

Selected methods of conservative treatment in painful hallux valgus therapy

Wybrane metody leczenia zachowawczego w terapii bolesnego palucha koślawego

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Abstract

Hallux valgus is one of the most common deformities within forefoot region. Reasons for this deformity are not entirely clear. The available literature lists both internal and external factors. Researchers dealing with hallux valgus emphasize that this deformation is accompanied by pain, reduced quality of life, changed foot statics, cosmetic problems and problems with buying the right footwear. The occurrence of pain may significantly affect the quality of everyday functioning and the broadly understood quality of life. The purpose of the following publication is to review selected interactions in the area of physiotherapy and orthopedic measures in the therapy of people reporting pain within the hallux valgus region.

Keywords: hallux valgus, pain, conservative treatment

Introduction

Deformative lesions within foot region due to general and local tissue aging worsen with age. The most common deformities within forefoot region include: hallux valgus, hammer toes and pinch calluses [1, 2]. Hallux valgus is a complex forefoot deformity characterized by lateral toe deviation and often medial deviation of the first metatarsal bone. In addition, the hallux valgus is positioned in internal rotation (pronation). This deformity is often accompanied by the eminence (bunion) of the first metatarsal bone of the forefoot, which can be painful [3]. Some researchers note that deformities occur not only in the metatarsophalangeal joint of a toe, but, what is important from the point of view of foot statics, in the first cuneo-metatarsal joint [4, 5]. The incidence of hallux valgus has not been fully investigated. After analyzing 78 papers (a total of 495 957 participants from around the world), Nix et al. [6] estimated that hallux valgus among people between 18 and 65 years of age occurs in every

fourth person (23% of the population), while among people over 65 years of age in every third person (35,7%). Hallux valgus is more common among women than men. The proportions of occurrence of this deformity among both genders are quite divergent presented by different authors and range from 2:1 to 15:1 [7–9]. The etiopathogenesis of hallux valgus is not fully understood. Most authors point out the multifactoriality, which may contribute to the aggravation of deformity. Researchers point out both internal and external factors. Internal factors include mainly gender and genetic predisposition, while external factors include mainly the type of footwear worn. Abnormalities within foot region can affect the position of the proximal joints. The available literature shows links between the presence of hallux valgus and altered mobility of the pelvis, knee joint and ankle joint [10–12]. This, in turn, may have an impact on the more frequent occurrence of overload and degenerative lesions in knee joints in the group of people with hallux valgus compared to the control group [13–15]. Many researchers dealing with hallux valgus also emphasize that the presence of hallux valgus may affect balance, gait quality [10, 13, 16, 17], decreased quality of life [18–21] and occurrence of pain [21–25].

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Hallux valgus vs. pain

The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience, combined with actual or potential tissue damage or associated with the imagination of this type of damage [26]. In the case of hallux valgus, pain results most likely from the medial eminence, probably caused by irritation of the skin nerves. Other sources of pain are also indicated, such as bursitis, pain in the area of sesamoids, metatarsophalangeal joint pain and metatarsalgia [27, 3]. The frequency of pain within the hallux valgus region, depending on the publication, is estimated at 76% to 83% [28, 29]. The occurrence of pain may significantly affect the quality of everyday functioning [22, 25] and the broadly understood quality of life [18, 20, 21, 30, 31]. Deep muscles play an important role in the pathomechanism of hallux valgus formation, including: abductor hallucis muscle, adductor hallucis muscle, extensor hallucis. McKeon et al. [32] proposed a pragmatic foot model, which is compared by the authors to the lumbopelvic core. Researchers attribute the role of local stabilizers to deep muscles, while the more superficial muscles with their muscle attachments in the lower leg are attributed to the global function. Deep muscles are arranged in four layers. The course of the first two layers coincides with the course of the longitudinal arches (lateral and medial), while the deeper layers rather coincide with the front and rear transverse arches. These muscles, as studies indicate, are more active during dynamic than static activities, an increase in their load-dependent activity is observed, and their important role in supporting the arches of feet is emphasized. These muscles work in synergy as a unit providing dynamic arch support during propulsion. From the point of view of physiotherapy, it is important that these muscles strengthen the foot when they are trained [33–35].

