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Special Article

Minimal incision surgery in hallux rigidus

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Abstract

The choice of surgical technique in the treatment of hallux rigidus is an individual decision of the surgeon. Minimally invasive osteotomies have proven to be valid techniques, allowing us to perform cheilectomies, first proximal phalangeal osteotomies, and distal first metatarsal osteotomies. We describe the minimally invasive technique for the treatment of hallux rigidus.

Level of Evidence V; Therapeutic Study; Expert opinion.

Keywords: Hallux rigidus; Minimally invasive surgical procedures; Osteotomy.

Introduction

The choice of surgical technique for the treatment of hallux rigidus is still an individual decision of the treating surgeon[1]. Different therapeutic algorithms have been proposed[2,3] and, although none of them has been validated, minimally invasive surgery (MIS), which consists of procedures such as minimally invasive osteotomies, has proven to be a valid technique that yield results similar to those of open osteotomies for the treatment of forefoot problems[4].

Indications

Initially, conservative treatment is indicated for all patients, with the use of rocket-bottom shoes and stretching exercises of the Achillean-calcaneus-plantar system. In case of treatment failure and persistence of clinical manifestations, surgical treatment is proposed. MIS techniques allow us to perform different procedures, such as cheilectomy, first proximal phalangeal (P1) osteotomy, and distal first metatarsophalangeal (M1) osteotomy[5], with different indications according to patient's functional demand and to Coughlin and Shurnas[6] classification, as shown below:

Grade 0: conservative treatment

Grades 1-2-3:

- *Young patient with functional demand:* association of cheilectomy, descending M1 osteotomy and Moberg phalangeal osteotomy. The indication may be expanded to the initial stages of grade 4 when more than 45% of joint cartilage is of good quality, especially in cases of *metatarsus primus elevatus*.
- *Older patient or with low functional demand:* isolated cheilectomy. This procedure should be performed alone with MIS techniques only in older patients whose pain does limit everyday activities. In these patients, the main problem is the conflict of space between produced exostosis and the shoe; therefore, our surgical approach will improve clinical symptoms.

Grade 4: metatarsophalangeal arthrodesis.

Surgical technique

Cheilectomy

A 5-mm incision is made in the medial surface, dorsal to the plantar edge of the first metatarsal, proximal and dorsal to the medial sesamoid (Figure 1). A perpendicular incision is made to the skin through the capsule towards the metatarsophalangeal joint. With a movement to the dorsal and plantar direction, the entire capsule is detached from the superior and external surface of the metatarsal head, creating a space between the latter and the bone, where it will be possible to «work on»; a DPR rasp is introduced to check the space created, which will prevent soft tissue injuries. A reamer is introduced at a slow velocity, from 2,000 to 6,000 rpm, and exostosis is eliminated using oscillatory movements exactly

Study performed at the Hospital Quirón Salud Murcia, Murcia, Spain.

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up to the desired level, which will be confirmed under fluoroscopic control. This process is interrupted on two or three occasions to extract the produced bone paste by pressing the capsule on the metatarsal head towards the skin incision, as well as to introduce the DPR rasp, in order to extract fine body remains and adherences to the deep surface of the capsule. The repetition of these procedures makes it possible to perform complete exostectomy and appropriate cleaning.

Distal M1 osteotomy

A Shannon 44 reamer is introduced through the portal created for cheilectomy. Under fluoroscopic control, the reamer is placed in an angle of approximately 45° in relation to the M1 axis, in the plantar-proximal direction. Osteotomy is performed is performed in an oblique direction of 45° from distal-dorsal to plantar-proximal, with the upper limit defined as the final portion of the neck when reaching the joint cartilage. Subsequently, the metatarsal head is lowered and moved back by pressing it to the proximal direction.

P1 osteotomy

An incision is made over the dorsomedial surface of the P1 base, medial to the extensor hallucis tendon (Figure 2). A rasp is introduced to conduct periosteal section, a straight 2-15 reamer is introduced, supported on the cortical bone, and then a digital extension movement is performed to prevent damages to the surrounding neurovascular structures. Osteotomy perpendicular to the proximal phalangeal axis and starts with a lateral rotation movement, using the skin incision as a pivot point. Osteotomy is completed sparing some millimeters of the plantar cortical surface. The desired dorsal wedge is created by applying dorsal pressure on the toe whereas the reamer performs a slightly oscillatory movement.

