Original Article

Experience and Satisfaction with Non-surgical Hallux Valgus Treatment Among Patients in Siriraj Hospital

Paweena Tantamacharik, Navaporn Chadchavalpanichaya, Thanitta Thanakiatpinyo and Sumana Srisoongnern

Department of Rehabilitation Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand

ABSTRACT

Objectives: To describe patient experiences, treatments, outcomes, side effects, and satisfaction with hallux valgus treatments at Siriraj Hospital.

Study design: A cross-sectional study

Setting: Siriraj Hospital, Bangkok, Thailand

Subjects: Two hundred thirty participants aged over 18 who were diagnosed with hallux valgus by their physician for over a year and were able to communicate in Thai. Participants had to use the treatment for at least 5 hours per day, 5 days per week, for a minimum of 1 month.

Methods: Data was collected via questionnaires from July 2021 to April 2022. Proportions of experience and satisfaction with non-surgical hallux valgus treatment were calculated to measure the patient's experience and satisfaction with treatment options from the patient's perspective. Mean pain score differences before and after treatment were analyzed using a paired sample t-test.

Results: The study included 217 females (94.3%) with a mean age of 56 SD = 16.4. Fifty-six percent had bilateral hallux valgus. The most common treatment was changing footwear or shoe modification, which was used by 93.0% of participants. The most preferred treatment was changing footwear or shoe modification (65.2%), followed by insoles (20.0%) and dynamic splints (5.7%). These treatments all showed statistically significant clinical improvement ($p < 0.001$, $p < 0.001$ and $p = 0.008$, respectively). Most participants (81.3%) felt their deformity remained unchanged. The median satisfaction score was high for all treatments (8 out of 10). No serious complications were reported.

Conclusions: Changing footwear or shoe modification was the most utilized and the preferred treatment, demonstrating significant clinical improvement. Further studies are recommended to investigate the effectiveness of newer treatments and potential alternatives, e.g., bunion shields, toe separator socks, and cotton toe separators.

Keywords: hallux valgus, treatment, pain, satisfaction

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Introduction

Hallux valgus is a common forefoot deformity characterized by the abnormal angulation of the great toe lateral deviation and the first metatarsal medial deviation. This deformity progresses slowly and has several stages. To classify these stages, the investigators used the hallux valgus angle (HVA) and the intermetatarsal angle (IMA) measured through radiographic evaluation, diagnosing patients as having mild, moderate, or severe deformity.[1] The prevalence of hallux valgus is related to age. More than 50 percent of patients were over 60 years old.[2]

The etiologies of hallux valgus are multifactorial. Intrinsic factors are genetics, pes planus, gout, and rheumatoid arthritis. The main extrinsic factor is the use of improper footwear.[1,3] The prevalence of hallux valgus is higher in women than in men, with a ratio of 15:1.[1,4] However, neither obesity nor occupation are associated with hallux valgus.[3]

Clinical symptoms include first metatarsophalangeal (MTP) joint pain, bunion pain, overriding toes, ulcers from toe-toe or toe-shoe friction, and calluses. This deformity also causes plantar pain and difficulty in ambulation due to abnormal foot pressure distribution while pushing off. Additionally, patients may present with cosmetic issues or difficulty finding suitable shoes.[5]

Non-surgical treatment in patients with mild to moderate hallux valgus is suggested over surgery to avoid postoperative complications because most hallux valgus patients are elderly. Many non-surgical treatment options are currently available, but no standard clinical practice guidelines exist for hallux valgus. Physicians can prescribe most treatments, such as shoe modification, custom-made insoles, and silicone toe separators with bunion shields. However, patients can also seek treatment independently from online or medical device stores, e.g., bunion shields.[5]

A review of the literature found Australian podiatrists often recommend new footwear or modifications to existing foot-

Correspondence to: Navaporn Chadchavalpanichaya, MD, FRCPhysiatrT; Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Wanglang Road, Bangkoknoi, Bangkok 10700, Thailand; E-mail: drnavaporn@gmail.com

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wear as the primary treatment for hallux valgus across all age groups. Other recommended options include orthotic devices, in-shoe padding, bunion shields, strapping, and exercise.[6] Studies have confirmed the association between hallux valgus and ill-fitting shoes. Wearing a narrow-toe box and high-heeled shoes (more than 2.5 cm) has been shown to be associated with hallux valgus, corns, calluses, and other foot pain problems.[7] Although changing footwear is recommended for treating hallux valgus, there is no published research regarding specific footwear characteristics that can help prevent deformity progression. Silicone toe separators have shown evidence of pain relief and hallux valgus deformity reduction.[8,9] While insoles and toe splints have been reported to provide pain relief, they cannot prevent or correct hallux valgus deformity.[10-14] Using hallux valgus night strap or intrinsic foot muscle exercise has been shown to not reduce pain or deformity.[15,16] Some items, like toe separator socks, bunion shields, and cotton toe separators, are used by patients despite a lack of supporting research demonstrating their efficacy.