Many authors found links between the formation of the hallux valgus and the occurrence of other abnormalities within foot and ankle joint region. These disorders include first ray hypermobility, clubfoot position, tibialis posterior failure, generalized ligamentous laxity, first ray hypermobility, shortening of the calf triceps and transverse flatfoot [8, 36–38]. According to Kaphandji [39], under physiological conditions, the anterior transverse arch extends between the head of the first metatarsal bone and the head of the fifth metatarsal bone. It covers the heads of all other metatarsal bones, the second of which is placed the highest. This arch is stabilized by weak metatarsal plantar ligaments and only by one muscle – the transverse head of the big toe adductor. Studies conducted by Suzuki et al. [40] indicate that among people with hallux valgus, the first, second and third heads of the metatarsal head are lowered [41] and the sesamoids are shifted outwardly with a rotational deviation. People with hallux valgus experience muscular activity lesions of muscles located in the forefoot area. Arinci et al., in EMG studies, noted a decrease in abduction muscle activity among

patients with hallux valgus compared to adductor muscles. The observed muscular imbalance may be the cause of increasing deformity [42]. In turn, Lobo et al. observed, in the ultrasound image, a decrease in cross-sectional size and thickness of the big toe abductor and short flexor among people with hallux valgus. Interestingly, the thickness of the anterior, medial and posterior muscles and plantar fascia is greater among people with hallux valgus than in the control group [43]. Lesions in the cross-section, arrangement and size of structures located in the area of the first metatarsophalangeal joint were also noted in MRI scans [44]. The available literature emphasizes the need to include exercises that activate deep muscles in therapeutic programs [45–47]. Some researchers suggest that strengthening Abductor hallucis muscle may stop the occurring muscular imbalance in the early stages of deformity [5, 42]. Short foot (SF) and toe spread out (TSO) exercises are recommended. Kim et al. [45] using EMG, compared the activity of Abductor hallucis muscle and Adductor hallucis muscle during SF and TSO among people with benign hallux valgus. While performing the TSO exercises, they noted significantly more Abductor hallucis muscle activity than during SF. In addition, they observed a decrease in valgus angle during the TSO exercise. They did not observe differences in the activity of Adductor hallucis muscle.

Conservative treatment

The hallux valgus treatment method depends on the size of the deformity. In the case of mild to moderate deformities, mainly conservative treatment is used, while in the case of advanced deformities, surgical treatment. The main goal of conservative treatment is to reduce pain, stop the progress of deformities and improve daily functioning.

Practice

The available literature emphasizes the effectiveness of performing exercises to reduce pain and improve the position of the first toe. Bayar et al. [48] evaluated the effectiveness of a home exercise program among 20 women aged between 43 and 62 years old. The study subjects were divided into two groups. In the first group, the study subjects performed only the prescribed exercises, while in the second group, in addition to the exercises, the patients were covered with rigid strapping tape. The study subjects from both groups performed the same exercises: active toe abduction and passive toe abduction with traction in the first metatarsophalangeal joint of the toe. Exercises were performed twice a day for 10 repetitions for a period of 8 weeks. In the first group, among women performing only the recommended exercises, a significant reduction of pain was assessed using the VAS scale both at rest and while walking. In addition, a significant improvement in the toe position was observed. In turn, Kim et al. [46] assessed the effect of TSO exercises on changes in Abductor hallucis muscle cross-sectional size. The study involved 24 people (13 men, 11 women) between the ages of 19 and 29

with mild to moderate hallux valgus. The study subjects were randomly assigned to one of two groups. The study subjects from the first group were asked to perform TSO exercises for 8 weeks/4 times a week for 20 minutes. In addition, they were asked to wear an orthosis for more than 8 hours a day. The control group consisted of persons who were only supposed to wear an orthosis. There was a significant change noted in the position of the first toe and an increase in the cross-section of Abductor hallucis muscle in the first group. In turn, Arge et al. [23] offered a group of 7 women between 50 and 65 years old with advanced hallux valgus to participate in the exercise program. Study subjects performed 15 exercises recommended by the therapist at home for 8 weeks, twice a day for 20 minutes. Due to the severity of the deformities, the study subjects reported major pain and limited mobility in the first metatarsophalangeal joint of the toe was noted in the study. The home improvement program included exercises aimed at improving mobility in the metatarsophalangeal joint, proprioception and muscular endurance. A significant reduction of hallux valgus pain was noted in the follow-up examination. In addition, improvement of mobility in the first metatarsophalangeal joint was noted. The authors recommend a home exercise program before surgery. The available literature also points out the effectiveness of interactions in the area of manual therapy. Du Plessis et al. [49] in a randomized study of 15 persons with mild to moderate hallux valgus aged between 26 and 64 years old, assessed the impact of an innovative manual therapy protocol. The control group consisted of 15 persons using the abduction splint for putting on at night. The manual therapy protocol included mobilization of the metatarsophalangeal joint, cold therapy, mobilization of the joints of the foot and ankle joint. Four procedures were performed over a period of 2 weeks. Then two examinations were performed. The first examination was carried out one week after the end of treatment and the second one after 1 month. There were no changes in the position of the first toe, but there was a reduction in pain that persisted during the one-month follow-up period during which no manual procedures were used.

