 2007).

In certain investigations and require a medical procedure all the more frequently, which is believed to be related with differential utilization of tight-fitting and high-obeyed shoes. Ladies likewise will in general have higher paces of ligamentous laxity and diverse hard life structures for those doing jobs (Wilkerson & Mason, 2000).

Indications of Hallux valgus incorporate poor-fitting shoes, pain at plantar surface of foot, first MTP joint pain, profound MTP hurting torment from joint degeneration, and torment with weight bearing. The executive of hallux valgus for the most part starts with traditionalist (no operative) treatment,

particularly in adolescent Hallux valgus. Traditionalist means the modalities incorporate evasion of tight-fitting, high-obeyed shoes; wearing wide-toed delicate footwear; utilization of different additions/cushions; and exercise based on recuperation. Careful remedy is shown in circumstances of bombed non-operative administration, reformist, difficult distortion, and disturbance of way of life as well as movement.

Diverse moderate treatment choices have been proposed for first-line treatment, including various types of physiotherapy (PT), orthoses and splinting technique (Zipfel et al., 2011). Orthoses have been proposed to lessen the raised plantar weight under the medial ray in patients with Hallux Valgus or bunion and diminish pain (Torkki et al., 2015)(Yamamoto et al., 1996) when joined with a toe separator, orthosis may likewise assist with remedying alignment, at any least when the orthoses are utilized consistently (Tang et al., 2002). Hallux valgus causes many problems, including psychological issues and impaired quality of life (Abhishek et al., 2010). Preventing general disability and halting the progression of structural changes are important for the management of hallux valgus. This research aims to evaluate the clinical effects of dynamic splints on Hallux valgus this study was performed.

## Methods

### 1.1 Study Design:

Experimental based study design

### 1.2 Study setting:

Study was conducted at PIPOS (Pakistan Institute of Prosthetics and Orthotics Sciences).

### 1.3 Study Duration:

The duration of the study was 6 months.

### 1.4 Sample Size:

Sample size was 8.

### 1.5 Sampling Technique:

Convenience sampling technique was used.

### 1.6 Sample Selection:

#### Inclusion criteria:

- Hallux valgus patients with age from 15-60 years
- Mild, moderate Hallux Valgus
- Hallux valgus angle < 40 degree
- Both genders

#### Exclusion criteria:

- Hallux rigidus
- Pain at bunion

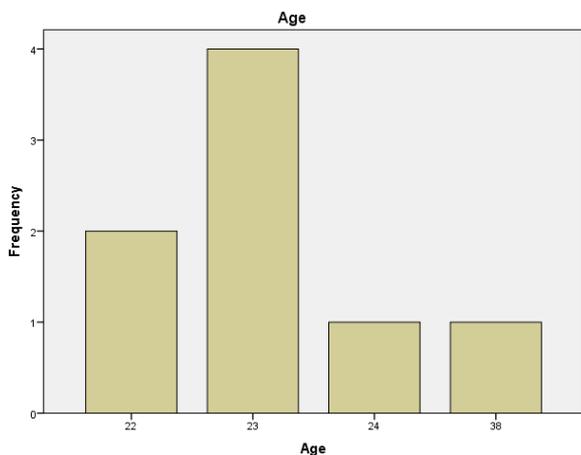
### Results

#### Gender:

Variable	Frequency	Percentage
Male	2	25.0
Female	6	75.0
Total	8	100.0

Total sample size was 8, in which 6 (75%) were Female and 2 (25%) were males, and they all are from Peshawar.

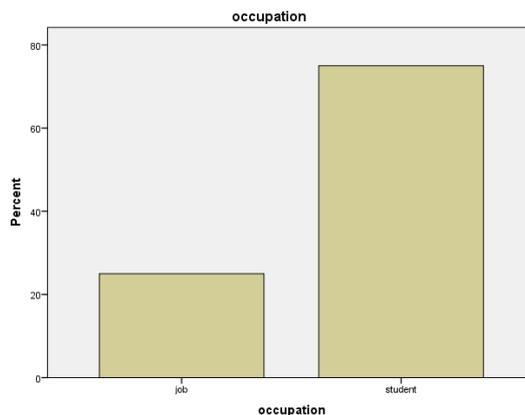
#### Age:



Total sample size was 8 and the age 2 patient were 22 year (25%) out of total population and the age 4 patient were 23 year (50%) out of total population and the age 1 patient was 24 year (12.5%) out of total

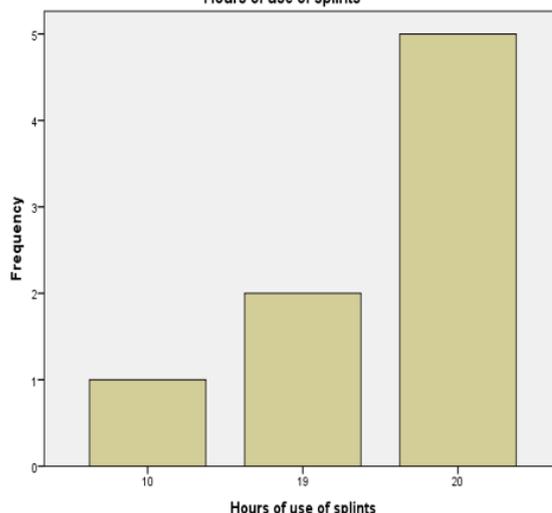
population and the age 1 patient was 38 year (12.5%) out of total population.