The primary objective of this study was to describe the treatments based on patients' experiences and the preferred treatment for hallux valgus at Siriraj Hospital. Secondary objectives were to assess outcomes after using these treatments, including changes in pain score and hallux valgus deformity from the patient's perspective, side effects, and patient satisfaction. The results of this study could lead to further studies, such as randomized controlled trials, to confirm the effectiveness of treatments that as yet not supported by evidence.

Methods

Study design

This cross-sectional study received ethical approval from the Siriraj Institutional Review Board (COA No. Si 523/2021) on February 28, 2022. The study was conducted in accordance with the STROBE guideline for observational studies.

Participants

Two hundred and thirty patients with hallux valgus who visited the foot clinic and the outpatient rehabilitation clinic at Siriraj Hospital from July 2021 through April 2022 were recruited for this study. Inclusion criteria included age over 18 years, having been diagnosed with hallux valgus by a physician for more than 1 year, being able to communicate in Thai to answer the questionnaire, having used any hallux valgus treatment for at least 5 hours per day, 5 days per week, for at least 1 month, and being capable of giving informed consent. Exclusion criteria included having active arthritis, a history of rheumatoid arthritis, or a history of foot bone fractures. Sample size calculation was based on a review of the literature.[6] The sample size was calculated based on the percentage of the most widely recommended treatment for hallux valgus, i.e., provision of advice on different footwear or existing footwear modification (equal to 92.0%). Using the nQuery Advisor program, we set 0.92 as the expected proportion and the accepted distance from proportion to limit = 0.035 (5% type I error, 2-sided, 95% confidence interval (95%CI) = 1.96). Two hundred and thirty participants were calculated to be required for this study.

Materials and data collection

An information sheet with verbal explanations of the study was provided to all participants. Signed informed consent was obtained prior to the study. Participants completed the questionnaire themselves independently; if they could not write or read Thai, they answered the questions verbally, and their relatives or doctors helped fill in the case record form.

Three-part case record form

Part I: General information about the participants, including age, gender, weight, height, occupation, daily lifestyle (sitting or walking, wearing shoes or barefoot), onset and side of hallux valgus.

Part II: Patient experience with hallux valgus treatment. Participants specified all treatments they had received from a provided list (they could select more than one treatment). The names of the different treatments were supplemented by colored pictures following each options as shown in Appendix 1. The list of treatments included changing to different footwear or shoe modification, using prefabricated or custom-made insoles, a static splint, a dynamic splint, a bunion shield, a silicone toe separator with bunion shield, a single piece silicone toe separator, a cotton toe separator, a hallux valgus strap, toe separator socks, taping of toes, intrinsic foot muscle exercise (strengthening and/or stretching), surgery among others. Participants also chose the best treatment for hallux valgus from their perspective, which they must have used regularly for at least 5 hours per day, 5 days per week, for at least 1 month.

Part III: The most preferred treatment from the patient's perspective. Participants reported the duration and frequency of use (hours per day, days per week, and total period of use), how they learned about and where they received the treatment, and their scores before and after treatment for each of five common foot problems that usually occur with hallux valgus. The five common foot problems were first MTP joint pain, bunion pain, plantar pain, difficulty walking, and toe friction. Scores were chosen using a numeric rating scale from 0 to 10 where zero means no pain or no symptoms in that domain of the foot problem and ten means maximal pain or the most disturbance from that foot problem. Next, they rated the change of hallux valgus deformity (self-assessed with no radiographic confirmation). They could answer "Less" meaning having a lower degree of the big toe deviation, "More" meaning having a higher degree of big toe lateral deviation, or "Unchanged" as having no change of the big toe deformity from the participant's perspective. Finally, participants rated their overall satisfaction using a numeric rating scale which

ranged from 0 (most dissatisfaction) to 10 (most satisfaction). Additionally, participants were asked to write down any side effects.

