ABSTRACT

**Purpose.** To report outcome of Scarf osteotomy with or without proximal phalangeal osteotomy for correction of severe hallux valgus deformity.

**Methods.** Records of 48 women and 4 men aged 28 to 68 (mean, 52) years who underwent 57 Scarf osteotomies with or without proximal phalangeal osteotomy for severe hallux valgus by a single surgeon were reviewed. The patients had a hallux valgus angle (HVA) of up to 55°. An additional proximal phalangeal osteotomy was performed in 11 of the patients whose hallux valgus persisted (HVA >10°). The American Orthopaedic Foot and Ankle Society (AOFAS) hallux score, the HVA and intermetatarsal angle (IMA) on radiographs, and the complication rate were assessed.

**Results.** The mean follow-up period was 26 (range, 24–36) months. The mean AOFAS hallux score improved from 57.4 (range, 49–64) to 91.6 (range, 75–100). The mean HVA improved from 38.1° (range, 28°–52°) to 12.8° (range, 5°–20°). The mean IMA improved from 17.0° (range, 13°–24°) to 6.8° (range, 3°–10°). One patient developed chronic regional pain syndrome. There were no instances of non-union, delayed union, or malunion of the osteotomy site.

**Conclusion.** Scarf osteotomy with or without proximal phalangeal osteotomy is an effective treatment for correcting severe hallux valgus deformity.

**Key words:** hallux valgus; metatarsophalangeal joint; osteotomy

INTRODUCTION

Hallux valgus involves medial deviation of the first metatarsal, subluxation or dislocation of the first metatarsophalangeal joint (MTPJ), pronation of the big toe, and/or lateral shift of the sesamoid complex (owing to the flattened sesamoid ridge). Hallux valgus can be idiopathic or secondary to rheumatoid arthritis, poorly fitted shoe wear, connective tissue disorder, or neuromuscular disorders. Surgical correction of hallux valgus involves correction of alignment with a metatarsal osteotomy and soft-
tissue release. In general, distal osteotomies of the first metatarsal are recommended for mild to moderate hallux valgus deformities, whereas more proximal metatarsal osteotomies are advocated for severe deformities.\textsuperscript{1,2} Scarf osteotomy is a Z-step cut osteotomy of the first metatarsal and helps to reduce the increased intermetatarsal angle (IMA). Proximal phalangeal (Akin) osteotomy is used as an adjunct if the deformity persists after Scarf osteotomy. We report outcome of Scarf osteotomy with or without proximal phalangeal osteotomy for correction of severe hallux valgus deformity.

**MATERIALS AND METHODS**

Records of 48 women and 4 men aged 28 to 68 (mean, 52) years who underwent 57 Scarf osteotomies with or without proximal phalangeal osteotomy (Fig.) for severe hallux valgus between June 2007 and June 2010 were reviewed. All procedures were undertaken by a single foot and ankle surgeon. Indications for surgery were pain and hallux valgus deformity that failed to respond to conservative treatment. The patients had a hallux valgus angle (HVA) of up to 55º. Patients with severe osteoarthritis of the first MTPJ, first tarsometatarsal joint instability, or with open epiphysis were excluded.

An incision was made in the first intermetatarsal space, and the lateral capsule, adductor tendon, and the sesamoid of the first MTPJ were released. A second incision was made on the medial aspect of the first ray, and the medial bony eminence was excised and a Z-step cut (Scarf) osteotomy of the first metatarsal was performed.\textsuperscript{4} The distal fragment was rotated and translated laterally to achieve correction, and fixed with 2 Barouk screws. Medial capsulorrhaphy was then performed. An additional medial closing wedge proximal phalangeal osteotomy was performed and fixed with a screw if the hallux valgus persisted (HVA >10º). The additional osteotomy was performed in 11 of the patients.

Postoperatively, patients were mobilised in heel-bearing shoes for 6 weeks, followed by full weight-bearing with normal footwear. Patients were followed up at weeks 6 and 12 and months 6, 12, and 24. The American Orthopaedic Foot and Ankle Society (AOFAS) hallux score, the HVA and IMA on radiographs, and the complication rate were assessed.

**RESULTS**

The mean follow-up period was 26 (range, 24–36) months. No patient was lost to follow-up. The mean AOFAS hallux score improved from 57.4 (range, 49–64) to 91.6 (range, 75–100). The mean HVA improved from 38.1 (range, 28–52) to 12.8 (range, 5–20). The mean IMA improved from 17.0 (range, 13–24) to 6.8 (range, 3–10). Three patients had superficial infections, which resolved after antibiotic treatment. One patient developed chronic regional pain syndrome. There were no instances of non-union, delayed union, or malunion of the osteotomy site.

**DISCUSSION**

The configuration of Scarf osteotomy is more stable than the proximal or distal osteotomies in terms of weight-bearing stresses.\textsuperscript{5,6} After Scarf osteotomy, the mean AOFAS score was reported to improve from 61.5

![Figure](image-url)  
**Figure** Hallux valgus deformity corrected with Scarf osteotomy (a) with or (b) without proximal phalangeal osteotomy.
(range, 34–76) to 90.3 (range, 58–100), whereas the mean AOFAS forefoot score was reported to improve from 50.1 to 91.8 These outcomes are consistent with the findings in our study.

70 to 100% of Scarf osteotomies are combined with proximal phalangeal osteotomy and distal soft-tissue realignment, but in our study this figure was only 19%, as the HVA could be corrected to <10º in 81% of patients. Better correction of hallux valgus is achieved when Scarf osteotomy is combined with proximal phalangeal osteotomy.

Scarf osteotomy is a rotational and translation osteotomy, and thus both the IMA and HVA can be corrected. One study reported that the mean HVA improved from 31.4º (standard deviation [SD], 8.0º) to 11.0º (SD, 10.8º), and the mean IMA improved from 13.0º (SD, 4.2º) to 6.1º (SD, 3.2º). Complications of Scarf osteotomy include troughing of the metatarsal, recurrence of deformity, delayed union, rotational malunion, fracture, and infection. One study reported a peri-operative complication rate of 6% in the first 100 Scarf osteotomy procedures; 3 of these involved a split first metatarsal. Stiffness of the first MTPJ is the most frequent complication (which can be improved with time). Only 1% of patients had osteotomy displacement and none had non-union of the osteotomy. After modifying the operative technique to limit the short arm of the Z-osteotomy to 2 to 3 mm in depth and adjust the direction of the long arm of the Z-osteotomy, the rate of troughing decreased from 35% to 1%. In a study of over 1000 cases, none developed non-union and stress fracture occurred in 2 cases only. None of our patients developed non-union, delayed union, or malunion either.

CONCLUSION

Scarf osteotomy with or without proximal phalangeal osteotomy is effective for correcting hallux valgus deformity, with low complication rates. Nonetheless, large, long-term studies comparing the various osteotomies such as Scarf, basal, and chevron are warranted.

DISCLOSURE

No conflicts of interest were declared by the authors.

REFERENCES