Hallux Valgus

Subjects: Surgery
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Hallux valgus (HV) deformity is a common, potentially debilitating deformity. And evidence with high-quality for the conservative treatments of HV deformity is still required.

Keywords: hallux valgus deformity ; bunion ; non-surgical ; conservative

1. Introduction

Hallux valgus (HV) deformity (bunion), whose definition is a lateral deviation on the first metatarsal joint of the great toe (hallux), is a common, potentially debilitating deformity [1]. The deviation primarily occurs in the transverse plane with the deformity that involves rotation of the toe in the frontal plane and makes the nail face medially (eversion). Different terms are being used to describe the deformity because of the two types of deviations [1][2]. In orthopedic texts, it is often called “hallux valgus” (HV) whereas many podiatry texts prefer the term “hallux abductovalgus (HAV).” The public is more familiar with the expression “bunion.” In this manuscript, the term “hallux valgus” (HV) and “hallux valgus (HV) deformity” are used to describe the deformity [3].

Normally, the metatarsocuneiform joint has medial-dorsal and plantar-lateral movements with a sinusoidal curve. The increased pressure under the head of the first metatarsal caused by increased subtalar pronation or a congenital plantar-flexed first ray would make the metatarsal move medial-dorsally. This movement increases the hallux abductus and intermetatarsal angles and places the metatarsal more medial relative to its proximal phalanx. Eventually, pressure from the proximal phalanx on the lateral direction of the metatarsal head would push the metatarsal more medially, then increasing the hallux abductus angle, as muscle action stabilizes the joint during gait.

Furthermore, high-heel shoes or a typical narrow tiptoe box might induce deviations in both the proximal phalanx of the hallux and the first metatarsal bones. Nevertheless, the isolated role of heel height remains unclear in the development of HAV pathology [4]. Since the first metatarsal becomes more medial and the hallux becomes more lateral, the medial capsule and medial collateral ligament would be chronically strained and eventually ruptured. As the metatarsal moves medially, the abductor hallucis muscle would gradually move beneath the metatarsal and act solely as a plantar-flexor of the proximal phalanx from this position, thereby leading to the valgus rotation seen with HV deformity. Eventually, the lateral joint capsule and collateral ligaments would be tightened, and the adductor hallucis muscle would act unopposed, exacerbating the deformity without medial stabilizing structures under a condition that without medial stabilizing structures [5].

There may be a threshold up to which the forces deforming the joint could be opposed by other anatomic structures according to the fact that not all cases of HV deformity would become severe. When forces become greater than the threshold, the joint becomes deformed. Such progression may occur rapidly rather than worsening steadily over several years [1][3][6].

Although there are many theories been proposed, the precise etiology of hallux valgus deformity is still unclear [7][8]. It is most likely that hallux valgus deformity is multi-factorial in origin and includes many factors such as abnormal foot mechanics affecting the first ray [9][10][11][12][13][14], abnormal first metatarsophalangeal anatomy [15][16][17][18], joint hypermobility [19][20], and genetic influences [21]. Hallux valgus is also associated with conditions such as inflammatory joint disease [22][23][24].

Many studies have tried to determine the prevalence of hallux valgus (HV) deformity. The prevalence of hallux valgus is approximately 23% among adults in 18 to 65, 36% among adults more than 65 years old, and 30% among adult females [25]. Moreover, although the condition is still found twice as often in women than men in non-shod populations, the prevalence would be greater among shod compared with barefoot populations [26][27][28]. Moreover, it is accepted that different degrees of HV deformity with impaired quality of life-related to foot health in women [29].

By using clinical examination, hallux valgus would be easily recognized. The results of radiological studies showed that the geometry of the proximal phalanx of hallux and first metatarsal bone could predict HV deformity [30]. Moreover, the result of finite element analysis indicated that the geometry of the proximal phalanx of hallux was a significant factor in HV deformity development influencing the other reported skeletal parameters and clinical assessment should evaluate the first ray as a whole and not as isolated factors [31]. Historically, a hallux abductus angle, which could also be named hallux valgus angle (HVA), of greater than 15 degrees was considered abnormal, but such deformities are not always symptomatic, and some cases of an HA angle greater than 15 degrees occur naturally due to the shape of the articular surfaces involved [1][3]. Contemporary research suggests a hallux valgus angle (HVA) of 20 degrees or greater is abnormal [2]. Hallux valgus involves the first ray. The angle determined by the bisection of the longitudinal axes of the first and second metatarsals is defined as the intermetatarsal angle (IMA), which would be considered normal if less than 9 degrees.