Statistical analysis

Statistical analysis was performed using IBM SPSS version 23. Categorical variables are presented as frequencies and percentages. Normally distributed continuous variables are presented as means and standard deviations (SD). Non-normally distributed continuous variables are expressed as medians with first and third quartiles. For the most preferred hallux valgus treatment chosen by participants, a paired sample t-test was used to analyze the mean difference in pain scores before and after using the treatments. A *p*-value of less than 0.05 was considered statistically significant.

Results

Two hundred and thirty participants were enrolled in this study. Table 1 displays participant demographic information. The mean age was 56, and the average body mass index was 24.1 kg/m^2. Most participants (94.3%) were female. Ninety-eight participants (42.6%) were teachers. More than half (73.0%) usually walked with shoes in their daily lifestyle. Seventy-nine participants (34.3%) had been diagnosed with hallux valgus for one to five years, and one hundred and twenty-nine participants (56.1%) had bilateral hallux valgus.

Table 1. Demographic information of 230 participants

	n (%)
Age (years)[1]	56.2 (16.4)
BMI (kg/m^2)[1]	24.1 (4.6)
Gender[2]	
Female	217 (94.3)
Male	13 (5.7)
Occupation[2]	
Teacher	98 (42.6)
Healthcare workers	28 (12.2)
Merchant	23 (10.0)
Chef	12 (5.2)
Accountant	11 (4.8)
Housekeeper	8 (3.5)
Soldier/policeman	5 (2.2)
Other	45 (19.6)
Lifestyle[2]	
Usually sit	51 (22.2)
Usually walk with shoes	168 (73.0)
Usually walk barefoot	11 (4.8)
Diagnosis as hallux valgus[2]	
One to five years	79 (34.3)
Five to ten years	29 (12.6)
Ten to twenty years	60 (26.1)
More than twenty years	62 (27.0)
Side of hallux valgus[2]	
Right	52 (22.6)
Left	49 (21.3)
Bilateral	129 (56.1)

[1]Mean (SD), [2]number (%)
BMI; body mass index

Primary outcome

Figure 1 shows experiences of the 230 patients with hallux valgus treatment at Siriraj Hospital. Participants chose all the options that they had experienced. The most frequent treatment was changing to different footwear or modifying existing shoes (214 participants, 93.0%).

Figure 2 displays the proportion of participants' selection of the best hallux valgus treatment. Participants were asked to choose their best treatment for hallux valgus. The most frequently chosen option was changing to different footwear or modifying existing shoes, selected by 150 participants (65.2%).

Participants were asked who recommended their most preferred treatment and where they obtained that treatment.

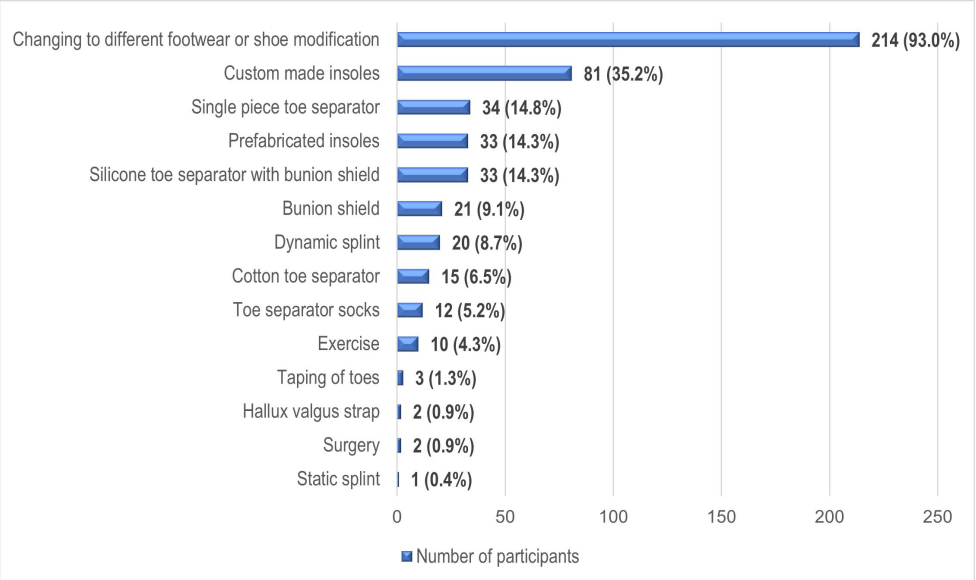


Figure 1. Patient experience with hallux valgus treatment. (Participants could choose more than one treatment.)