#### Occupation



Total sample size was 8 and 2 (25%) patient were on job 6 patient (75%) were student out of the total population.

#### Hours of use of splints



Total sample size was 8 and 1 (12.5%) patient wore the splint for 10 hours 2 patients (25%) wore the splint for 19 hours and 5 (62.5%) patient wore the splint for 20 hours.

**Before Using Splints**

Angle	Frequency	Percent
18	1	12.5
19	2	25.0
20	1	12.5
21	2	25.0
23	1	12.5
25	1	12.5
Total	8	100.0

Total sample size was 8 and Mean of the angle before using the splint is (20.75) and standard deviation among the angle was (2.315)

**After Using Splints (15days)**

After 15 days

Angle	Frequency	Percent	Valid Percent	Cumulative Percent
17	1	12.5	12.5	12.5
18	2	25.0	25.0	37.5
19	1	12.5	12.5	50.0
20	2	25.0	25.0	75.0
22	1	12.5	12.5	87.5
25	1	12.5	12.5	100.0
Total	8	100.0	100.0	

Statistics

	Before using Splints	After 15 days
Mean	20.75	19.88
Median	20.50	19.50
Std. Deviation	2.315	2.588

Correction Achieved in 15 days

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	1	12.5	12.5	12.5
1	6	75.0	75.0	87.5
2	1	12.5	12.5	100.0
Total	8	100.0	100.0	

Statistics

Correction Achieved in 15 days

Mean	1.00
Median	1.00
Std. Deviation	.535

Total sample size was 8 and Mean of the angle after using appliance for 15 day was (19.88) and standard deviation of the total population was (2.58), while the correction achieved in degree of angle has a mean of (1.00) and standard deviation of (0.535).

**After Using Splints (30days)**

After 30 days

	Frequency	Percent	Valid Percent	Cumulative Percent
16	1	12.5	12.5	12.5
17	2	25.0	25.0	37.5
18	1	12.5	12.5	50.0
19	2	25.0	25.0	75.0
21	1	12.5	12.5	87.5
25	1	12.5	12.5	100.0
Total	8	100.0	100.0	

	Before using Splints	After 30 days
Mean	20.75	19.00
Median	20.50	18.50
Std. Deviation	2.315	2.878

Correction Achieved in 30 days

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	1	12.5	12.5	12.5
2	5	62.5	62.5	75.0
3	2	25.0	25.0	100.0
Total	8	100.0	100.0	

Statistics

Correction Achieved in 30 days

Mean	2.00
Median	2.00
Std. Deviation	.926

Total sample size was 8 and Mean of the angle after using appliance for 30 day was (20.75) and standard deviation of the among the angle was (2.878) while the correction achieved in degree of angle has a mean of (2.00) after 30 days and standard deviation of (0.926).

## Discussion

The aim of this study was to evaluate the angle, following the application of dynamic splints in 8 patients with Hallux valgus. Previous studies suggested that orthoses and stretching could correct deviation of the joint.

Similar studies that compared the effects of static and dynamic orthoses (i.e., an insole with a toe separator) concluded that the application of a corrective force during walking via the use of the dynamic orthosis was more effective than the static orthosis in reducing pain related to Hallux valgus and the Hallux valgus angle.

In later research, Mathew et al showed that a dynamic orthosis reduced contracture of first metatarsophalangeal joint and improved the alignment of the Hallux through low torque and prolonged stretching (John, DPM & Willis, PhD, 2010).

In the present study, the deformity of the Hallux valgus angle was reduced to a similar level after using the orthoses for 1 month. Although, the angle was decreased 2-3° after using orthoses, note that these changes have been obtained just after one month of using orthoses and for better achievement, at least 6-month application is required.

The persistence of the effect of orthosis is another point which could be assessed by evaluating changes during the wash-out period. Based on results the fact is that the angular changes are related to the time when orthosis is worn, so these changes were returned to first state by doffing the orthosis. It is important to mention that, due to the flexible muscle structure in this age group, it is necessary to use an orthosis for a longer time to stabilize the effect of orthosis.

According to these studies it was assumed that, a dynamic orthosis which applies a corrective force during walking and maintains the correct alignment of the metatarsophalangeal joint may reduce. In general, participants have more satisfaction

with dynamic orthosis than static one due to the ease of use and fitting and better appearance.

However, a disadvantage of the dynamic orthosis was that multiple orthoses were required for each patient due to the risk of the orthosis breaking while walking. The limitations of this study include a lack of X-ray assessments of the Hallux valgus angle. The latter was not performed due to the high risks associated with radiation at the short time of the study. In addition, the orthotic intervention was relatively short (1 month), and a longer-term follow-up was not conducted.

This study was conducted on young age as they have the intact bone structure and their joint not affecting by degenerative disease. Also, this age group were a convenient sample. So, the external validity of this study is limited to the young population and may not be generalized to juvenile and elderly Hallux valgus. Another limitation of this study is the measurement error by Goniometer that was not considered. Though, few studies had investigated the accuracy of Goniometer with methods such as radiography, and its repeatability and reliability is confirmed.

## Conclusion and Recommendation

The use of dynamic splints for 1 month can reduce the Hallux valgus angle up to 2 Degrees. To achieve better results, it is suggested to wear orthoses for longer time. The dynamic orthosis also increases the passive range of motion of the first metatarsophalangeal joint and it seems to be effective during daily walking. Dynamic splints are recommended to patient having mild to moderate hallux valgus angle. Hallux valgus is also helpful in reducing hallux valgus angle and also preventing it from further damage.

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