



Scarf Osteotomy For Correction Of Hallux Valgus Deformity: Radiological And Clinical Outcome

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Abstract

Background- Scarf osteotomy of the first metatarsal bone to correct hallux valgus deformity has benefited from a number of improvements over the past two decades, most notably regarding the internal fixation method.

Aims and Objectives- This article aims to radiographically and clinically evaluate the results of the surgical correction of hallux valgus using the scarf technique. The pre- and postsurgical hallux valgus angles – metatarsophalangeal angle (MP), intermetatarsal angle (IM), and degree of dislocation of the sesamoids – were retrospectively evaluated, as well as their clinical parameters of volar and dorsal plating for the management of dorsally displaced distal radius fractures.

Materials and methods- The study was conducted on patients attending orthopaedic OPD and emergency in our tertiary care hospital. 44 cases of scarf osteotomy were performed in 35 patients with moderate and severe hallux valgus. The American Orthopaedic Foot and Ankle Society (AOFAS) score, visual analogue scale (VAS) score, range of motion of the first metatarsophalangeal joint, and radiographic results were evaluated.

Results- The mean hallux valgus angle and the mean first intermetatarsal angle improved from an average of 32.2° and 14.3°, respectively, to an average of 12.5° and 8.6°, respectively. The distal metatarsal articular angle improved from an average of 18.7° to 12.4°. The preoperative mean AOFAS and VAS scores were 47 points and 7 points, respectively, which improved to 86 points and 1 point, respectively, at the final follow-up.

Conclusion- Scarf osteotomy improves the MP and IM angles and corrects the position of the sesamoid, as well as improves the AOFAS.

Keywords: Metatarsal bones, Hallux valgus, Scarf osteotomy

Introduction

Hallux valgus is a common condition and surgical correction has remained a challenge over the last 100 years with at least 130 procedures being described.¹ The choice of operation depends principally on the severity of the deformity.^{2,3} For mild and moderate deformities,

distal osteotomies of the first metatarsal joint such as the Chevron,⁴ Austin, Wilson or Mitchell techniques are used.

A proximal metatarsal osteotomy is recommended for more severe deformities because it allows a greater degree of correction.³ This may be at the expense of stability and bony healing. The Scarf osteotomy has gained popularity because of its inherent stability, minimal shortening⁵ of the first metatarsal and ease of internal fixation.

Meyer⁶ first described the greater stability of this osteotomy (Z step cut) but initially its use was limited probably because of a lack of sophisticated

instruments. Recently, Weil and Borelli⁷ in the USA and Barouk⁸⁻¹¹ in France have contributed to its development. Nevertheless, most of the studies have been retrospective.¹²⁻¹⁸

We present the results of a prospective study of the Scarf osteotomy for the treatment of hallux valgus.

Aims and Objectives of Study:

This article aims to radiographically and clinically evaluate the results of the surgical correction of hallux valgus using the scarf technique.

Materials and Methods:

Patients attending orthopaedic OPD and emergency in our tertiary care hospital. All 44 cases (35 patients) that underwent the scarf osteotomy and were available for at least 1 year of follow-up were included in this study.

There were 4 males and 31 females. Their mean age was 42 years (range, 18 to 65 years). Nine patients had hallux valgus on both feet, 21 patients on the left foot, and 23 patients on the right foot. The average follow-up period was 19 months (range, 9 to 25 months).

American Orthopaedic Foot and Ankle Society (AOFAS) first metatarsophalangeal score, visual analogue scale (VAS) score, and range of active motion of the first metatarsophalangeal joint were measured before the operation and at the last follow-up for clinical evaluation.

All patients underwent weight-bearing plain roentgenography of the anteroposterior and lateral sections of the feet before and after the operation. The hallux valgus angle (HVA), inter-metatarsal angle (IMA), distal metatarsal articular angle (DMAA), height of the first metatarsal-cuneiform bone, and the first metatarsal-talar angle were measured and compared before and after operation.

Operation method and postoperative treatment:

The medial side of the patients' feet was shifted upward, and a medial skin incision of about 5 cm was made between the first metatarsal-cuneiform joint and the first metatarsophalangeal joint on the medial side of the feet.

Incision was performed in the medial articular capsules of the first metatarsophalangeal joint and

some of the relaxed articular capsules were removed, and then the first metatarsal head was exposed.

A Z-shaped osteotomy line was marked on the medial surface of the first metatarsal bone.

The osteotomy was performed using an oscillating saw on the medial surface of the first metatarsal. (Figure-1)

The distal osteotomy fragment was transferred and rotated outward to reduce the first-second IMA. Two cortical screws were used to fix the two osteotomy fragments. The excised articular capsules were sutured, and the wound was sutured. A compression gauze bandage was used to maintain a fixed posture. (Figure 2 and 3)

A bulky compression dressing is applied to the forefoot, and the foot is placed in a position of maximal elevation for 48 to 72 hours.

