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Technique 3: Scarf Osteotomy

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Abstract

The Scarf osteotomy is a surgical procedure used for the treatment of hallux valgus without instability. It is a versatile technique that consists of a Z-shaped-diaphyseal osteotomy of the first metatarsal and can be combined with an Akin osteotomy of the proximal phalanx to provide satisfactory alignment and alleviation of the symptoms of hallux valgus.

Introduction

The Scarf osteotomy was first described by Meyer in 1926 [1]; however, was not popularized until the 2000s by Barouk [2]. The osteotomy consists of a joint-preserving [3], Z-shaped Shaped diaphyseal osteotomy that corrects the intermetatarsal angle (IMA) and hallux valgus angle (HVA). This osteotomy is versatile and can be adjusted for length, rotation, and plantar flexion, which allows it to be utilized in moderate to severe cases of hallux valgus.

Indications

- Symptomatic hallux valgus with an IMA from 12° to 20° [4–6]
- Supple 1st metatarsal phalangeal joint (MTPJ) with no evidence of osteoarthritis [4, 5]
- Stable first tarsometatarsal joint (TMTJ) [5, 6]
- Juvenile hallux valgus with an abnormal distal metatarsal articular angle (DMAA) [4–6]
- Revision surgery [3–5]
- Sufficient width of metatarsal to allow correction [5]

Contraindications

- First TMTJ instability/hypermobility [5, 6]
- Osteoarthritis of the MTPJ [5–7]
- Severe osteoporosis [6, 7]
- Active infection [7]

Surgical Technique

Positioning
- Supine
- Tourniquet is applied (thigh or lower leg)
- Bump or bone foam to elevate the leg

Landmarks
- Tarsometatarsal joint (TMTJ)
- 1st metatarsal (1st MT)
- Metatarsal phalangeal joint (MTPJ)
- Interphalangeal joint (IPJ)

Incision
- Medial longitudinal incisions approximately 5–7 cm long extending from the base of the proximal phalanx to the proximal third of the metatarsal shaft
  - Distal extension is possible if an Akin osteotomy is required.

Superficial Dissection
- Blunt dissect, identify, and protect the dorsal medial cutaneous nerve.
  - Retract it away from the operative field.

Deep Dissection
- Longitudinal capsulotomy
- Subperiosteal sharp dissection to free the dorsal and lateral aspects of 1st MT
  - Maintain a capsular cuff for capsulorrhaphy.
  - Continue periosteal dissection dorsolaterally. The lateral periosteum is a common block to translation.
- It is imperative that the distal plantar soft tissue of the metatarsal neck is left intact in order to preserve the blood supply and prevent avascular necrosis.

Bunionectomy
- Excise the medial eminence with a sagittal saw 1 mm medial to the sagittal sulcus.
  - Provides a flat surface to perform the osteotomy
  - Minimal resection is advised to maintain maximal surface area for translation and fixation.

Lateral Release
- Incision over the first intermetatarsal space centered around the MTPJ
- Blunt dissect down the side of the first MT.
- 15 surgical blade is inserted on the lateral aspect of the neck of the first MT and swept distally to the base of the proximal phalanx.
  - Conjoined adductor tenotomy
  - Suspensory MT-sesamoid ligaments
- Perforate lateral capsule with #15 blade and place varus force to attenuate the capsule.

Scarf Osteotomy
- ***Medial longitudinal cut*** (Fig. 1)
  - Identify the TMTJ with fluoroscopy.
  - Mark out osteotomy cuts with electrocautery.
  - Sagittal plane
    - Distal dorsal apex
      - Junction of the dorsal one-third and plantar two-thirds of the MT head approximately 5–7 mm from the joint surface
      - Cancellous bone and not medullary to prevent troughing
      - Proximal plantar apex
      - Junction of the dorsal two-thirds and plantar one-third of the diaphysis of the MT
      - Length depends on the severity of the deformity, but ensure not to penetrate the TMTJ.
      - Score a line with a sagittal saw connecting the two points prior to commencing the osteotomy.
  - Frontal/coronal plane (Fig. 2)
    - Rest the saw blade against the proximal plantar aspect of the shaft and complete the cut distal to proximal