Braces and insoles

People with hallux valgus face a difficult choice of a variety of orthopedic aids aimed at stopping or slightly reducing the size of hallux valgus and pain. In practice, static braces for putting on at night only are used. They are dynamic, allowing walking. Orthotic insoles with a toe separator are used as well. Many authors emphasize the effectiveness of this method. Plass Ch. et al. [50] evaluated the effect of the 12-week program using dynamic orthoses on the level of pain and the position of the first toe among people with hallux valgus. 26 persons with mild to moderate hallux valgus participated in the study. After completing the rehabilitation, they experienced a significant reduction in pain reported during physical activity (walking and running).

There were no changes in the position of the first toe. The recorded result seems to be consistent with the result obtained by Torkki et al. [24]. 211 persons with painful hallux valgus were qualified for the project. Researchers compared the effectiveness of surgery compared to conservative treatment using orthosis among people with mild to moderate hallux valgus deformities. The control group consisted of persons who did not receive any treatment. Six months after the treatment, a reduction in pain was noted in the group of persons undergoing surgery and treatment with the use of orthoses. However, the study carried out again after a year showed that the intensity of pain was still lower only in the group of persons who had undergone the surgery. In the group of persons who used orthoses, pain remained at a comparable level as in the study after 6 months. In the control group, no significant changes were noted in both the first study as well as the second and third studies (after 6 months, after a year). The available literature includes publications describing the beneficial effects of using insoles and toe separators. Tang et al. [51] suggested a group of 12 women with painful hallux valgus to wear an insole with a toe separator. In the follow-up examination, after 3 months, there was a significant reduction in pain, improved functionality and improved toe position. In turn, Tehraninasr et al. [52] compared the effectiveness of two different methods of conservative treatment. They suggested a group of 15 women with painful hallux valgus to wear an insole with toe separator for 12 weeks. The control group consisted of 15 women who used an abduction splint for putting on at night for 3 months. There was no improvement in the first toe position in any of the groups. In the group of women wearing insoles with toe separators, a significant reduction of pain was observed, while in the group of female participants using abduction splints for putting on at night no such changes were found. The results obtained seem to contradict the results of the aforementioned studies conducted by du Plessis et al. [49]. The researchers suggested a group of 30 persons with mild to moderate hallux valgus deformities between 26 and 64 years of age to participate in the therapeutic program. Participants qualified for the project were randomly assigned to one of two groups. Persons from the first group underwent manual procedures performed by the therapist, while persons from the second group – control one, used the abduction splint for putting on at night for 3 weeks. A significant reduction of pain was observed among persons from the control group, however, the study conducted one month after stopping the use of the night splint showed that the pain increased again. The effectiveness of the comprehensive impact has been confirmed by the studies conducted by Abdalbarry [53]. He suggested a group of 56 women with moderate hallux valgus to participate in a therapeutic program. The study subjects were assigned to one of two groups. In the first group, 28 women participated in therapeutic sessions for 3 months three times a week. Each session included manual therapy procedures performed on the ankle and foot joints, manual stretching of the

Achilles tendon performed by the therapist and strengthening exercises. In addition, participants in the first group were asked to wear a toe separator for at least 8 hours a day. The control group consisted of 28 women who were not exposed to any interactions. In the first group, a significant reduction in pain, improved strength and a change in the position of the first toe were noted. Importantly, the persistence of these changes were noted after one year in the follow-up examination.

