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ORIGINAL ARTICLE

The treatment of hallux valgus with the mini-invasive technique

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Abstract: The Hallux Valgus is a pathology with multiple clinical symptoms, which should not be cured with a univocal surgical treatment: thus for each of these individual pathologies, we can propose an appropriate treatment. The surgical "mini-invasive" procedure can also find its place in this therapeutic arsenal and its indications should be clearly codified.

Keywords: Hallux valgus – Percutaneous surgery – Mini-invasive surgery – First shaft

Introduction

The hallux valgus is a pathology with multiple clinical symptoms, which should not be cured with a univocal surgical treatment: because for each of these individual pathologies, we can propose an appropriate treatment. The surgical "mini-invasive" procedure can also find its place in this therapeutic arsenal and its indications should be clearly codified.

The mini-invasive surgery of the foot has appeared in the 1970's among the American chiropodists, and today, one out of two hallux valgus is estimated to have had surgery with this technique.

However, we acknowledge Dr De Prado [5] as the one who gave scientific validation of this technique (anatomical work, review of patients,...) on the one hand, and academic teaching at the Faculty of Barcelona, on the other hand. Thanks to his invaluable help, this technique is now taught in France under the aegis of the GRECMIP in Bordeaux through a practical and theoretical course (Fig. 1).

Material and method

Purpose

The objectives and the requirements are the same as for open cut surgery: reduction of the volume of the bunion, reorientation of the distal articular surface of the first metatarsal (M1), lateral arthrolysis of the metatarso-phalangeal articulation and lastly, reorientation of the diaphysis of the first phalanx (P1) with a varisation osteotomy (Fig. 2).

Principles

The fundamentals of this surgery are the use and the achievement of mini-approaches and specific equipment.

Fig. 1. October 2002 course given in Bordeaux ; from left to right: Christophe de Lavigne (Bordeaux), Mariano De Prado (Spain), Stéphane Guillo (Bordeaux), Stephen Isham (USA)

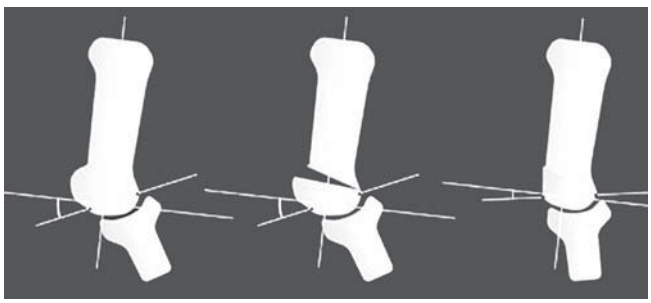

Fig. 2. The osteotomy of M1 (correction of distal metatarsal articular angle – DMAA)

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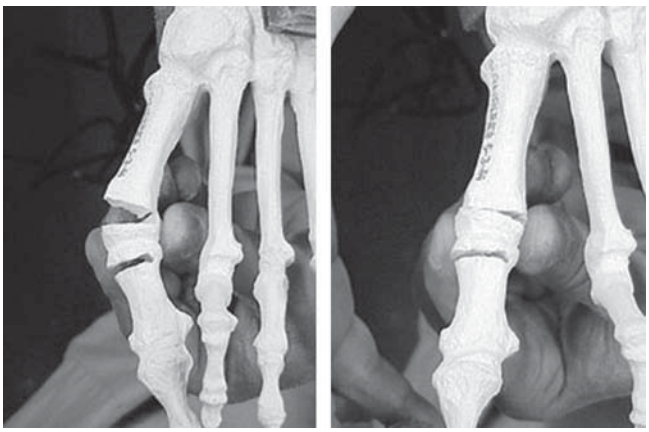

Fig. 3. Result on freeze-dried synthetic bone of the reorientation of the 1st shaft

Fig. 4. The detachment device

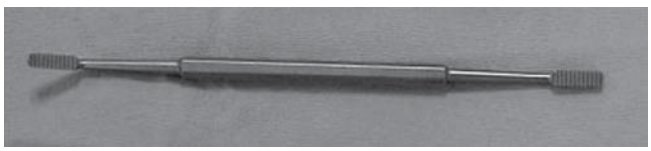

Fig. 5. The rasps

For the cure of a first shaft, three approaches are required: the first one allows creating a working chamber in contact with M1, to reduce the bunion and to reorientate the M1 articular surface with an appropriate osteotomy.

The second one allows the lateral metatarsophalangeal arthrolysis.

The last one allows creating a varisation osteotomy of the base of P1 (Fig. 3). Throughout this procedure, the control of the surgical steps is ensured with the brilliance amplifier as well as manually, palpating the bone relief through the teguments. No fixation with osteosynthesis equipment is required with this technique.

