A. Introduction

- Distal procedures have the highest and the safest healing potential
- Proximal procedures have the highest correction potential
- Midshaft procedures are in between proximal and distal procedures regarding correction and healing potentials
- Scarf osteotomy is a midshaft-distal procedures which can be lengthened far proximally and get a "proximal-midshaft-distal" osteotomy with both excellent correction and healing potential
- For this reason, scarf osteotomy can correct over 90% of hallux valgus deformities. For extremely severe hallux valgus, a "true" proximal procedure which corrects the deformity at the very bottom is required = Lapidus procedure

B. Definition

- "z-shaped" (proximal-) midshaft-distal osteotomy
- Overlapping of 2 fragments (one distal fragment (mobile) and one proximal fragment)
- The stability is given through the overlapping surface between both fragments

C. Advantages

- Very stable osteotomy because:
  i. it is "z-shaped" (self-locking when weight-bearing)
  ii. it can be performed very long (more contact surface for fixation and healing)
  iii. it is distal reaching (highest bone density in the region of 1st MT head)
- correction of mild to severe deformities by adapting of the length of the osteotomy (distal/midshaft-distal/proximal-midshaft-distal osteotomy)
- well preserved blood supply to 1st MT head/distal fragment since vessels plantar and retrocapital are not disrupted

- DMAA can be corrected with translation/rotation of the distal fragment

- "allround" OT allowing many adaptations for special situations (flexion, extension…)

D. Disadvantages

- learning curve relatively long

E. Indications

- scarf = “overlapping OT”, ie amount of correction not only given by IM1-2 angle but also by the width of the 1st MT → the widest the 1st MT, the more lateral translation of the distal fragment (correction) can be achieved. For a same IM1-2 angle, depending on the width of the 1st MT, a scarf will be possible or not!
- a scarf is possible whenever bone overlapping between both fragments is sufficient
- what is a sufficient overlapping?
  i. Depends from the skill and experience of the surgeons!
  ii. Up to ¼ remaining overlapping at the level of the 1st MT head is safe but even more translation is possible for experienced surgeons
F. Contraindications
- Osteoporotic bone
- "true" 1st ray instability (ie instability which is not due to failure of windlass mechanism)
- Elderly, disabled patients (prefer a resection arthroplasty!)

G. Surgical Technique

Soft tissue approach
- Longitudinal medial skin incision over MP1 joint
- Longitudinal MP1 capsule incision
  i. Take care of not disrupting the vessels coming from plantar-retrocapital
  ii. Release the capsule from the dorsum of base of phalanx to be able to subluxate the proximal phalanx plantarly
- subluxate the phalanx plantarly to gain access to the lateral MP1 compartment
- incise the MP1 phalanx just dorsal from lateral sesamoid for the lateral release

Osteotomy
- longitudinal cut
  i. starts underneath the level of the dorsal cartilage-bone junction of the 1st MT head at about 1/3 from the dorso-plantar distance of the head
  ii. ends more or less proximal, depending on how big is the deformity to be corrected, at about 2/3 from the dorso-plantar distance of the 1st MT at this level
  iii. is oriented parallel to the weight bearing plane or slightly from medial dorsal to lateral plantar in order to lower somewhat the 1st metatarsal head

- distal transverse cut
  i. is performed dorsally at the junction cartilage-bone
  ii. is performed perpendicular to the long axis of the 2nd MT to avoid any lengthening or shortening of the 1st metatarsal – this cut is usually more or less parallel to the dorsal joint line of the 1st MT head (usefull orientation tool)
  iii. is slightly angulated in relation to the longitudinal cut in the sagittal plane for self-blocking effect
- proximal transverse cut
  i. is exactly parallel to the distal transverse cut or better slightly divergent from medial-distal to lateral-proximal, in order to be able to move the distal fragment laterally (convergent transverse cuts would make impossible any lateral displacement!)
  ii. is slightly angulated in relation to the longitudinal cut in the sagittal plane for self-blocking effect