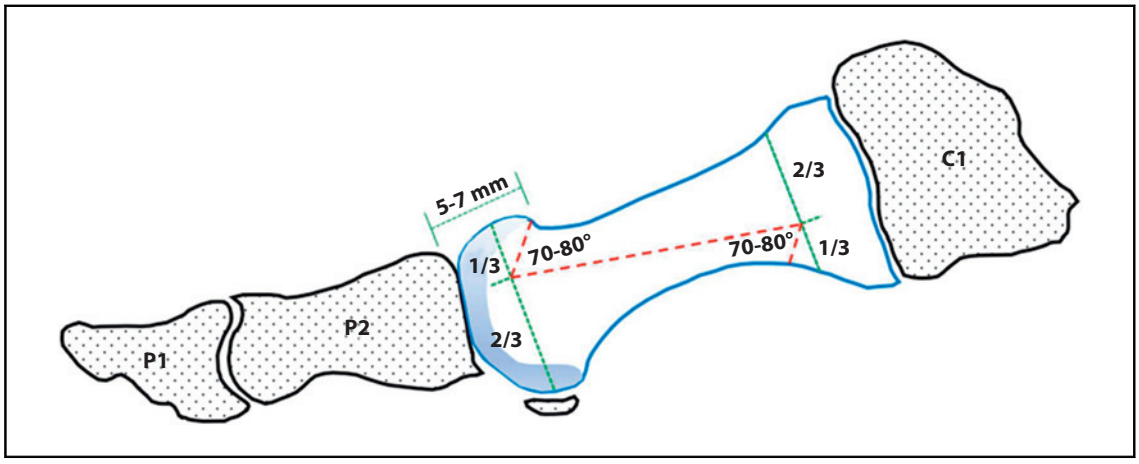

Fig. 1. Drawing representing the sagittal metatarsal osteotomy in red. Note the approximate distances from the joint surface and the proportions required for the proximal and distal apices of the cut (green).

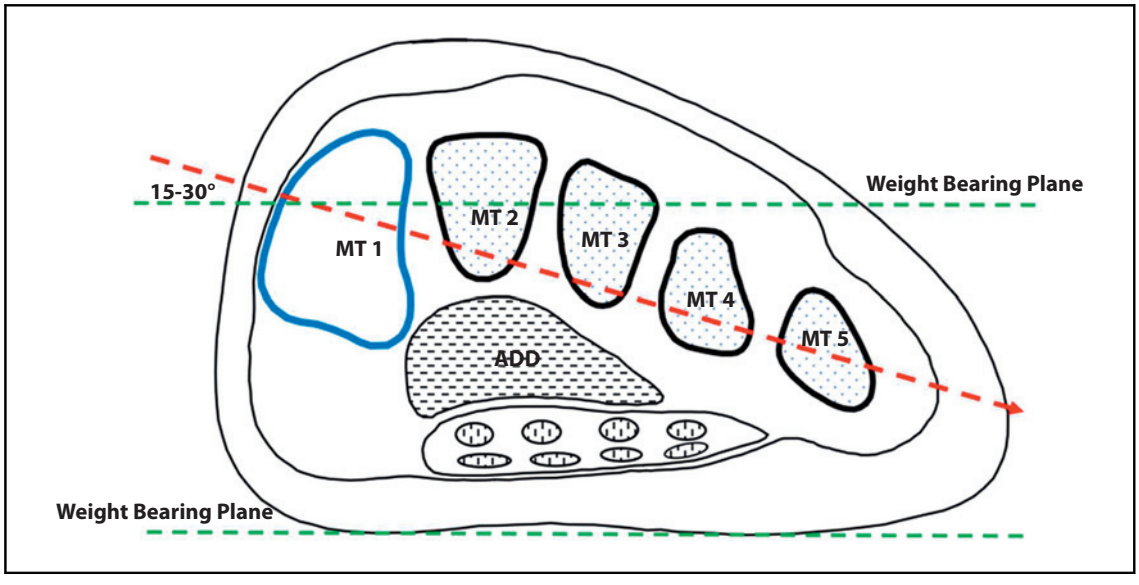

Fig. 2. Coronal drawing demonstrating the angle of metatarsal osteotomy in red. Note that the angle is 15°–30° to the weight-bearing plane (green line) and in-line with the 4th and 5th metatarsal.

- Oblique to the weight-bearing plane
- Angulated 15°–30° dorsal medial to plantar lateral aiming at the 4th and 5th MTs
- Allows for plantarization of the MT head on translation

- ***Transverse cuts*** (Fig. 3)
  - Retract and protect extensor tendons.
  - Complete the distal dorsal cut first, then proximal plantar.
  - Parallel or divergent (Do not converge cuts as osteotomy will not translate.)

