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Dorsal closing wedge calcaneal osteotomy for the treatment of Insertional Achilles Tendinopathy: A technical tip to optimize its results and reduce complications

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ABSTRACT

Background: Dorsal closing wedge calcaneal osteotomy is a technique for the treatment of Haglund's triad, which is considered a safe procedure with good results. However, one of the complications that could lead to revision operation is the nonunion of the osteotomy and failure of osteosynthesis. This is attributed to instability of the osteotomy site and proximal migration of the posterior calcaneal process due to breakage of plantar bone-bridge at the apex of the wedge osteotomy.
Methods: This study presents a technical tip that helps the surgeon to avoid the breakage of the plantar hinge of the os calcis which is believed that causes instability of the osteotomy.
Results: After the utilization of that technical tip, no proximal migration of posterior calcaneal process or subsequent nonunion and failure of the osteosynthesis was noted.
Conclusion: Dorsal closing wedge osteotomy is a technique for the treatment of IAT, which is considered a safe procedure with good results. The proposed technical tip helps to avoid the breakage of the plantar hinge which is believed that causes instability of the osteotomy with proximal migration of the posterior calcaneal process and subsequent nonunion and failure of the osteosynthesis.

1. Introduction

Posterior heel pain syndrome is a clinical problem that represents a combination of three pathologies that comprises what was used to be referred to as Haglund's triad: the insertional Achilles tendinitis, the retropatellar bursitis (RB) and the Haglund's deformity. The Achilles Tendon Study Group made a consensus effort and after consideration of the anatomic location, symptoms, clinical findings and histopathology, proposed the terminology Insertional Achilles Tendinopathy (IAT) [1]. The current management of IAT varies with several conservative and surgical treatments [2]. Surgical intervention is indicated in patients unresponsive to conservative therapy for at least 6 months [3,4].

Dorsal closing wedge calcaneal osteotomy is a technique for the treatment of IAT, first described by Zadek [5] in 1939. It is considered a safe procedure with excellent results and low rate of complications such as shortening of the os calcis and creation of a plantar beak on the apex of the osteotomy [6]. However, one of the complications that could lead to revision operation is the nonunion of the osteotomy and failure of osteosynthesis. This is attributed to instability of the osteotomy site and proximal migration of the posterior calcaneal tuberosity due to breakage of plantar bone-bridge at the apex of the wedge osteotomy and the unopposed traction from the Achilles tendon (AT) (Fig. 1).

The purpose of this study is to present a technical tip that protects the plantar bone-bridge intact, thus preventing the devastating complication of nonunion and proximal migration of the posterior process of the os calcis.

2. Surgical technique

The procedure is performed through a lateral approach with the patient in a lateral position, under general anaesthesia and ankle block with thigh tourniquet on after administration of 1.5 g cefuroxime. An L-shaped lateral incision is used and extended down to the bone which is exposed by sub-periosteal dissection. The goal of the procedure is to remove a dorsal wedge from the

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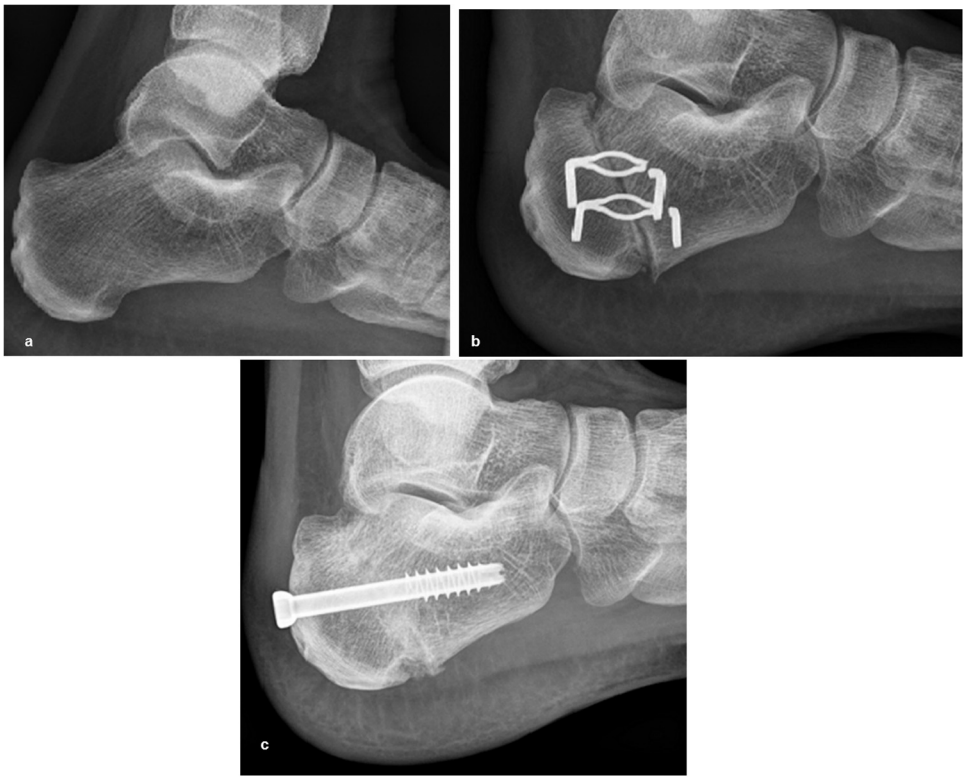