Equipment

At this stage, it is important to state that mini-invasive surgery requires specific hand tools, a brilliance amplifier and an appropriate driver.

The hand instruments

The bistoury

It should allow the creation of mini approaches. We use a blade-holder and Beaver© blades which have the advantage to incise in the axis of the bistoury over a width of approximately 3 mm.

Fig. 6. The hand piece

The detachment device (Fig. 4)

It should cut away the soft tissues from the bone in order to work in contact with the latter. We use a dura mater detachment device or a small rugine Morel-Fatio or Muller type.

The rasps (Fig. 5)

Specific rasps have been designed in order to remove bone debris from the bunionectomy (and not to rasp the bone). The range includes different orientations and sizes.

The driver and the drills

The driver should include a hand piece (Fig. 6), which rotation axis is paralleled to the one of the driver. The torque should be substantial. The speed of rotation (Fig. 7) should be adjustable with an appropriate foot treadle. It should spin at low speed (maximum: 15 000 revolutions/minutes).

Specific drills have been designed which allow performing either an osteotomy or a bone resection, according to their shape (Fig. 8).

The brilliance amplifier

Each surgical step should be controlled with a brilliance amplifier. We use a mini-amplifier (Fig. 9) to allow

Fig. 7. The driver console

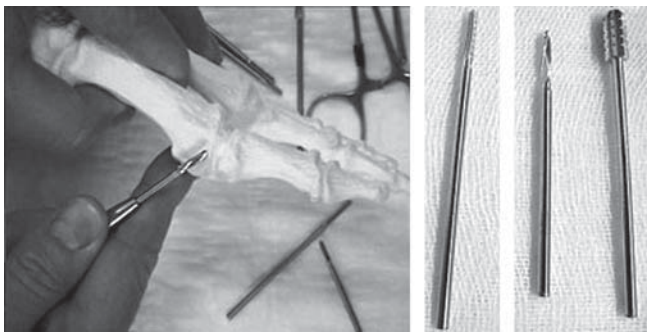

Fig. 8. The drills: osteotomy drill, surfacing drill

Fig. 9. Amplifier ready and installation

reducing the radiations significantly (10 to 100 times fewer rays than a usual amplifier).

Preoperative evaluation

Our preoperative evaluation always includes three incidences: plain weight bearing axial and AP view, and an incidence (Guntz view or Walter-Muller's).

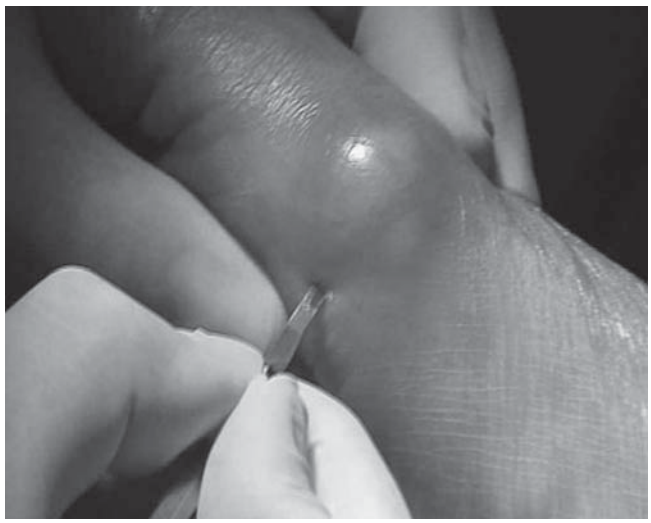

Fig. 10. First incision

On the AP view picture usual references are marked (metatarsus varus, phalangeal valgus, distal metatarsal articular angle) allowing us to consider the indication for a mini-invasive procedure, i.e. for a primary hallux valgus, a metatarsus varus, which should be inferior or equal to 16°, the articulation being congruent with an increased DMAA3 (congenital hallux valgus).

Surgical technique

We will only report here the technique for an uncomplicated first shaft.

Anaesthesia

In most cases, it consists in local/ regional anaesthesia, which combines a posterior tibial block, pedious and anterior coronal of the mid-foot or upper at the popliteal level.

Patient positioning

The patient is in a decubitus dorsal position. The operated foot protrudes from the table while the opposite lower limb is flexed at 90°. This technique does not require a tourniquet on the lower limb. The amplifier is placed on the side of the operated foot in order to control the bone surgical steps and to adjust the osteotomies.