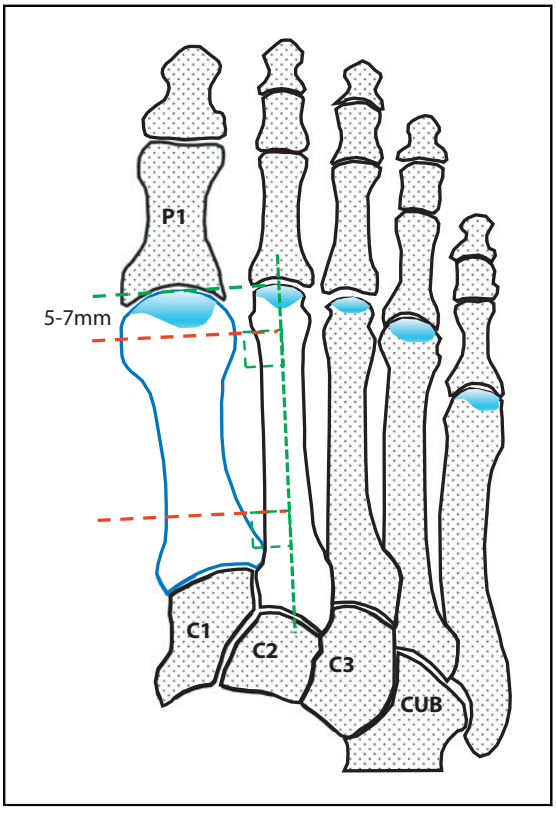

Fig. 3. Drawing representing the transverse metatarsal osteotomy in red. Note that the osteotomy is perpendicular to the longitudinal axis of the second metatarsal (green).

- Care not to crosshatch osteotomies as it may precipitate fracture.
  - Use a K-wire at the apices to prevent fracture.
- Sagittal plane
  - Angle the cuts 70°–80° to the medial longitudinal cut on the sagittal plane.
- Transverse plane
  - Angle of cut will affect the length of the 1st MT.
  - Neutral – perpendicular to the long axis of the 2nd MT
  - Lengthen – medial proximal and lateral distal
  - Shorten – medial distal to lateral proximal

Translation/Fixation

- The aim of the osteotomy is to translate the MT head laterally into the correct anatomical position.
- Displace fragments without force and do not lever due to the risk of fracture.
  - Check lateral periosteum is not holding two fragments.
- Place a pointy clamp onto the distal medial corner of the dorsal fragment and translate the plantar head fragment laterally.
  - Up to two-thirds of lateral displacement can be obtained while maintaining a strong lateral strut and good bone apposition.
  - Rotation can be simultaneously done to correct any pathological DMAA.
- A Barouk clamp is placed along with a 1.2-mm wire to temporarily hold the reduction.
- Two 2.4-mm cannulated compression screws are used to fix the fragments.
  - 2Place the distal screw by passing a guidewire from the proximal fragment obliquely into the head through cancellous bone and avoiding intra-articular penetration.
  - Place the proximal screw bicortical.
- Resect the medial distal aspect of the dorsal fragment with a sagittal saw.
  - Check for stability and reduction of sesamoids with fluoroscopy.
  - Check the overall position and proceed to AKIN if necessary.

Closure

- Imbricate the medial capsule with strong absorbable sutures while holding the hallux in a neutral of slightly abducted position.
- Excise redundant capsule and skin.
- Close skin with 3-0 nylon sutures.

Postoperative Care

- A light dressing is applied with varus taping of the bandage until sutures are removed.
- Immediate full weight-bearing in a heel wedge boot for 6 weeks
- Sutures removed at 10–14 days

- Start passive and active range of motion of the MTPJ after suture removal.
- Scar massage and foot sensitization to commence after sutures are removed.

Complications

- Decreased range of motion and stiffness of the first MTP is the most common complication [8, 9].
- Nonunion
- Malunion
- Troughing of the metatarsal
- Fracture
- Avascular necrosis
- Infection
- Hallux varus deformity
- Sesamoiditis
- Metatarsalgia
- Recurrence

Results and Outcome

The underlying goal of the scarf osteotomy is to correct the hallux valgus and relieve the associated pain. The clinical and radiological results of the procedure have been reviewed and different outcomes have been reported.

The American Orthopaedic Foot & Ankle Society scores improvement in short, medium [1, 2, 7, 9, 10], and long terms [11] has been reported in several studies.

Radiological improvement in the short, medium [1, 2, 7, 9], and long terms [11] has also been reported with significant improvements in IMA, HVA, and DMAA.

However, reports of recurrence have been reported in medium- to long-term studies of up to 30% [2, 9, 11, 12] and up to 8% needing reintervention [9]. Risk factors for recurrence are: a large preoperative and 6-week follow-up HVA, a large 6-week IMA, DMAA, and sesamoid malpositioning [11].

Statement of Ethics

No pictures of patients were used.

Conflict of Interest Statement

The Authors have no conflict of interest to declare.

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Author Contributions

JYCC made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and drafting the work or reviewing it critically for important intellectual content and final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

RPP-L contributed by drafting the work, reviewing it critically for important intellectual content, and final approval of the version to be published.

AC-F contributed by drafting the work, reviewing it critically for important intellectual content, and final approval of the version to be published.

MK contributed by drafting the work, reviewing it critically for important intellectual content, and final approval of the version to be published.

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