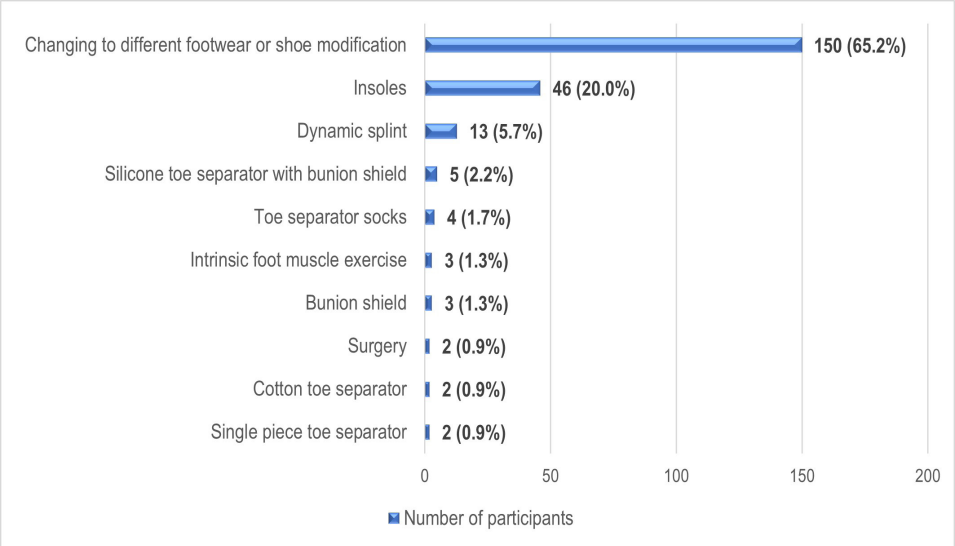


Figure 2. Participant's opinion of the best treatment for hallux valgus

Table 2. Outcome and satisfaction score after using the most preferred hallux valgus treatment

Option n (%)	First MTP pain	Bunion pain	Plantar pain	Difficulty in walking	Toes friction	Satisfaction score Median [IQR]	Reduction in the severity of the deformity n (%)
Different footwear or shoe modification 150 (65.2)							
Pre, mean (SD)	1.12 (2.29)	1.79 (2.70)	2.16 (2.85)	1.19 (2.52)	0.60 (1.55)	7 [5-9]	
Post, mean (SD)	0.38 (1.05)	0.38 (1.17)	0.76 (1.45)	0.41 (1.34)	0.20 (0.93)		6 (26.1)
Mean diff (95%CI)							
Δ Pre-post,	0.74 (0.45, 1.04)	1.41 (1.03, 1.78)	1.40 (1.05, 1.75)	0.79 (0.47, 1.11)	0.40 (0.21, 0.59)		
p-value*	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		3 (13.0)
Custom-made/ prefabricated insoles 46 (20.0%)							
Pre, mean (SD)	1.74 (2.97)	2.59 (3.01)	4.98 (3.28)	2.28 (3.18)	0.87 (1.73)	8 [8-10]	6 (26.1)
Post, mean (SD)	0.52 (1.59)	0.8 (1.94)	0.76 (1.74)	0.30 (1.26)	0.52 (1.47)		
Mean diff (95%CI)							
Δ Pre-post,	1.22 (0.52, 1.92)	1.78 (1.11, 2.46)	4.2 (3.33, 5.11)	1.98 (1,14, 2.82)	0.35 (0, 0.69)		
p-value*	0.001	< 0.001	< 0.001	< 0.001	0.048		
Dynamic splint 13 (5.7)							
Pre, mean (SD)	4.15 (3.31)	4.77 (3.63)	3.54 (3.53)	1.31 (2.18)	1.46 (2.82)	8 [7-8]	
Post, mean (SD)	2.15 (2.99)	3 (3.42)	2.23 (2.92)	0.46 (1.39)	0.85 (2.15)		
Mean diff (95%CI)							
Δ Pre-post,	2 (0.63, 3.37)	1.77 (0.15, 3.39)	1.31 (0.04, 2.58)	0.85 (-0.2, 1.89)	0.62 (-0.56, 1.80)		
p-value*	0.008	0.035	0.044	0.102	0.275		

* P-value from paired sample t-test

MTP, metatarsophalangeal; IQR, interquartile range

Most treatment options, such as insoles and dynamic splints, were recommended by the hospital healthcare workers and were obtained from hospitals. Some participants were recommended by healthcare workers to use a silicone toe separator with bunion shield and a single piece silicone toe separator which the patient obtained from a hospital and/or drug stores. Changing to different footwear and using toe separator socks were treatments recommended by friends; patients obtained these items from shoe stores and/or online shopping. Two participants were recommended to use cotton as a toe separator by friends. Additionally, three participants learned about intrinsic foot muscle exercises online and performed the exercises regularly on their own.

