

Percutaneous Distal Osteotomy of the Fifth Metatarsal for Correction of Bunionette

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Introduction

Percutaneous distal metaphyseal osteotomy, a sub-capital linear osteotomy of the fifth metatarsal performed through a minimally invasive percutaneous approach and stabilized with a single Kirschner wire, without soft-tissue procedures, enables the surgeon to achieve consistently good correction of a fifth metatarsal bunionette deformity.

The main indication for surgical correction of a bunionette deformity, or tailor's bunion, is pain resistant to conservative treatment. Various surgical procedures¹⁻²⁶ have specific indications based on the type of deformity. The decision-making process requires a careful physical examination and radiographic assessment to determine the specific elements that need correction^{27,28}.

Osteotomies permit complete correction of the deformity with low recurrence rates, and they can be divided into three main groups: proximal, diaphyseal, and distal osteotomies¹⁻²⁴. Distal osteotomies are indicated for type-II and III bunionette deformities according to the Coughlin classification^{10,11,26} since these procedures have the ability to correct the fourth and fifth intermetatarsal angle. Among the several procedures described, a minimally invasive²² or percutaneous^{21,24} distal osteotomy of the fifth metatarsal has the potential to reduce complications because of the limited surgical exposure^{21,22,24-26,29,30}.

Our recently published study²⁴ shows that our technique for percutaneous distal metaphyseal osteotomy of the fifth metatarsal for correction of bunionette deformity had good results comparable with those reported with traditional open distal metatarsal osteotomy¹⁷⁻¹⁹.

The procedure is performed in seven steps (Video 1).

- Step 1: Wire insertion
- Step 2: Skin incision
- Step 3: Periosteal detachment
- Step 4: Osteotomy

- Step 5: Correction
- Step 6: Stabilization
- Step 7: Postoperative care

Step 1: Wire Insertion

It is mandatory to place the wire in a parosteal position to allow medial displacement of the metatarsal head at the osteotomy site.

- Place the patient in the supine position, with a below-the-knee wedge bracket allowing 90° of knee flexion and a plantigrade position of the foot on the operating table. The surgical procedure is performed with ankle block anesthesia and can be facilitated by the use of a fluoroscopic image intensifier to monitor the performance of some of the steps. Position the fluoroscopic image intensifier to the side of the patient while the surgeon stands at the end of the operating table.
- Insert a 2-mm Kirschner wire in a parosteal position, starting from the upper-outer corner of the nail bed of the fifth toe. Drive the wire from distal to proximal so that it lies along the lateral side of the phalanges and the head of the fifth metatarsal (Figs. 1-A and 1-B). It is mandatory to place the wire in a parosteal position to allow medial displacement of the metatarsal head at the osteotomy site.

Step 2: Skin Incision

Make a short skin incision directly to the bone on the lateral side of the distal metaphysis of the fifth metatarsal (Fig. 2).

Step 3: Periosteal Detachment

Detach the periosteum surrounding the bone at the site of the planned osteotomy with a small scissors inserted percutaneously, dorsally initially and then plantarly. In this way, the structures surrounding the metatarsal shaft can be kept safely away from the saw blade (Figs. 3-A and 3-B).

Step 4: Osteotomy

Perform the osteotomy with a micromotorized Lindemann bone cutter, avoiding damage to the surrounding structures by drilling the lateral cortex first and then the medial cortex, keeping the bone cutter in the same lateral entry hole and its tip inside the medullary canal.

- Perform the osteotomy through the subcapital region of the fifth metatarsal with a 2.3-mm-diameter micromotorized Lindemann bone cutter (Aesculap, Tuttlingen, Germany). Make the cut in a single plane, perpendicular to the axis of the shaft of the fifth metatarsal in the sagittal plane or with a slight mediolateral obliquity to prevent shortening of the metatarsal and to achieve medial displacement of the metatarsal head fragment (Figs. 4-A and 4-B).
- To avoid damage by the bone cutter to the surrounding structures, perform the osteotomy by drilling the lateral cortex first and then the medial cortex, keeping the bone cutter in the same lateral entry hole and its tip inside the medullary canal of the fifth metatarsal. Then drill multiple holes circumferentially to complete the cut using this corticotomy technique (Fig. 4-C).
- Following the osteotomy, check the osteotomy site manually and under fluoroscopy to confirm that the osteotomy is complete and that the metatarsal head can be mobilized (Fig. 4-D). The osteotomy enables the surgeon to achieve an appreciable degree of medial displacement of the metatarsal head. Furthermore, the metatarsal head can be rotated manually in the axial plane to correct supination, which can be achieved more readily with a more plantar starting positioning for insertion of the Kirschner wire.

