

Scarf Osteotomy

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KEYWORDS

• Hallux valgus • Bunion • Scarf • Osteotomy • Metatarsal

KEY POINTS

- The scarf osteotomy is an extremely powerful and versatile method of correcting hallux valgus.
- Scarf osteotomy can be used to correct a large range of deformities, including an altered distal metatarsal articular angle.
- As with all operations, complications may arise, but the rate can be diminished by accurate preoperative planning and osteotomy technique.

ETIOLOGY

Both extrinsic and intrinsic factors have been reported as causative factors in hallux valgus. Various studies have shown that shoe wearing significantly increases the prevalence of the deformity.^{1–3} Work by Sim-Fook and Hodgson³ in the 1950s showed a 33% association between shoe wearing and hallux valgus (compared with 2% in the bare-footed population). High heels have also been attributed to the deformity⁴ with the rationale of increased first-ray loading as the foot slides forward into the toe box being suggested as the main driving force.⁵ It is deemed, however, that this increased forefoot loading is likely to be more influential in progression rather than initiation of deformity.⁶ Other causes of increased forefoot loading, such as occupation, obesity, and excessive walking, have not been shown to have a causative link with hallux valgus.^{7–10}

Intrinsic factors also feature, with genetics being a forerunner. Articles have quoted between 68% and 90% of affected patients showing a familial tendency.^{11,12} It has been documented that gender is also a significant factor. It is well known that women are far more likely to seek surgical treatment for their hallux valgus deformity (female to male ratio 15:1).^{13,14} However, it is unclear as to how much this ratio is influenced by the increased prevalence of abnormality (owing to a higher prevalence of laxity and first-ray hypermobility)^{15,16} being secondary to gender, and the increased tendency for women to wear high-heeled or poorly fitting shoes.^{17,18}

A large body of work has been published regarding pes planus and its role in hallux valgus. It is thought that although it probably does not initiate the deformity it seems to

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increase the rate of progression,¹⁹ which is explained primarily by the increased loading on the medial border of the hallux secondary to excessive pronation.²⁰ However, it should be noted that pes planus has not been shown to have a negative effect on outcomes following surgery for hallux valgus.^{16,21}

First-ray hypermobility has been reported to be responsible for hallux valgus.^{22,23} A positive correlation has been shown between hallux valgus and first-ray hypermobility.²⁴ There are also several studies that have shown stabilization of the tarsometatarsal joint (TMTJ), without fusion, following first-ray realignment procedures.^{25,26} This finding leads to the conclusion that hypermobility may be secondary to a decrease in soft-tissue stability as opposed to being a primary force behind the hallux valgus deformity.²⁷ The other confounding factor in this debate is the lack of clinical correlation in determining how one accurately delineates first-ray hypermobility.²⁴

The windlass mechanism is another deforming force in hallux valgus. On weight bearing, the hallux valgus deformity is increased owing to the tightening of the plantar fascia and concurrent pronation.²⁸ On activation of the windlass mechanism on heel raise, the first metatarsophalangeal joint (MTPJ) has to reciprocally dorsiflex. Tightening the plantar fascia exerts an opposing force to the ground reaction force on the MTPJ. These opposing forces result in the hallux following the path of least resistance and a subsequent increase in deformity.²⁹ It has been proposed that first-ray hypermobility may be partially explained by transmission of these forces through a rigid MTPJ.³⁰

PATHOANATOMY

It is thought that hallux valgus deformity follows a stepwise deterioration.^{31,32} Critically the medial structures (medial sesamoid and medial collateral ligaments) of the MTPJ must fail.³³ This failure permits varus movement of the metatarsal, which can be exacerbated by instability at TMTJ. The proximal phalanx responds by a relative valgus movement attributable to its attachments to the phalangeosesamoid ligament, the plantar plate, and adductor hallucis. The resulting position of the metatarsal head leads to erosion of the cartilage covering the medial sesamoid as well as the nearby crista. When coupled with weakness of the medial sesamoid ligament, the deformity can progress rapidly.²⁹ The lateral sesamoid tends to be left uncovered as the head of the metatarsal slips from its original position overlying the sesamoid apparatus.¹⁹ Owing to the medial prominence, the overlying bursa thickens as it is subjected to abnormally high pressures from footwear. The deformity then progresses as the long flexors and extensors acting on the hallux function as adductors as they bowstring laterally.³⁴ Secondary to the pull of adductor hallucis and lateral head of flexor hallucis brevis, combined with the dysfunction of the medial musculature (medial head of flexor hallucis brevis and abductor hallucis), the first metatarsal pronates, resulting in offloading of the first ray onto the lesser toes.³⁵ This process can result in lesser toe clawing and associated metatarsophalangeal subluxation.

TECHNIQUE

The first descriptions of a z-shaped osteotomy were by Burutaran³⁶ and Zygmunt.³⁷ However, the term scarf osteotomy was first used by Weil, who presented results from more than 1000 cases.³⁸ Scarf is a carpentry term describing beveling the ends of 2 pieces of wood and securely fastening them so that they overlap to create one continuous piece. This technique was popularized by Weil^{38,39} and Barouk^{40,41} as a versatile method of correcting hallux valgus while maintaining the blood supply to the metatarsal head. It also has rigid fixation, allowing early mobilization.

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