Secondary outcome

Table 2 shows the outcomes and satisfaction scores after using their most preferred treatment. The treatment outcome focuses on the change in score (mean difference) between before (pre) and after (post) using the treatment regularly for five common foot problems associated with hallux valgus, i.e., first MTP joint pain, bunion pain, plantar pain, difficulty in walking and toe friction. The results showed statistically significant pain score reductions in all five domains after changing to different footwear or modifying shoes and using insoles ($p < 0.001$). A dynamic splint significantly was reported to reduce first MTP joint, bunion, and plantar pain ($p = 0.008$, 0.035, and 0.044, respectively). However, the numbers of participants using each method (toe separator socks, bunion

shields, silicone toe separators with bunion shields, single-piece silicone toe separators, intrinsic foot muscle exercises, surgery, and cotton toe separators) were too small to find a statistically significant difference.

Most participants (187 participants, 81.3%) felt their deformity remained unchanged after regularly using their most preferred treatment. Table 2 also shows the number and percentage of participants who felt their deformity improved in terms of severity from their perspective (no radiographic confirmation). Twenty-three participants (10.0% of participants) felt their hallux valgus deformity decreased after changing new shoes or modifying shoes (6 participants, 26.1%), using a dynamic splint (6 participants, 26.1%), using insoles (3 participants, 13.0%), using a bunion shield (3 participants, 13.0%), using a single-piece silicone toe separator (2 participants, 8.7%), having surgery (2 participants, 8.7%) and using a silicone toe separator with a bunion shield (1 participant, 4.4%). In contrast, a few participants felt their deformity progressed after changing to new footwear (15 participants), using insoles (3 participants), using a dynamic splint (1 participant), and using a silicone toe separator (1 participant). The median satisfaction score (7 to 8 out of 10) for all each of the participants' most preferred hallux valgus treatment was high.

Side effects and complications

Participants complained that plastic dynamic splints were uncomfortable and unwearable with shoes during the day. They also reported pain, irritability, and easy displacement while wearing silicone toe separators with bunion shields or single-piece silicone toe separators with shoes. Additionally, these items were easily torn and became dirty. The bunion shields often rolled over and fell off while being worn with shoes, causing patients to feel tight and uncomfortable. No serious complications were reported.

Discussion

Changing to different footwear or modifying shoes was chosen as the most used and preferred management method for hallux valgus among the 230 participants. Hallux valgus is slow and progressive and can result in different clinical presentations. As it is slowly progressive, some patients did not seek early treatment because they were asymptomatic. In cases of mild deformity, patients may have difficulty finding shoes because of the bunion. As the deformity progresses, pain such as first MTP joint pain, bunion pain, or toe friction can occur, leading patients to visit a physician for consultation. However, some patients avoid consulting a physician and seek treatment themselves.

Changing to different footwear or modifying shoes significantly reduced pain scores across all five common foot problems associated with hallux valgus. The statistical analysis showed that the pre-mean pain score for this group's five-foot problems was mild. Therefore, changing footwear or modifying shoes was selected as the first choice since it was easily accessible and provided good results in pain reduction. Most participants learned about this treatment from friends and healthcare providers. They could get new footwear from shoe shops based on their preference or the physician's advice. If they could not find proper shoes that fit their foot deformity, they would get their existing shoes modified, as prescribed by the physician at the hospital. Shoe modifications could include bunion release or padding to reduce friction with shoes.

According to previous research, the effectiveness of hallux valgus deformity correction or prevention remains controversial. One study confirmed the association of hallux valgus with ill-fitting shoes. Wearing narrow-toe boxes and high-heeled shoes more than 2.5 cm was associated with hallux valgus, corns, calluses, and other foot pain problems.[7] Consequently, physicians recommend that hallux valgus patients avoid these types of footwear; however, most participants felt their hallux valgus deformity remained unchanged from their perspective. Participants were satisfied with this treatment as their best hallux valgus option, even though changing footwear did not reduce the deformity. Once the pain was reduced, participants continued using these shoes and did not seek other treatment options for hallux valgus.

