Lapidus, a Percutaneous Approach

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KEYWORDS

• Lapidus • Percutaneous • Mini-invasive surgery • Forefoot • Hallux valgus • Tarsometatarsal • Arthrodesis

KEY POINTS

- The percutaneous Lapidus procedure is a powerful but demanding technique.
- Its is a less aggressive procedure than open procedure.
- It is less painful, with less swelling.
- The percutaneous Lapidus procedure needs specific training.

INTRODUCTION

First ray deformity is a common pathologic condition. Different options of treatment have been described in open techniques, such as the Lapidus. First ray deformity treatments were initially described by Albrecht, but were reported by Lapidus in 1934, who gave his name to this powerful procedure.[1,2] The Lapidus is probably the most versatile procedure in foot and ankle surgery. Used in many circumstances, it offers a stable and reliable correction. Its aim is to fuse the first tarsometatarsal joint (TMT) in an adequate position. The procedure is used in different pathologic conditions, such as first TMT instability, hallux valgus deformity, flat foot deformity, and TMT arthritis. Introduced in Europe by Mariano De Prado in the 1990s and promoted by the GRECMIP since 2004, percutaneous surgery offers a large range of possible treatments. A percutaneous Lapidus procedure became a real option for patients.

No conflict of interest.

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SURGICAL TECHNIQUES

Equipment

Beaver blade
Burr: Wedge, 12 × 3 mm, and a Shannon, 20 × 2 mm and 20 × 3 mm
K-wire: 2 K-wires of 2-mm diameter
Screws: 2 to 3 screws of 4 mm
Driver: Must have high torque so it can be used with a low speed. High speed is responsible for thermal injury to the skin and the bone. Irrigation would be also preferable for cooling the burr.
C-arm: Mini, rather than large, is easier to maneuver.
Tourniquet: It is a surgeon choice. Blood is an excellent cooling system. If a tourniquet is used, irrigation is highly recommended.

Anesthesia

Regional ankle block or general anesthesia depends on the expertise of the anesthetist. A single dose of antibiotics is suggested as per local guidelines.

Positioning

The patient is positioned supine with the foot overhanging the end of the table. The C-arm is positioned under the foot for an immediate control of the procedure.

THE TECHNIQUE

The surgery is performed under radiograph control. The TMT is localized with fluoroscopy.

To avoid excessive shortening, 2 K-wires are placed vertically on both sides of the joint (Fig. 1). Their positions and directions would dictate the amount of correction and the potential shortening. If lowering of the head is necessary, the K-wires would be divergent (Fig. 2). The position of the K-wire is very important. It will determine the resection and the correction. It is recommended to go through the sole of the foot and hold the K-wire with a clip.

A medial approach, 1 cm, is realized at the level of the TMT joint. The 20 × 2-mm burr is introduced in the joint and run parallel to the K-wire. It is important to release the medial cuneometatarsal ligament to open and mobilize the joint. The plantar part of the joint must be carefully prepared. If needed, the wedge burr or the 20 × 3-mm Shannon burr can be used. The osteotomy starts at the level of the cuneiform bone, perpendicular to the second metatarsal along the proximal K-wire. The resection must be minimal. As soon as this first stage is performed, the joint becomes

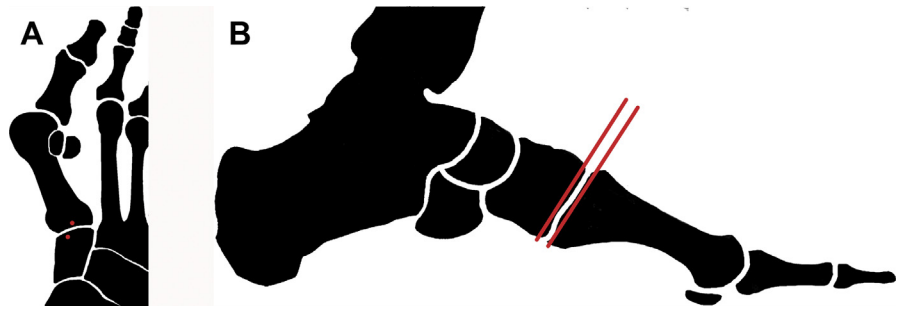

Fig. 1. (*A, B*) Position of the parallel K-wire at the level of the cuneometatarsal joint.