Step 5: Correction

The correction is usually satisfactory when contact between the lateral aspect of the metatarsal head and the medial cortex of the metatarsal neck is achieved in the frontal plane.

Displace the fifth metatarsal head with use of a bent, grooved probe, manufactured from a stainless-steel rod and measuring 7 mm in diameter (Tercres, Verona, Italy). The distal edge of the probe is smooth and is curved over a distance of approximately 4 cm (Figs. 5-A, 5-B, and 5-C). No associated soft-tissue procedures are performed. The correction is usually satisfactory when contact between the lateral aspect of the metatarsal head and the medial cortex of the metatarsal neck is achieved in the frontal plane. Slight overcorrection is advisable (Figs. 6-A and 6-B).

Step 6: Stabilization

Stabilize the osteotomy site with the 2-mm Kirschner wire, driven distal to proximal into the medullary canal of the fifth metatarsal as far as its base (Figs. 7-A through 8-C). Use a single suture to close the wound.

Step 7: Postoperative Care

Apply adhesive tape with a plantar, kidney-shaped pad.

- To maintain rotation and correction postoperatively, apply adhesive tape and replace this dressing every week. Insert a plantar, kidney-shaped pad with the taping, with its concavity surrounding the plantar aspect of the head of the fifth metatarsal to reduce weight-bearing pressure on the metatarsal head (Fig. 9-A). Perform the taping with use of a skin-protector band, followed by a second layer of adhesive-elastic tape, bandaged from lateral to medial, across the midfoot and onto the fifth toe (Fig. 9-B). This dressing helps maintain the rotational correction.
- Beginning on the day after the operation, allow the patient to walk without the aid of crutches but with the use of a postoperative shoe with a flat rigid sole. This shoe is worn for six weeks while walking, even when combined procedures have been performed on the forefoot.
- Remove the Kirschner wire at four weeks after surgery and maintain the tape for six weeks.

Results

In our study of this technique²⁴, the American Orthopaedic Foot & Ankle Society (AOFAS) score improved from a mean and standard deviation of 51.9 ± 10.2 points preoperatively to 98.4 ± 2.6 points at the time of final follow-up. In 73% of the feet, there was complete resolution of pain at the fifth metatarsophalangeal joint without any functional limitation (AOFAS

score of 100). In 20% of the cases, the AOFAS score was 95 points with some decrease in function and a need to use comfortable shoes. In the remaining 7% of the patients, the AOFAS score was 93 points with mild asymptomatic malalignment. No nonunions or recurrences were observed.

What to Watch For

Indications

- Painful type-II and type-III bunionette deformity, according to the Coughlin radiographic classification, resistant to conservative treatment for more than one year.

Contraindications

- Previous surgical treatment for the same deformity.

Pitfalls & Challenges

- The percutaneous procedure must be strictly followed step by step, with no modifications, at least during the learning curve, to prevent complications. This rule includes both the surgical steps as well as the postoperative care.
- In Step 1, avoid inserting the wire at the distal corner of the nail to prevent skin slough while the Kirschner wire is in position. Also, the lateral aspect of the metatarsal head must be firmly engaged to avoid losing contact, which

can result in uncontrolled displacement of the metatarsal head fragment.

- In Step 5 (correction), because of the effective action of the grooved instrument, care must be taken to displace the capital fragment gradually to avoid having the metatarsal head displaced too far and fall off medially. This often occurs, but it can be easily resolved by manually repositioning the metatarsal head on the end of the diaphyseal fragment. Slight overcorrection is advisable to allow early removal of the Kirschner wire. No valgus deformity has been observed in our clinical experience, probably because soft-tissue procedures are never performed.
- In Step 6 (stabilization), to avoid inadequate fixation of the osteotomy site, drive the Kirschner wire as far as the base of the fifth metatarsal. Crossing the metatarsocuboid joint with the Kirschner wire can be accepted without the risk of adverse events.

Clinical Comments

The surgical technique has not been modified by us since it was described in our original article²⁴. We currently use the percutaneous approach for the treatment of selected complex forefoot deformities in association with surgery of the first ray and the other, lesser rays. The results of these procedures are presently being evaluated.

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Figures

Fig. 1-A

Kirschner wire insertion starts from the lateral corner of the nail of the fifth toe.

Fig. 1-B

The parosteal position of the Kirschner wire is centered between the dorsal and plantar aspects of the metatarsal head.

Fig. 2

The skin incision.

Fig. 3-A Fig. 3-B

The periosteum is detached around the osteotomy site with use of small scissors.

Fig. 4-A

The osteotomy is performed with use of a micromotorized Lindemann bone cutter.

Fig. 4-B

The level of the cut is checked under fluoroscopy.