First step: bunionectomy and osteotomy of the neck of the 1st metatarsal

An incision is made with the Beaver© bistoury on the inferomedial wedge of the metatarsal head, just above the posterior portion of the sesamoids (Fig. 10). It is about 3 to 5 mm long and starts from skin to the bone contact. Once the bone is reached, the blade performs a first detachment of the soft tissues on the medial aspect of the

Fig. 11. Bunionectomy

Fig. 12. Osteotomy drill

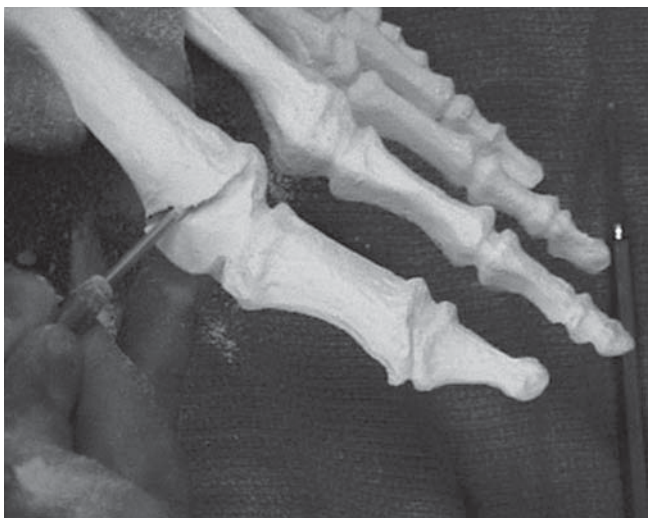

Fig. 13. The osteotomy

Fig. 14. Digital pressure

head, facilitated by performing wiping movements with the help of bistoury then detachment device. Once the working chamber is achieved, surfacing drills (large diameter) reduce the bone of the bunion to a pulp (Fig. 11). This resection is controlled with manual palpation of the medial aspect of the metatarsal and with the help of the amplifier. It should stop at the capital functional articular surface, taking into account the value of the distal metatarsal articular angle. The drills should be used very carefully and the surgeon should comply with some requirements. The speed of rotation should be kept to the minimum, between 8000 and 15 000 revolutions per minute maximum, in order not to burn the soft tissues and damage the bone.

Once the bunion is resected, a correction of the distal metatarsal articular angle is carried out (or PASA or DMAA or a. angle) with the Reverdin-Isham7 osteotomy. We use a long osteotomy drill (Fig. 12), which is inserted with the same approach. Its upper end is placed at the base of the superior articular surface, which is located with the amplifier on the axial view; the drill should perform an oblique-plane osteotomy of 45° from dorsal distal to proximal plantar, and parallel to the distal articular surface (Fig. 13). It preserves the lateral cortical and achieves an osteoclasia through external manoeuvre (forced hallux abduction and plantar flexion). It thus corrects both the metatarsal distal articular angle and a portion of capital pronation. At the end of the operation, bone debris are removed with the help of digital pressure (Fig. 14) and with the use of suitable rasps (Fig. 15).

Second step: lateral arthrolysis

With the help of the Beaver©, we perform a dorsal incision opposite to the metatarsophalangeal articulation of the hallux 2 to 3 mm outside the long extensor tendon. The blade of the bistoury should be parallel to the M1 axis and, in a first stage, proceeds along the articulation.

Fig. 15. Rasps

Fig. 17. Control of the osteotomy of P1 under amplifier

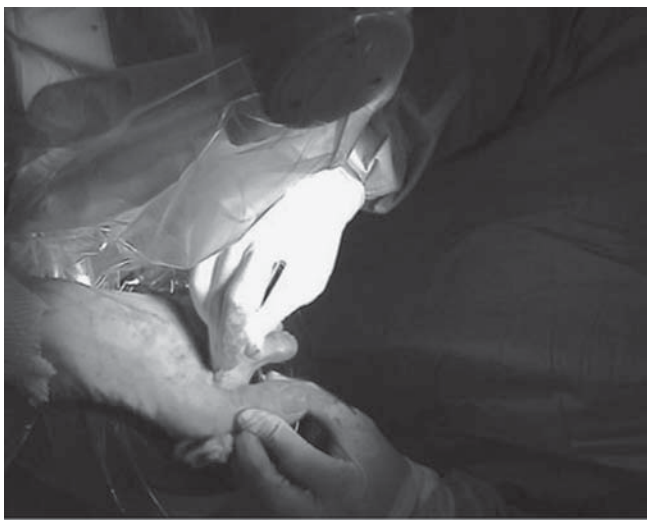

Fig. 16. Lateral release

Fig. 18. Placement of the drill

Halfway through, we progress inside the articulation applying a 90° lateral rotation to the blade. The shifting of the blade of the bistoury achieves a tenotomy of the adductor of I and the plantar capsulotomy, which will allow consolidating P1 on the head of M1 (Fig. 16).