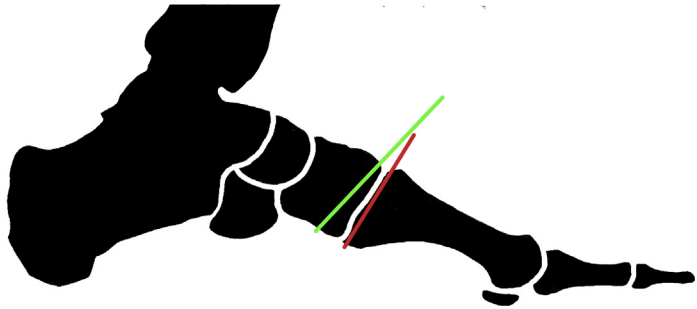

Fig. 2. Divergent K-wire.

particularly mobile. The deformity can be corrected. The second stage is the osteotomy of the base of M1. It must be parallel to the first stage cut with the first metatarsal in a correct position. The distal K-wire guarantees minimal resection (Fig. 3).

Once the correction is completed, the bones are then fixed with 2 or 3 crossed screws (Fig. 4). The first screw is positioned horizontal from distal to proximal and medial to lateral, and the second screw is positioned vertical from proximal to distal. If instability between the first and the second cuneiform is noted, then a third screw is positioned between the first and second metatarsal (Fig. 5).

The wounds are closed with absorbable sutures.

Postoperative Care

- The dressing is left undisturbed for 2 weeks.
- The foot is kept elevated.
- An orthopedic heel shoe is required for 6 weeks with the help of crutches.

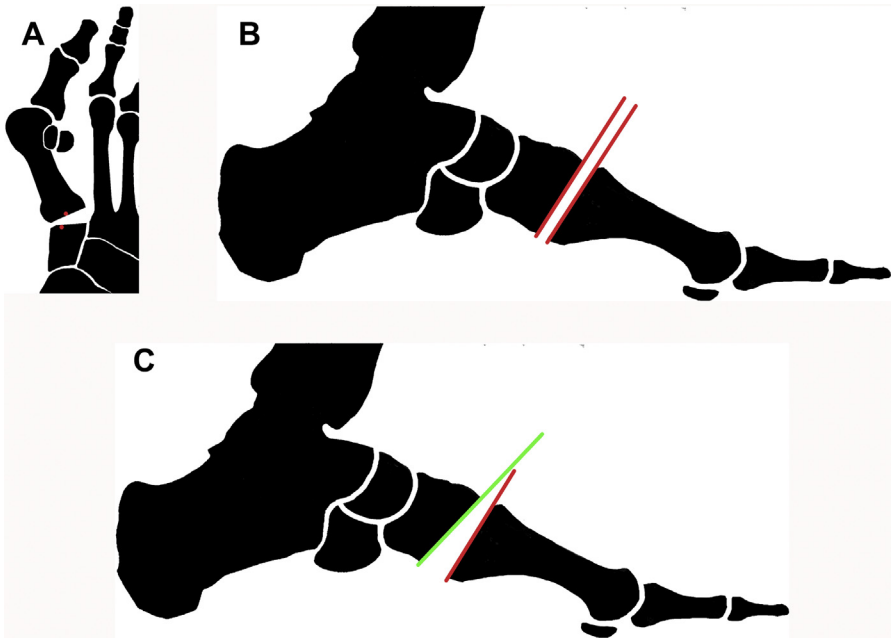

Fig. 3. (*A*) Resection of the joint with 2 parallel (*B*) or divergent (*C*) cuts.

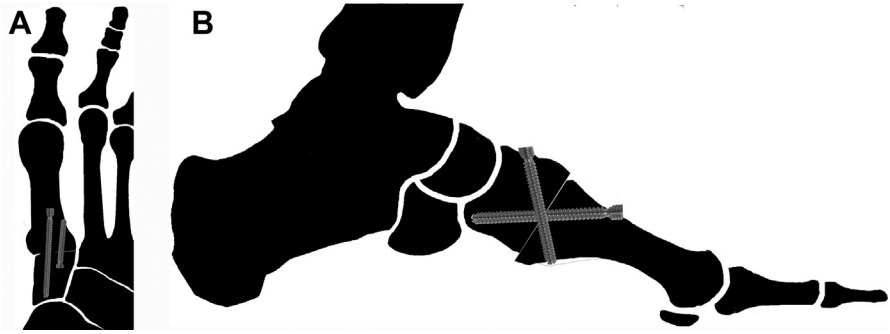

Fig. 4. Fixation with 2 cross-screws. AP view (*A*), Lateral view (*B*).