Postoperative care

Weight bearing with postoperative shoes is allowed soon after intervention. A clinical follow-up is performed on the 7th postoperative day, suture stitches are removed, and postoperative bandage is changed to metatarsal band and Coban™ cohesive bandage, and patients are instructed on how to apply it so that they can change it every day after foot personal hygiene. During the first 4 weeks, gait is allowed only with postoperative shoes. One month later, a new clinical and radiological follow-up is performed, and patients are allowed to wear new shoes, provided that they have rigid soles, are wide, and have laces so that they can be properly adjusted in order to prevent slapping. Intense physical activity is not allowed up to nearly 2 months after intervention.

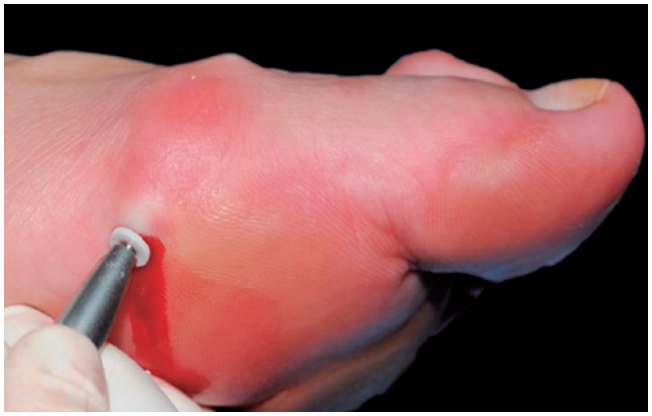

Figure 1. Cheilectomy and distal M1 osteotomy approach.

Figure 2. P1 osteotomy approach.

Figure 3. Pre-and postoperative radiographic study.

Complications

The rate of complications may decrease significantly with the participation in specific training courses. Possible complications resulting from the technique include postsurgical hematoma, persistent edema, joint stiffness, transfer metatarsalgia, displacement secondary to osteotomies, and delayed union. Delayed union of first metatarsal osteotomies is frequent, the presence of nonunion cannot be considered except for cases that exceed the minimum time of progression of 18 months. This delayed union is produced by osteotomy mobility, and, on other occasions, it may be favored by possible bone necrosis produced by the action of cutting reamers at more than 10,000 rpm. It may also be observed in cases when metatarsal head was excessive and did not receive any weight-bearing stimulation.

Results

We conducted an analysis of surgical treatment results of patients with *hallux rigidus* whose conservative treatment failed. Surgical treatment was performed in 42 patients, with mean age of 51 years, 24 men and 18 women; *hallux rigidus* was classified as grade II in 14 patients, and as grade III in 28 of them, according to the Coughlin and Shurnas classification. All patients were subjected to a minimally invasive technique combining cheilectomy, Moberg P1 base osteotomy, and distal dorsal closing M1 descending osteotomy. Mean follow-up time was 27 months, with clinical and radiological follow-up (Figure 3). Pre-and postoperative AOFAS scores were assessed. Mean AOFAS score was 44 preoperatively and 82 at the end of follow-up, and outcomes were classified as good or excellent in 86% of patients.

Complications were present in five patients: two cases of transfer metatarsalgia, one case of delayed union, one case of postoperative stiffness, and one case of postoperative hematoma. Stiffness was treated using percutaneous arthrolysis, delayed union was achieved at 8 months of follow-up, and postoperative hematoma spontaneously resolved with no need for drainage.

Radiological outcomes are comparable to those of open surgery, with osteotomies exhibiting union rates of 100% of the reviewed cases.

Conclusion

Minimally invasive surgery for the treatment of hallux rigidus allows us to perform different surgical techniques and is a useful therapeutic tool for our patients, with results similar to those of open surgery.

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References

1. Polzer H, Polzer S, Brumann M, Mutschler W, Regauer M. Hallux rigidus: Joint preserving alternatives to arthrodesis - a review of the literature. World J Orthop. 2014;5(1):6-13.
2. Asunción Márquez J, Martin X. Hallux rigidus: aetiology, diagnosis, classification and treatment. Rev Esp Cir Ortop Traumatol. 2010; 54(5):321-8.
3. Viladot-Pericé R, Álvarez-Goenaga F, Formiguera-Sala S. Update on the Treatment of Hallux Rigidus. Rev Ortop Traumatol. 2006; 50(3):233-40.
4. Bauer T, de Lavigne C, Biau D, De Prado M, Isham S, Laffenétre O. Percutaneous hallux valgus surgery: a prospective multicenter study of 189 cases. Orthop Clin North Am. 2009;40(4):505-14.
5. De Prado M, Ripoll PL, Golanó P. Minimally invasive foot surgery: surgical techniques, indications, anatomical basis. Barcelona: About Your Health; 2009. p. 63-109.
6. Coughlin MJ, Shurnas PS. Hallux rigidus: demographics, etiology, and radiographic assessment. Foot Ankle Int. 2003;24(10):731-43.