Fig. 1. Radiographs of a complicated case.
Lateral radiograph of the calcaneus of a 45-year-old man (a). Complication with non-union of the osteotomy, proximal migration of the posterior os calcis and breakage of the staples (b). The osteosynthesis was revised with a 6.5 mm cannulated screw. Union of the osteotomy achieved at 12 weeks (c).

calcaneus, allowing the calcaneal tuberosity to rotate anteriorly. The dorsal base of the wedge is about 1 cm. Extra care is taken to preserve a bone hinge at the apex of the wedge at the plantar surface of the calcaneus. For that reason, a 1.6 mm Kirschner wire is placed perpendicular to lateral calcaneal surface in about 2 mm from the plantar edge of the os calcis prior to osteotomy. The first cut of the osteotomy was performed with a saggital saw immediately posterior to the posterior subtalar joint facet, and perpendicular to the weight-bearing surface. The second cut was performed anterior to the AT and angled to meet the first cut to form an apex plantarly. The wedge is easily removed if the medial periosteum is detached by a sharp elevator passed over the proximal border of the calcaneal tuberosity, taking care not to injure the medial neurovascular bundle. Then the K-wire is removed and the osteotomy is closed by dorsiflexion of the ankle joint with gentle plastic deformation of the plantar hinge which should be preserved to avoid instability. Fixation achieved with two staples (Figs. 2 and 3).

3. Discussion

Dorsal closing wedge calcaneal osteotomy- first used by Zadek [5] and popularized by Keck and Kelly [6] — tilts the heel prominence anteriorly to reduce the posterior prominence of the heel and lowers the Fowler–Philip angle [7,8]. Additionally the osteotomy slightly elevates the insertion of the Achilles tendon. The osteotomy would therefore address slight equinus, which is commonly present, creating an effect similar to an AT lengthening. The orientation of the AT fibres at the calcaneal insertion are also effectively altered, thereby reducing stress, which provides relief from pain associated with related IAT and RB [8,9]. All these anatomical changes cause improvement to both the biological and mechanical disorders that are believed to be the cause of the insertional Achilles pathology: degeneration of AT, friction and compression of retrocalcaneal bursa, mechanical irritation of tendon by the calcaneal prominence, increased mechanical load at the calcaneal insertion of the AT, tight gastrosoleus muscle [10,11].

Although it is considered a safe method with good results and low complication rates, one of the complications that could lead to revision operation is the nonunion of the osteotomy and failure of the osteosynthesis. This is attributed to instability of the osteotomy site and proximal migration of the posterior calcaneal tuberosity due to breakage of the plantar bone bridge at the apex of the wedge osteotomy and the unopposed traction of the AT [7].

The K-wire preserves the plantar bone-hinge in two ways. First, it acts as an actual mechanical block that avoids inadvertent maltracking of the saw and prevents the breakage of the bone-bridge due to the side-to-side vibrations of the sagittal saw blade. Then, after the removal of the K-wire, the remaining hole at the apex of the osteotomy helps to prevent a stress riser to propagate all the way through the plantar bone hinge during the closure of the osteotomy allowing only for plastic deformation [12–14]. A so-called ‘stop hole’ at the osteotomy tip is a well-known technique in engineering that helps to retard crack growth and propagation [15].

4. Conclusion

Dorsal closing wedge osteotomy is a technique for the treatment of IAT, which is considered a safe procedure with good results. The proposed technical tip helps to avoid the breakage of the plantar hinge which is believed that causes instability of the

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