

High-Heeled Shoes and Musculoskeletal Problems

Kim Christensen, DC, DACRB, CCSP, CSCS

Looking good is what counts most! At least that is what one might conclude, faced with the popularity of high-heeled fashion footwear. A recent survey of 620 women established that the majority was dissatisfied with their dress shoes because they hurt their feet, even though most had paid between \$50 and \$200 per pair. Not surprisingly, women have about 90 percent of the nearly 800,000 annual surgeries for neuromas, bunions, and "hammer toes." ¹ There is a clear link between the types of shoes worn and the development of abnormal foot conditions.

Convincing patients not to wear high heels is another story, however, this information should help you make a strong and logical appeal. Additionally, custom-made shoes - which combine fit, fashion, and the postural support of custom orthotics - are now available, so you can offer a sensible solution.

Forefoot Compression Injuries

A neuroma, also called interdigital neuritis, results from compression of a plantar nerve or a bursa between two metatarsals. The resulting inflammation and fibrosis can diminish both nerve and vascular flow, resulting in a burning sensation that extends into the toes. The most common area involved is between the third and fourth metatarsals but may occur at any site of compression. A three-inch heel was found to create seven times more stress on the forefoot than a one-inch heel." ¹

Brantingham et al. reported the results of a clinical trial involving 29 patients suffering from Morton's neuroma. The average pre-treatment history of foot pain was 19 months. All patients received a series of foot manipulations, with the number of treatments ranging from three to 26. The manipulations included mobilization of the metatarsal and MTP joints, forefoot mobilization relative to the rear foot, ankle mobilization, and specific adjustments of the cuboid and cuneiforms. Additionally, 23 of the patients (80 percent) were fitted with orthotics to control excessive movements and hyperpronation. A follow-up, three months after treatment established that 83 percent reported moderate-to-excellent relief of their pain. ² Adjustments that restore the articulations, combined with flexible orthotics that maintain the corrections, provide a true long-term solution in many cases, but high heels (higher than two inches) are nearly impossible to properly fit with orthotics.

Shoe Styles and Biomechanics

Although the Brantingham et al. study did not comment on modifying footwear, a long history of research has attempted to link shoe style with altered biomechanics, necessary for the development of these common conditions among women. ³⁻⁵ Some of the earliest studies that compared gait in low-heel and high-heel shoes were performed by Schwartz et al. They reported changes in the distribution of weight in the forefoot with a shift away from the fifth metatarsal head in high-heel shoes. ⁶ Increased

weight distribution over the third and fourth metatarsals, combined with the compressive toe box common to most high-heel shoes, is a logical mechanism for the development of a neuroma. Considering that 59 percent of women surveyed report wearing high-heel shoes at least one to eight hours a day, unless the underlying stress is removed by changing shoe styles, the symptoms associated with neuromas are likely to return. ⁷

Loss of Arch Integrity

The same biomechanical derangement responsible for neuroma can cause a *hallux valgus* and bunion formation. In this condition, one or more of the foot's three arches has often collapsed or lost integrity, which changes normal toeing off and weight transfer in the forefoot. Lateral deviation of the proximal first phalanx changes the direction of muscle attachments on the great toe. Contraction of these muscles leads to abnormal abduction of the phalanx and the cycle of deviation continues.

An early clue that the patient is losing integrity of the transverse arch is excessive callus formation directly under any of the metatarsal heads, but especially two through four. This is the body's attempt to lift and pad the fallen structures. Metatarsal corrections built into flexible, custom orthotics can lift the metatarsals from the bases and remove the pressure from the metatarsal heads.

Rear Foot Conditions

Wearing heels also concentrates abnormal forces on the ankle and rear foot, relative to the forefoot. The tibiotalar joint is a *tightly interlocked joint*, exposed to extreme mechanical conditions during single limb support, and is susceptible to repetitive, traumatic forces.⁸ Anyone who has seen an inexperienced high-heel walker knows exactly what repetitive microtrauma is. The integrity of this joint is ensured by tension produced as the wedge-shaped talus is secured between the malleoli. However, the forced plantarflexion associated with high-heel use decreases the degree of tension, because of the shape of the wedge (wider anteriorly).

Although slight, this loss of tension decreases the optimal biomechanical relationship. According to Kapandji: "There is only a single position of articular congruence for the subtalar joint, i.e. the median position. The foot is then straight without any inversion or eversion and it is the position adopted by a normal foot lying flat on a horizontal plane..." He continues: "This neutral position, where the articular surfaces are kept together by the force of gravity, and not by the ligaments, is stable and can be maintained for a long time owing to the congruence of the articular surfaces. All other positions are unstable and are associated with a variable degree of articular incongruence."⁸

In extreme cases, the plantarflexion associated with heels may be responsible for injuries as serious as inversion sprains. Remember also, that because of the lack of muscular attachments, the talus is nourished only by a weak blood supply, accompanying ligaments. "Thus it has a *barely adequate arterial supply under normal conditions*."⁸ This is an unfortunate situation for a bone faced with remodeling in response to repetitive microtraumas.

Conclusion

Whether or not your patient turns an ankle, high heels disrupt gait and posture for the entire body. In their study of varying heel heights, Gastwirth et al. observed: "Proximal symptomatology associated with wearing high heels, such as knee, hip and back problems, may in part be related to (a) restriction

of subtalar joint pronation. The subtalar joint pronation that normally occurs at heel strike aids in shock absorption. If this pronation is limited, an increased shock wave must be absorbed by the joints proximal to the foot." ⁹

If your female patients continue to wear their high-heeled shoes, despite your best recommendations, it isn't your fault if you cannot "cure" their every ache and pain. However, because fashion is still "in fashion," your patients will want an alternative to high heels. According to at least one study, it is not necessary to wear completely flat shoes. Only heel heights greater than 5 cm (2 inches) significantly influenced lower extremity mechanics and gait.¹⁰ That may be a compromise that many of your fashion-conscious patients could live with.

References

1. The low down on high heels. *AOFAS Online* (<http://www.aofas.org/highheels.htm>).
2. Brantingham JW et al. Chiropractic management of Morton's metatarsalgia (Morton's neuroma): a review of 29 patients. *Chiropractic Technique* 1994; 6(2):61-66.
3. Craigmile DA. Incidence, origin and prevention of certain foot defects. *Br Med J* 1953; 2:749.
4. Feinberg H. Women's fashion shoes. *JAPA* 1969; 59:360.
5. Gorecki GA. Shoe-related foot problems and public health. *JAPA* 1978; 68:245.
6. Schwartz RP, Heath AL, Misiek W. The influence of the shoe on gait. *J Bone Joint Surg* 1935; 17:406.
7. The Gallup Organization, Inc. *Women's Attitudes and Usage of High Heel Shoes*. August, 1986.
8. Kapandji IA. *The Physiology of the Joints* (5th ed.). New York: Churchill Livingstone Inc. 1989:148-206.
9. Gastwirth BW, et al. An electrodynamic study of foot function in shoes of varying heel heights. *J Am Podiatric Med Assoc* 1991; 81:463-472.
10. Ebbeling CJ, et al. Lower extremity mechanics and energy cost of walking in high-heeled shoes. *JOSPT* 1994; 19:190-196.

AUGUST 2000