



Abnormalities of the Forefoot and Conventional Therapy

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Abstract

In clinical practice, forefoot problems are frequently observed. Pain and deformity in the forefoot can affect gait function and lower quality of life. The common forefoot conditions discussed in this review are treated conservatively with an orthosis or insole. The Metatarsal (MT) area of the foot is affected by the painful ailment known as metatarsalgia. MT pain can be reduced by using an MT pad, MT bar, or forefoot cushion. A deformity called hallux valgus is defined by lateral deviation of the hallux and medial deviation of the first MT. Patients with hallux valgus frequently use a toe spreader, valgus splint, and bunion shield. Hallux limitus and hallux rigidus are painful restrictions on the first metatarsophalangeal joint's ability to dorsiflex. Using a rocker sole or kinetic wedge foot orthosis can help ease hallux limitus or rigidus problems. Sagittal plane abnormalities of the lesser toes include hammer, claw, and mallet toes. High-pressure areas in the proximal or distal interphalangeal joints, as well as underneath the MT heads, might be covered with toe sleeves or cushioning. Insoles with MT off-loading can also be utilized to treat symptoms brought on by smaller toe abnormalities. A benign neuroma of the intermetatarsal plantar nerve called Morton's neuroma is a painful condition that affects the MT region. A more cushioned insole, the plantar pad, or the MT bar would all be beneficial.

Keywords: Orthosis; Metatarsalgia; Hallux valgus; Hallux limitus; Hallux rigidus; Interphalangeal joints; Intermetatarsal plantar nerve

Introduction

Extremely common in the general population, forefoot abnormalities can make it difficult for individuals to go about their daily lives. Patients who have acute discomfort during gait may find it difficult to move around, which might impair their physical function. Forefoot diseases are frequently brought on by wearing uncomfortable or high-heeled shoes, misaligned feet, and foot arthropathy. Metatarsalgia, hallux valgus, hallux limitus/rigidus, smaller toe deformities (hammer, claw, and mallet toes), and Morton's (interdigital) neuroma are the most prevalent forefoot diseases, while there are other conditions as well. Prior to surgical surgery, conservative treatment is typically tried for the management of certain conditions. Corrective footwear, the use of insoles or orthoses, such as pads or supports, oral medications, and steroid injections are examples of conservative therapy. Forefoot diseases are very common, although the effectiveness of conservative therapies is rarely investigated. By emphasizing shoe changes and the use of insoles or orthoses, we hope to summarize common forefoot diseases and propose conservative therapies in this study [1].

Metatarsalgia

The term "metatarsalgia" refers to pain in the second, third, and fourth rays of the Metatarsal (MT) head on the plantar aspect of the foot. The majority of the pressure is centered here during the toe-off phase of gait. Metatarsalgia can be caused by increased weight-bearing pressure on the MT head as a result of the foot's deteriorating biomechanical health [2].

Three categories of metatarsalgia exist: primary, secondary, and iatrogenic. First ray insufficiency is brought on by the first ray's inability to support stresses during weight bearing, which causes pressure to be transferred to the smaller MT. Several disorders, including hallux valgus, pes planus, and hypermobility of the first Metatarsophalangeal (MTP) joint, can cause first ray insufficiency. Indirect forefoot overloading causes secondary metatarsalgia. Foot trauma can change the alignment of the foot, displacing the MT either rotationally or angularly. The biomechanical alignment of the foot is compromised by fracture or injury to the MTP joint's supporting components (the plantar plate and collateral ligaments), which causes forefoot instability and pain [3].

Iatrogenic metatarsalgia develops as a result of past forefoot surgery, including changed MT position following proximal MT osteotomy and severe MT shortening following MT osteotomy or hallux valgus surgery. Iatrogenic metatarsalgia can result from post-operative complications such as nonunion, malunion, or avascular necrosis [4].