Kinesiology Taping

Kinesiology Taping is another method of interaction used to alleviate pain which is described in the literature. Many types of receptors are located in the dermis layers. The receptors of surface sensation receive various stimuli: touch and vibration, pain and temperature stimuli. These include Puccini, Meisner, Ruffini, Krause bodies, free nerve endings and Merkel bodies. The use of Kinesiology Taping mainly stimulates Merkel bodies, which react in situations of longer pressure. Merkel cells are neuroendocrine and epithelial. They produce neuromediators and hormones. The literature says that met-enkephalin released from neurosecretory vesicles and inflammatory leukocytes reacts with peripheral opioid receptors, which gives an analgesic effect [54]. The therapy uses both rigid and flexible strapping tapes (Kinesiology Taping). Depending on the method of application, a specific therapeutic effect (analgesic, decreasing swelling, corrective, increasing the range of motion in the joint) can be obtained. In the available publications, regardless of the type of tape used (rigid, flexible) and the manner of application, the possibility of obtaining a significant analgesic effect in the hallux valgus area is emphasized. An example is the study conducted by Lee et al. [55]. The researchers proposed applying a strapping to a 26-year-old woman with moderate bilateral deformity complaining of major toe pain when walking in shoes. Kinesiology Taping was performed every day for a period of 3 months. A significant reduction of hallux valgus pain was noted in the follow-up examination. This is also confirmed by the studies conducted by Jeon et al. [56]. The study group consisted of 15 persons with painful hallux valgus. The researchers noted a significant reduction in pain and improved toe position after just 4 weeks of regular strapping. Karabicak et al. [57] suggested a group of 21 women with mild to moderate hallux valgus to use Kinesiology Taping in conjunction with a home exercise program. The application was done on 1st, 3rd, 7th and 10th day of the treatment. 30 days after the start of therapy, a follow-up examination was conducted. A significant reduction of hallux valgus pain and improved position of the first toe were noted. The results obtained seem to be consistent with the results of the aforementioned studies conducted by Bayar et al. [48]. The authors compared the effectiveness of two therapeutic programs in a group of 20 women with mild deformity of the hallux valgus. The women were randomly assigned to one of two groups. Exercises

were performed by the female participants twice a day for a period of 8 weeks. In addition, the women from the first group were treated with rigid strapping tapes. The follow-up examination revealed that both groups experienced an improvement in the position of the first toe and a reduction in pain, but the inter-group comparison showed a better result in the group in which strapping was used in addition to the exercises. In turn, Radwan et al. [58] compared the effectiveness of two different ways of applying tapes on people with mild to moderate hallux valgus deformities. The study involved 30 persons who were randomly assigned to one of two groups. Kinesiology Taping was used in the first group, while in the second group, strapping with rigid strapping tapes. Persons from the first group as well as the persons from the second group performed exercises recommended by a physiotherapist at home for 8 weeks 3 times a day. The results of the follow-up examinations showed a significant change in the level of pain sensations among people from both the first and second group, but the group in which Kinesiology Taping was used was definitely better.

Physiotherapy

In physiotherapeutic practice, people with hallux valgus are often treated with physiotherapy procedures. The main purpose of using these procedures is to achieve analgesic and anti-inflammatory effects. Recommended procedures include: laser therapy, ultrasound, low frequency magnetic field and shock wave [59, 60]. There have been no publications confirming the effectiveness of the procedures used on a larger group of patients in the literature review from the last 10 years. Mainly publications in which individual case reports have been presented are available [59]. The beneficial effects of physical procedures are more often emphasized in publications dealing with the subject of rehabilitation after hallux valgus surgeries. The attention is mainly drawn there to the use of physical procedures in order to obtain an analgesic and anti-edema effects [59, 61, 62].

Pain is the main factor prompting the doctor to decide on surgery [27, 63]. It is worth using various methods of conservative treatment to reduce pain before making such a decision. As shown by the results of the studies conducted by various authors, the use of interactions in the area of physiotherapy and orthopedic measures (exercises, braces, Kinesiology Taping, physical therapy) can bring beneficial results in reducing pain. An important factor to maintain the longevity of the effects obtained is also the modification of the footwear worn.

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Streszczenie

Paluch koślawy jest jedną z najczęstszych deformacji w obrębie przodostopia. Przyczyny powstawania tej deformacji nie są do końca wyjaśnione. W dostępnej literaturze wymienia się zarówno czynniki wewnętrzne, jak i zewnętrzne. Badacze zajmujący się tematyką palucha koślawego podkreślają, iż wspomnianej deformacji towarzyszą: dolegliwości bólowe, obniżona jakość życia, zmieniona statyka stopy, problemy natury kosmetycznej oraz problemy z zakupem właściwego obuwia. Pojawienie się dolegliwości bólowych może w istotny sposób wpłynąć na jakość codziennego funkcjonowania oraz na szeroko rozumianą jakość życia. Celem poniższej publikacji jest przegląd wybranych oddziaływań z zakresu fizjoterapii i zaopatrzenia ortopedycznego w terapii osób zgłaszających dolegliwości bólowe w obrębie palucha koślawego.

Słowa kluczowe: paluch koślawy, dolegliwości bólowe, leczenie zachowawcze