Reduction of the deformity
- complete the lateral longitudinal incision into the lateral MP1 capsule (for lateral release) through the osteotomy if needed
- grasp the proximal fragment with a clamp and push the distal fragment laterally as far as possible (“pull and push” manoeuver)

- fixate temporarily the reduction with a K-wire inserted some 5 mm proximal from distal transverse cut into the proximal fragment into the distal fragment

- check the reduction of the 1st MT head over both sesamoids clinically and radiologically with fluoroscopy (if available)
- with the push up test (foot is pushed from plantar into the neutral position), the hallux valgus deformity should be now fully reduced at the MP1 joint – if this is not the case,
work again on the soft tissue release and/or on the lateral displacement of the distal fragment. Don’t try to correct the residual deformity with medial capsuloraphy – the valgus deformity will recur soon or late!

- Place a first screw from the proximal fragment lateral-distal, some 5 mm proximal from distal transverse cut into the 1st MT head
- Place a second screw from the proximal fragment lateral proximal, some 5 mm distal from proximal transverse cut into distal fragment

- Insert a third screw in between the first 2 screws if you need additional stability
- The screws should be as perpendicular as possible to the plane of the longitudinal OT for maximal stability

- Resect now the medial pseudo-exostosis on the 1st MT head and the excess of bone medially on the proximal fragment
- Perform an additional Akin OT if the big toe is not in line with the first ray

Soft-tissue closure
- resect the excess amount of MP1 capsule and skin
- close the MP1 capsule side to side

After treatment
- full weight-bearing in a postop wedge shoe

H. Potential technical errors/complications
- longitudinal cut is (too) oblique from medial dorsal toward lateral plantar → the cut ends distally into the MP1 joint plantar
- the longitudinal cut is not distal enough → the overlapping of both fragments doesn’t reach the very dense bone of the distal metaphysis and the osteotomy may get instable (“toughing effect”)
- the longitudinal cut is ending too dorsal proximally (normal 2/3 – 1/3 from dorsal to plantar) → the cortex over the end of the longitudinal cut is too thin and might break

- the transverse cuts are not perpendicular to the axis of the 2nd metatarsal → lengthening or shortening of the 1st MT with MP1 pain respectively transfer metatarsalgia on 2nd ray
- the screws have been place too obliquely → unstable osteosynthesis, secondary displacement
- the distal screw has been place retrocapital and impinge with one of the sesamoid
- the proximal screw has been place over the proximal transverse cut and weaken the cortex at the relative weak point → fracture, dislocation
- the distal fragment has not been pushed sufficiently laterally → undercorrection

I. Literature

- Barouk LS. Scarf Osteotomy for Hallux Valgus Correction. Foot Ankle Clin 2000 Sep;5(3):525-58
My Evolution in Correcting Bunion and Why

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The hospital I was trained started with foot and ankle surgery in 1974. In this period the Keller-Brandes procedure was the solution for any type of Hallux valgus and Hallux rigidus. A small series of basal closing wedge osteotomies was performed in 80 patients (109 feet) until 1985. This procedure was abandoned in 1986 when the experienced surgeon left the department and was then replaced by the Kramer Osteotomy with percutaneous wire fixation. In 1991 the classic Chevron osteotomy was introduced to the department. By mistake in 1992 the surgeons started to combine a lateral soft tissue release through a second dorsal incision and without any type of fixation. The results of the above described techniques were reviewed in 1993 and 1994. The study on the basal closing wedge osteotomies revealed that this procedure was technically demanding, and shortening of the first ray and sagittal plain malalignment were common pitfalls. Although radiographical results were excellent, shortening and malalignment excluded this technique from further inclusion in our Hallux valgus treatment algorithm.

The 53 patients after classic Austin and 80 patients after modified Austin with lateral soft tissue release were each analyzed patients with Grade III sesamoid position were compared. The results revealed that the Austin technique with lateral soft tissue release was the more reliable technique, statistically better