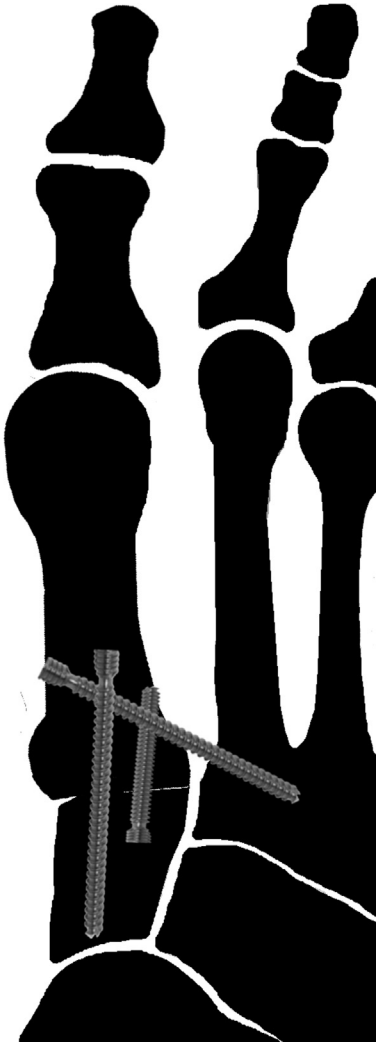

Fig. 5. An additional screw from M1 to M2 or C2.

- At 6 weeks' follow-up, radiographs are requested. If the healing is correct, the patient can wear normal shoes.
- Impact on the forefoot is authorized from 3 months.

Indication

- Flat feet
- Arthritis
- Hallux valgus

RESULTS

Seventy feet treated with a percutaneous Lapidus were followed and reviewed. All cases have been performed by a single surgeon. All the patients have been reviewed at 2 and 6 weeks and then at 3 and 6 months postoperatively both clinically and radiologically. An Akin osteotomy has been routinely performed. No additional distal osteotomy has been requested. The procedure has been used for a flat foot correction on 10 occasions.

The average age of the population was 69 years.

The satisfaction rate was good and excellent for 95% of the patients.

Four patients presented a nonunion.

No metatarsalgia transfers and no infections have been reported.

DISCUSSION

Lapidus has been used since 1934 for the treatment of hallux valgus. A powerful technique, Lapidus allows a great deal of correction, but there are some pitfalls that must be avoided. The position and the orientation of the cut are essential. This lies in the position of the K-wires. If too medial, too much bone may be removed; too lateral, and not enough is removed to obtain the correction. If not close enough to the joint, then too much bone may also be removed. An excess of shortening may be responsible of secondary metatarsalgia even with the lowering of the head. That is why an index minus is probably not a good indication for a Lapidus. Parallel to each other, the metatarsal will not be lowering. Divergent, the metatarsal head will be lowering depending on the angulation between the 2 K-wires. The quality of the correction depends on the release of the TMT joint and the removal of the debris left in the joint particularly on the plantar part.

A lateral release at the metatarsophalangeal joint is not systematic for the authors except if a retraction of the capsule is present.

Since the authors promoted percutaneous surgery, they have heard many concerns about the safety of using a burr. If the technique is not safe and reproducible, it will fail. The authors use a medial approach to prepare the joint and recommend an "extensive" approach of 8 to 10 mm. The burr is introduced in the joint and must stay in the joint. The rotation and the size of the portal avoid any burning on the skin. A cooling system can be associated particularly if a tourniquet is inflated.

The structures at risk are on the dorsal part of the joint and lateral distal part.[3,4] Because the burr stays in the joint, any damage would be a surprise and a surgical mistake because the burr's spinning should be stopped as soon as the dorsal or plantar capsule is reached. The position of the K-wire "guide" must be carefully decided to avoid a lesion of the superficial peroneal nerve or the dorsal-medial artery. A medial position to the tendon extensor would be preferable. In the authors' experience, no injury has been report at the level of the TMT joint. The fixation is realized with 2 cross-screws, and if necessary, an intermetatarsal third screw. The authors

recommend a distal horizontal screw positioned 3 to 4 cm distal to the joint line on the lateral side of the extensor tendon. The proximal screw would be inserted through a dorsal-lateral 5-mm approach to the extensor tendon. The need of a third screw occurs when instability between first and second cuneiform bone is revealed. The squeeze test is helpful to determine this need.[5]

The average age of the authors' population is older than the usual publication[6–9] because the authors prefer to perform a basal osteotomy on the younger population.

Surgeons have always tried to optimize the recovery and minimize their approach. Michels and Lui[10,11] presented an interesting arthroscopic Lapidus procedure, but in the authors' hands, it seems to be a longer procedure with no advantage compared with the percutaneous technique. As for Michels' and other techniques, an additional distal osteotomy is needed.

The authors' only concern raised is the shortening of the first ray. Even if no metatarsalgia has been reported, a longer follow-up may shed more light on this.

SUMMARY

Lapidus percutaneous correction is a very interesting procedure, but excessive shortening remains a concern and could potentially result in metatarsalgia.

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