Third step: phalangeal osteotomy

A third incision is made on the dorsomedial aspect of the proximal third of the P1 metaphysis, on the inner aspect of the extensor tendon; blade is orientated in a parallel position with the bone. We replace the blade with the rugine and we progress toward the contact with the proximal third of the metaphysis. We verify the good positioning of the instruments under scopy (Fig. 17). The same osteotomy drill replaces the rugine and creates a varisation osteotomy of the base of P1 preserving the lateral cortical (Fig. 18), Akin1 type osteotomy. The osteotomy is then closed with hallux abduction external manoeuvre and we verify under brilliance amplifier the closure of the osteotomy cut.

The three approaches are then closed with simple sutures with rapid vicryl or with non-resorbable single strand thread (the dorsal arthrolysis approach can be left without sutures).

An injection of 2 mg of dexamethason can next be administered at the level of the lateral arthrolysis and of the P1 osteotomy. We do not inject corticoids at the level of the M1 osteotomy.

Fourth step: the dressing

Since we have not used any osteosynthesis equipment, the placement of the dressing is essential because it will allow supporting the bone corrections, which have been carried out (eight-shaped dressing, left in place for 8 days). It should necessarily be applied by the surgeon in

Fig. 19. The dressing

Fig. 20. The medical shoe

the operating theatre (Fig. 19) and should be followed by an immediate scopic control in AP and axial view.

Postoperative follow-up

In the majority of cases, the surgery is performed in ambulatory care: the patient returns home on the same night with a medical shoe (stiff-soled), which he will keep for 2 to 3 weeks (Fig. 20). Full weight bearing is immediately permitted but some time slots should be arranged for rest with raised foot. On the eighth day, the patient is reviewed: dressing and non-resorbable stitches are removed. A support orthoplasty with silicon is placed (Fig. 21). A radiographic evaluation is next performed, with orthesis still in place. The patient returns home with a support of the metatarsal arch with a self-adhesive elastic bandage. He/she will be seen next in a follow-up consultation in a month for a second clinical and radiological control, which this time, will be carried out weight bearing and orthesis removed. Post-operative shoe will have been replaced two weeks before with a flexible sports type shoe. The patient is then reviewed between three and four months later for the third radiological and clinical control (Fig. 22). The future follow-up frequency is variable, and usually yearly.

Fig. 21. The orthoplasty

Fig. 22. X-ray at three months

Conclusion

Among the numerous surgical techniques for the correction of the hallux valgus, mini-invasive surgery, which is less aggressive and can be performed in ambulatory care, seems to us to be a fundamental progress in the forefoot surgery. It has its own perfectly codified indications and can never be a substitute in itself for conventional surgery. Nevertheless, we think that this technique, which requires a long learning curve and should be learned through both theoretical and practical courses but also through transmission of knowledge by experienced surgeons, provides a valuable alternative to traditional surgery. It deserves its place in the therapeutic arsenal of primary corrective procedures of the hallux valgus.

Bibliography

1. Akin OF (1925) The treatment of hallux valgus: a new operative procedure and its results. Med Sentinal 33: 678-83
2. Andreasi A, Coppo M (1997) L'intervento di Reverdin-Gren modificato nel truittamento quirurgico dell'alluce abdono-valgo. En: Gaggi A, editor (1997) Progresi in Medicina e Chirurgia del Piede. L'alluce valgo. Bologna: Aulo Gaggi 105-14
3. Canovas F, Poiree G, Bonnel F, et al. (1998) Radiographic analysis of the orientation of the distal articular surface of the first metatarsal in the horizontal plane. Rev Chir Orthop Reparatrice Appar Mot 84: 546-9
4. Coughlin MJ (1997) Hallux valgus in men: effect of the distal metatarsal articular angle on hallux valgus correction. Foot Ankle 18: 463-70
5. De Prado M, Ripoll PL, Golano P (2003) Cirugia percutanea del pie (Tecnicas quirurgicas. Indicaciones, Bases anatomicas). Ed. Masson. Barcelona
6. De Prado M, Ripoll PL, Vaquero J, Golano P (2003) Tratamiento quirurgico percutaneo del hallux valgus mediante osteotomias multiples. Rev Ortop Traumatol 47: 406-16
7. Isham S (1991) The Reverdin-Isham procedure for the correction of hallux abducio valgus – A distal metatarsal osteotomy procedure. Clin Podiatr Med Surg 8: 81-94
8. Wù K (1997) Modified Mitchell's bunionectomy (Wù's bunionectomy). Orthopedics 20: 253-7