Fig. 4-C Fig. 4-D

The osteotomy is performed with use of a corticotomy technique from within the medullary canal.

Fig. 5-A Fig. 5-B Fig. 5-C

The curved end of the grooved probe is introduced into the diaphysis of the fifth metatarsal, and the Kirschner wire is pushed into the groove in the device.

Fig. 6-A Fig. 6-B

Correction is achieved through medial displacement of the metatarsal head.

Fig. 7-A Fig. 7-B

The realignment is stabilized by the insertion of the Kirschner wire from distal to proximal into the medullary canal of the fifth metatarsal.

Fig. 8-A

The Kirschner wire is driven firmly as far as the base of the fifth metatarsal in order to improve stabilization.

Fig. 8-B Fig. 8-C

The correction achieved is confirmed radiographically.

Fig. 9-A Fig. 9-B

Postoperative taping. Note the plantar pad incorporated into the dressing. The dressing is maintained for six weeks and is changed weekly.



Fig. 1a



Fig. 1b



Fig. 2



Fig. 3a



Fig. 3b



Fig. 4a



Fig. 4b

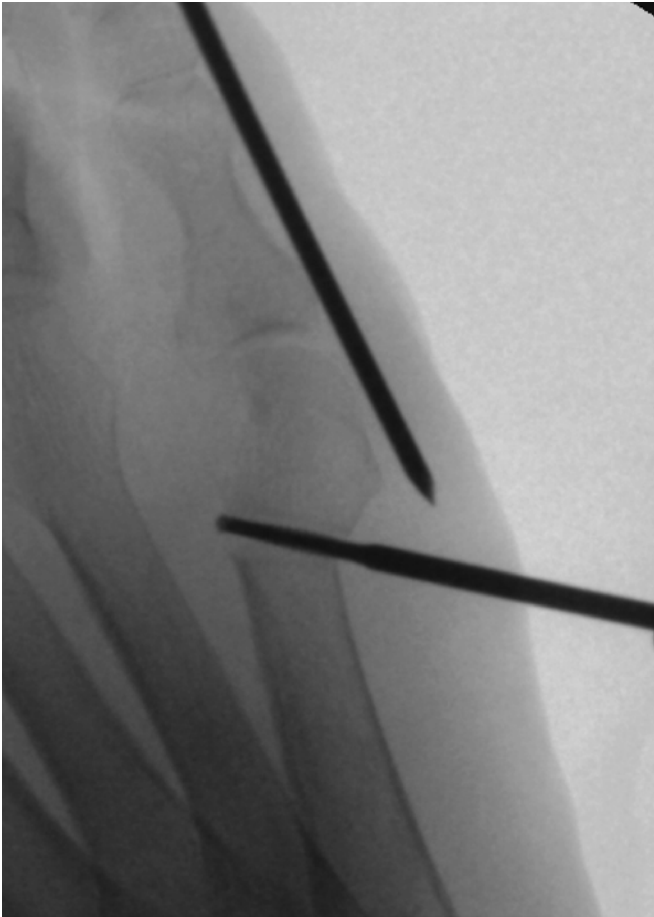


Fig. 4c



Fig. 4d

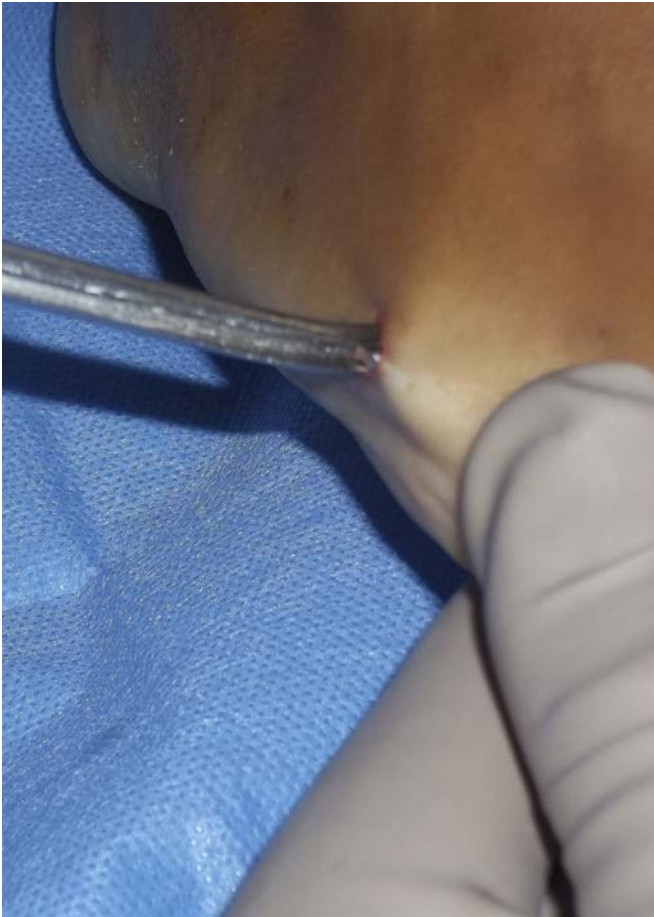


Fig. 5a



Fig. 5b



Fig. 5c



Fig. 6a



Fig. 6b



Fig. 7a

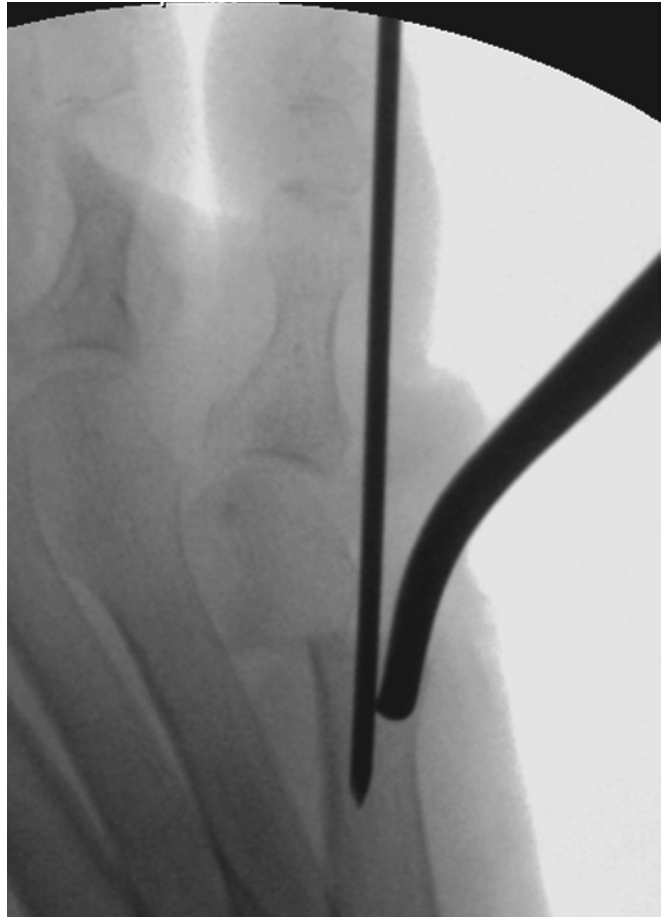


Fig. 7b



Fig. 8a



Fig. 8b

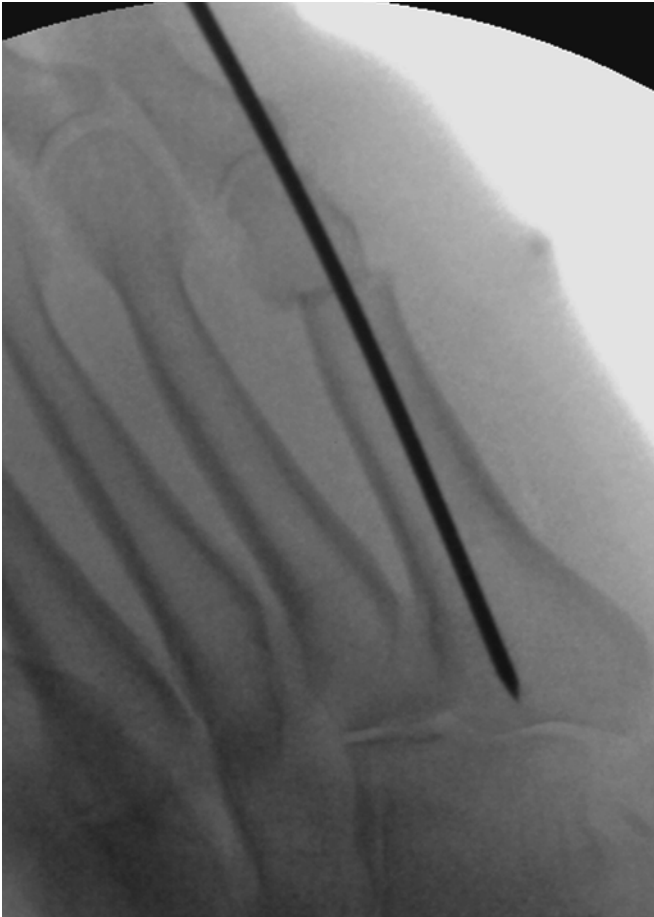


Fig. 8c



Fig. 9a



Fig. 9b