According to the suggestion given by the American College of Foot and Ankle Surgeons, which is wildly accepted, patients should use conservative treatments before surgical treatment [32]. Only patients with severe pain or dysfunction and those whose symptoms do not improve under a conservative regimen should be referred to a foot surgeon.

2. Adjusted Indirect and Mixed Comparisons of Conservative Treatments for Hallux Valgus

There are still not mixed and indirect comparisons of these treatments. Hundreds of studies have been published assessing many conservative treatments for HV deformity, however, at present, there is no enough evidence with high quality about the choice of conservative treatments for HV deformity, and there are only a few randomized trials with a small sample size comparing the difference in the effects of a specific conservative treatment protocol and no-treatment protocol or placebo treatment protocol. The effects of conservative treatment remain controversial because of the limitations in design or the small sample size of these studies. At the same time, due to the different interventions of these studies, it is also difficult to use traditional pair-wise meta-analysis to synthesize evidence and obtain higher-level evidence for treatment recommendations. For example, it could not be ignored that the effectiveness of night splints is still unclear. A randomized trial with a small sample size reported that the night splints were ineffective in reducing pain associated with HV deformity. The reason might be that the progression of the deformity might not occur over the six-month trial duration [33]. Another small study reported that night splints were more effective in reducing deformity and pain than a toe separator, but they were less effective than exercises [34]. However, the mean decrease in HVA was only about 2 degrees, which might in the range of measurement error. A study of 30 patients comparing night splints to a toe separator attached to a semi-rigid insole reported a significant reduction in pain intensity at three months in the group using the toe separator insole, but changes in HVA and IMA were not significantly different and the decrease in pain in the toe separator group may be attributable to the change in footwear [35].

A study of 30 subjects comparing night splints to a slipper containing a toe separator reported improvement in the HVA in the slipper group after one year, but the changes were not clinically meaningful [36]. A study of 20 female subjects comparing taping and exercises versus exercise alone reported statistically significant short-term reductions in pain and improved walking in the taping group [37]. This study also reported improvements for both groups in HV and IM angles, but the changes were small and within the margin of error. Furthermore, the use of orthoses such as toe separators has still not been supported by all the medical communities. A study that measured pain, disability, and foot function reported that there was little difference between patients wearing orthoses and those wearing placebo devices. Furthermore, most patients in this study were male, and these results may not apply to women. Moreover, when orthoses were compared with no treatment in patients with painful and mild-to-moderate HV deformity, patients wearing orthoses reported improved pain scores after six months, but these improvements were not maintained thereafter [38]. At one year, only the global assessment score remained better in the orthosis group. In the same study, surgery (chevron osteotomy) outperformed orthoses for all outcomes. The study did not evaluate HVA progression.

In terms of morphological indicators of the hallux valgus deformity, many studies have reported that hallux valgus is associated with a change in weight-bearing pressures under the hallux and in other regions across the foot [39], suggesting that changes in weight-bearing pressures might lead to further injuries within the foot or limb [40]. There is some evidence claiming that the deformity would disrupt gait and balance particularly on uneven surfaces and among the elderly, who may be put at increased risk of falling [39]. Therefore, it might be necessary to use conservative treatments in the early stage of HV deformity to limit the deterioration of morphological indicators.

3. Conclusions

In conclusion, a combination of exercise and toe separator, night splints, and dry needling might be the better choices for reducing the hallux valgus angle (HVA) and intermetatarsal angle (IMA). Furthermore, toe separators (with or without exercise), dry needling, and manipulation (with or without ice treatment) might have advantages in improving the subjective feeling of patients with hallux valgus deformity. Multi-disciplinary conservative treatments might have a potential for hallux valgus deformity. However, studies with high quality are still needed in the future.

References

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