Hallux valgus

The most prevalent foot deformity, hallux valgus, is defined by medial first metatarsal deviation and lateral hallux deviation. Approximately 23% of adults between the ages of 18 and 65 and 35% of people over the age of 65 have hallux valgus. Patients are diagnosed with hallux valgus when the angle between the shaft axis of the first MT and the proximal phalanx of the hallux is greater than 15°. There are three levels of hallux valgus: mild (15–20°), moderate (21–39°), and severe (40°). Subluxation of the first MTP joint may be present in extreme cases. Patients with hallux valgus frequently have pain in the MTP joint, particularly when they are bearing weight.

The medial arch's position is maintained by the first ray, which carries a lot of weight. Hallux valgus can arise for a number of reasons, including pes planus, tight footwear, and foot abnormalities, which all compromise the integrity of the first ray. A conservative course of treatment should be started before surgery. Patients should wear soft, wide-toed shoes instead of restrictive or high-heeled footwear. Hallux valgus is proposed to be treated with a toe spreader, valgus splint, and bunion shield. The toe spreader separates the first and second toes and lessens bunion pain by minimizing MT head protrusion [5].

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Hallux limitus

The first MTP joint's reduced sagittal Range of Motion (ROM) is referred to as hallux limitus. Additionally, sagittal ROM is completely absent in a disease known as hallux rigidus. 35–60% of individuals over the age of 65 develop hallux limitus or rigidus. Additionally, functional hallux limitus refers to a functional reduction in ROM of the first MTP joint that happens during walking but has no anatomical limits. Osteoarthritis, trauma, rheumatoid arthritis, age, female sex, hypermobile first ray, hallux valgus, and pes planus are some of the risk factors for hallux limitus/rigidus. About 60% of a person's body weight is supported by the first MTP joint. Hallux rigidus or limitus can be treated using a kinetic wedge foot orthosis. Utilizing a cutout beneath the first MT head appears to promote dorsiflexion at the first MTP joint and free up the first ray's ability to plantarflex in this way. The first MTP joint's plantar pressure is lessened with the kinetic wedge foot orthosis [6].

Mallet toe and hammer claw

Sagittal plane abnormalities of the lesser toes include hammer, claw, and mallet toes. These abnormalities occur in about 30% of people. A flexion deformity at the Proximal Interphalangeal (PIP) joint of the toe and a modest MTP joint extension deformity are referred to as hammer toes. A hyperextension deformity at the MTP joint with secondary flexion deformities in the PIP and Distal Interphalangeal (DIP) joints are considered to be claw toes. Less severe toe abnormalities can develop as a result of hallux valgus. Hallux valgus shortens the first ray, which puts more tension on the lesser toes by loosening the plantar fascia and decreasing the windlass impact on the first toe. The smaller toe's supporting structures are more susceptible to failing as a result. Less severe toe abnormalities can also be brought on by diseases such as inflammatory arthritis, neuromuscular problems, and diabetes mellitus [7, 8].

Morton's neuroma

Morton's neuroma is a perineural fibrosis-related compression neuropathy of the plantar digital nerve. Morton's neuroma is thought to afflict 30% of people and is more common in women (4:1 female:male ratio). The third space is the one that is most frequently affected (66% of cases), followed by the second (32%), and the fourth (2% of instances). The forefoot will feel scorching and tingling, and the affected

toe may occasionally become numb. Just distal to the MT transverse ligament and before the digital nerves' bifurcation, Morton's neuroma, a swelling of the interdigital nerve, develops. Morton's neuroma is thought to be caused by entrapment of the interdigital nerve between the intermetatarsal ligaments. A physical examination can be used to identify Morton's neuroma. The patient's typical pain should be replicated by applying plantar pressure to the region between and immediately surrounding the MT heads. Additionally, simultaneous lateral, dorsal, and plantar compression of the MT heads can result in an uncomfortable Mulder click [9, 10].

Conclusion

Additional research is required to define the usefulness of these treatments for forefoot problems. Clinicians should think about using different techniques to treat forefoot diseases after reading this review.

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