Previous research has indicated that insoles can significantly relieve pain, especially plantar pain, in hallux valgus patients, but show no significant improvement in the hallux valgus angle (based on radiographic evaluation).[10,11] The outcome of this study aligns with previous studies showing that using insoles can significantly reduce all five-foot problems, and that a few participants felt the deformity was reduced in severity after using this item. The mechanism of insoles with hallux valgus remains controversial. All participants who chose insoles as their most preferred hallux valgus treatment also used them in combination with new shoes, typically sneakers. Thus, the results showed a similar outcome to both changing footwear and using insoles. However, participants who chose insoles as their most preferred hallux valgus treatment had a higher pre-treatment mean score for plantar pain. Thus, participants with hallux valgus who also had plantar pain preferred insoles with proper shoes to relieve this foot problem.

Previous research has reported no positive outcome from using dynamic splints for hallux valgus.[12-14] In this study, the pretreatment mean pain score for participants who chose dynamic splints as their best hallux valgus treatment was higher than for those who chose changing to different footwear or using insoles. Participants with mild to moderate pain sought options other than changing shoes to treat their hallux valgus pain. The results showed that dynamic splints significantly improved the first MTP joint, bunion, and plantar pain from the patient's perspective. Additionally, six participants (26.1%) felt their hallux valgus deformity decreased after using dynamic splints. The positive outcome encouraged participants to continue using this item, making it a good alternative

treatment for hallux valgus. It can also be used as a night splint to avoid the discomfort of wearing it during the daytime. Further research on dynamic splints for hallux valgus is needed to confirm their effectiveness.

Previous studies have reported on the efficacy of silicone toe separators and single-piece toe separators for hallux valgus in pain relief and deformity correction.[8,9] However, the present study found that silicone toe separators with bunion shields and single-piece silicone toe separators were not desirable from the patient's perspective. These items were used by only 14.0% of participants, and less than 2.0% chose them as their best hallux valgus treatment. Despite studies confirming their efficacy, the main reason for discontinuing these options were side effects such as pain, irritation, and easy displacement while wearing shoes.

Toe separator socks, bunion shields, and cotton toe separators were new items that participants chose as their most preferred hallux valgus treatment. However, the sample size within these groups was too small to find significant differences in pain reduction and improvement in hallux valgus deformity. Further studies, such as randomized controlled trials, are needed to confirm the effectiveness of these options which are low-priced and easily accessible.

Study limitations

The scoring was based on participants' perspectives. The difference in the pain score outcome for each treatment option was not categorized by the severity of hallux valgus deformity. Therefore, the conclusion regarding which items were the most preferred treatment for mild or severe hallux valgus remains controversial. Additionally, changes in hallux valgus deformity were not confirmed by radiographic evaluation. The results of this study could only serve as a guideline to develop further studies to confirm the effectiveness of these treatment options.

Conclusion

Based on the experience of patients at Siriraj Hospital, changing footwear or shoe modification was the most used treatment for hallux valgus. Moreover, the best treatment options in the opinion of participants were changing footwear or shoe modification, insoles, and dynamic splints. These options brought significant clinical improvement from the patient's perspective. Some new items, such as bunion shields, toe separator socks, and cotton toe separators, will require further studies to investigate their effectiveness in hallux valgus treatment as these items might be good alternative treatment options.

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Conflict of interest declaration

The authors confirm that there is no conflict of interest related to the manuscript.

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Data availability

The data that support the findings of this study are available upon request from the corresponding author, [Navaporn Chadchavalpanichaya]. The data are not publicly available due to containing information that could compromise the privacy of research participants.

Author contribution

Paweena Tantamacharik: conceptualization, methodology, resources, formal analysis, data curation, investigation, validation, writing - original draft, writing - review & editing,

Navaporn Chadchavalpanichaya: conceptualization, methodology, resources, formal analysis, data curation, investigation, supervision, validation, writing - original draft, writing - review & editing,

Thanitta Thanakiatpinyo : conceptualization, methodology, writing - original draft, writing - review & editing,

Sumana Srisoongnern: conceptualization, methodology, writing - original draft, writing - review & editing.

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