At 3 weeks, if the wounds are healed, the sutures are removed and adhesive strips are applied if needed; leaving the sutures in longer has no untoward effect. Some type of immobilizer or toe spacer to hold the toe in proper alignment is used. The toe spacer is worn for 6 weeks. At 12 to 14 weeks, a reasonably attractive shoe usually can be worn.

Statistical Analysis

Statistical analysis was performed using SPSS ver. 12.0, and the results were compared using paired t-test and Student t-test. A p-value < 0.05 was considered statistically significant.

Results:

The average AOFAS score significantly improved from 47 points preoperatively to 86 points postoperatively (p = 0.000). The average VAS score significantly decreased from 7 points preoperatively to 1 point postoperatively (p = 0.000). The range of active motion of the first metatarsophalangeal joint was reduced in two cases (4.5%) after operation.

On the radiological evaluation, the average HVA significantly reduced from 32.2° (range, 20° to 43.6°) preoperatively to 12.5° (range, 18.4° to 10.5°) postoperatively (p = 0.000). The average IMA also significantly decreased from 14.3° (range, 11.9° to

20.9°) before operation to 8.6° (range, 11.4° to 5.5°) after operation ($p = 0.000$). The average preoperative DMAA of 18.7° significantly decreased to 12.4° postoperatively ($p = 0.000$).

The average height of the first metatarsal-cuneiform joint remained unchanged postoperatively at 15.9 mm (range, 10.8 to 20.7 mm; $p = 0.946$). The average first metatarsal-talar angle significantly increased from

4.1° (range, 0.3° to 9.3°) preoperatively to 7.1° postoperatively ($p = 0.000$).

On postoperative complications, troughing of osteotomy fragments was reported in one case, and three cases showed recurrence of hallux valgus and underwent the operation again. There was no wound infection, nonunion, and fatigue fracture at the osteotomy site.

Figure 1: Scarf Osteotomy of 1st metatarsal

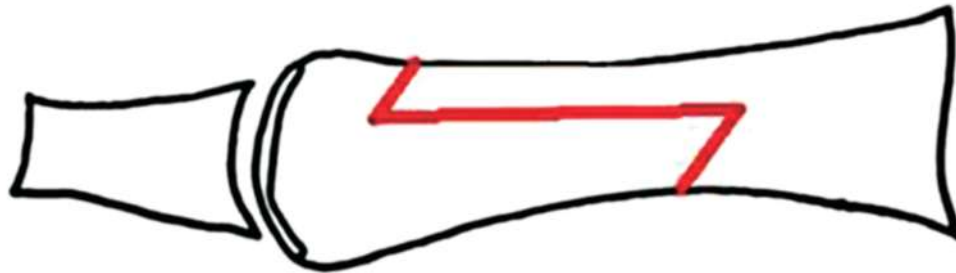


Figure 2: Clinical picture, A- before correction, B- after correction



Figure 3: Radiographic image, A-before correction, B- after corrective osteotomy and fixation



Discussion:

‘Scarf’ is the English translation of the phrase le trait de Jupiter des Charpentiers. It is a technique used by carpenters to increase the size of an entrance. Beams of timber are secured longitudinally together after notching or grooving the ends thereby allowing a degree of overlap. They are then fastened firmly as one piece.

Although it is accepted that no single operative procedure can address the wide range of deformity of hallux valgus the Scarf osteotomy has become widely used because of its great versatility. It allows lateral displacement of the plantar bone fragment thus reducing the IMA, medial displacement of the capital fragment in cases of hallux varus, plantar displacement to increase the load of the first ray and vice versa, elongation in cases of a short first metatarsal,

and shortening in cases of a long first metatarsal.⁷⁻¹⁰ In addition, it avoids the complication of metatarsus elevates associated with other proximal metatarsal osteotomies.¹⁹

Modifications of the Scarf osteotomy have been described,^{5,20,21} but they all have in common a Z-type first metatarsal osteotomy which is internally fixed, a lateral release, excision of the medial bony eminence and a medial capsulorrhaphy.¹⁰

Rigid compression of large areas of bone on bone provide a good environment for primary bone healing

thus allowing early return to normal weight-bearing and exercises to prevent stiffness of the joint.²⁰ Cadaver studies have confirmed that under loaded conditions the Scarf osteotomy has double the stability of a distal Chevron osteotomy or a proximal crescentic osteotomy.^{22,23} The patients in our series were allowed to bear weight on the heel and then immediately return to full weight-bearing when the plaster was removed at three weeks, without any significant complications.

In this study, the IMA improved from an average of 14.3° to an average of 8.6°, the HVA improved from an average of 32.2° to an average of 12.5°, and the AOFAS score improved from an average of 47 to an average of 86.

Conclusions:

Our results suggest that the scarf osteotomy could show excellent results in terms of the correction of the HVA, IMA, and postoperative satisfaction in patients with moderate to severe hallux valgus deformity.

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