

## Does Proximal Metatarsal Osteotomy Need Internal Fixation? A Case Report

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### Abstract

Internal fixation for proximal metatarsal osteotomies is generally not required, since many authors state that weight bearing may promote fusion of the metatarsal segments in the correct position.

This study reports a case of a 54 years old woman affected by metatarsalgia who was treated surgically with a proximal metatarsal osteotomy. Radiographies showed a non-union of the metatarsal osteotomy and MRI, bone scintigraphy and blood tests excluded infection. Surgical treatment consisted in debridement of fibrous non-union, autologous bone grafting and plate and screw fixation. The plate was removed 12 months after the surgery because of soft tissue irritation and hardware prominence.

At the last follow-up, the patient was pain free and resumed her daily activities.

In general, proximal osteotomies are safe procedures for the treatment of metatarsalgia. Although fixation is a controversial topic, it should be reconsidered in order to avoid nonunion.

**Keywords** Nonunion; Pain; Metatarsalgia; Forefoot

### Introduction

Metatarsalgia consists in persistent pain at the metatarsal head. It occurs when the metatarsophalangeal joint suffers from an overload of the weight distribution at the forefoot [1,2].

Treatment strategies for metatarsalgia include conservative and surgical ones. Common conservative strategies are wearing sneakers, avoiding high heels, using orthosis to distribute the load on all metatarsal head, NSAIDs and physical therapies, such as laser therapy or ionophoresis. These strategies are effective in more than 50% of patients, in whom no further treatment is required. In the remaining 50% of the cases surgical correction might be considered [3].

Proximal osteotomies are a feasible surgical option. As described by Sgarlato, proximal dorsiflexory wedge resection has been used to treat central metatarsalgia [4]. A dorsal wedge resection in the proximal metaphysis of the metatarsal is performed to decrease the overload on the metatarsal head. This technique achieves an optimal correction with a minimal bone resection. About fixation strategies there is still debate: some authors have proposed various methods such as screws, plates or Kirschner wires. Other authors, such as Cañadell, perform such osteotomies without an internal fixation [5].

We present a case of a 54 years old woman who developed non-union and excessive extension of the second metatarsal after a proximal dorsiflexory wedge osteotomy for central metatarsalgia. The patient was treated with debridement of fibrous non-union, followed by stabilization using a bone graft and plating.



**Figure 1:** Dorsoplantar weight bearing radiograph showing the nonunion of the second metatarsal.



**Figure 2:** Dorsoplantar (A) and lateral (B) weightbearing radiograph 12 months after surgery.

### Case report

A 54 year old woman was treated for a metatarsalgia in 2008 with a proximal extension osteotomy of the second metatarsal without fixation. The operative records reviewed showed no early complication. One year later she was referred to our clinic for a deformity in hyperextension of the second metatarsal and persistent pain, worsening during walking. There was no history of trauma. First line conservative strategy, consisting in physical therapy, active and passive mobilization and foot orthosis failed. Physical examination showed an evident antalgic gait. Plantar callosities were present under the third and fourth metatarso-phalangeal joint. Radiographic examination showed a nonunion without signs of infection (Figure 1). Length of the second and third metatarsal was respectively 78 mm and 76 mm. MRI, bone scintigraphy and blood test excluded an infection. A dorsal skin incision and inspection of the previous osteotomy site was performed showing fibrous non-union. Subsequently a curettage of the fibrous tissue was performed and subchondral bone drilling undertaken. An autologous bone graft was harvested from the proximal tibial metaphysis. After reposition of the metatarsal, the bone graft was placed in the defect cavity, in order to maintain the extension obtained. The fixation was achieved using a plate with a step of 4 mm and with 4 screws. The first postoperative day early mobilizations was permitted with a post-operative shoe. Full weight-bearing was allowed after 6 weeks, when the X-rays showed a satisfactory bone consolidation (Figure 2). The American Orthopaedics Foot and Ankle Society Lesser Metatarsophalangeal-Interphalangeal Scale Score (AOFAS), improved from 44 points before surgery to 100 points at the last follow-up (38 months). The plate was removed 12 months after surgery because of soft tissue irritation by prominent hardware. A CT examination after implant's removal showed a good bone consolidation (Figure 3). At the last follow-up, the patient was pain free and resumed her daily activities.

### Discussion

Surgical strategies to treat metatarsalgia include distal or proximal osteotomies. Meisenbach in 1917 described a lesser metatarsal osteotomy without fixation of the metatarsals to treat a depression of second, third and fourth metatarso-phalangeal joints [6]. Lelievre et al. proposed a resection of the metatarsal head in patients affected by severe pain and joint destruction [7]. Although this technique achieves good results, it may result in transfer metatarsalgia. Furthermore this is a very aggressive technique for the management of isolated

metatarsalgia, hence, it can be used only in patients with severe symptoms. In 1975, Helal described an oblique metatarsal osteotomy of the metatarsal neck [8]. Nevertheless this technique gives transfer metatarsalgia and non-union, as showed by Trnka et al. [1]. The Weil osteotomy is the most popular distal metatarsal osteotomy [9]. This technique permits a mild shortening of 4-5 mm of the metatarsal and requires an internal fixation with specific instruments. The Weil osteotomy achieves good results with success rates between 65% and 88% and for this reason it remains the gold standard in the treatment for metatarsalgia. The complication rate of delayed union and non union is very low [8], however this technique may give floating toe deformity, stiffness and loss of motion of the metatarso-phalangeal joint in about 40% of patients, or problems related to the internal fixation (3%-29%) [1,10]. Therefore, distal metatarsal osteotomy should be performed when the metatarso-phalangeal joint is impaired. With regard to proximal osteotomies, Cañadell et al. proposed a wedge resection of the metatarsal base, without giving any internal fixation [5]. This procedure is associated with a high rate of complications such as delayed unions or pseudoarthrosis. Spence described in 1990 a proximal metatarsal resection of a 0.5 cm cylindrical segment of bone. No fixation was considered necessary. However, the bone healed correctly only in 24% of patient [10]. In general, proximal osteotomies are more difficult from a technical point of view, and the long lever arm between the osteotomy site and the metatarsal head makes the final position less predictable than distal osteotomies [8,10].



**Figure 3:** CT examination after implant removal showing bone consolidation.

Complications following metatarsal osteotomy include transfer metatarsalgia, painful bone callus, recurrence, stiffness and/or instability of the metatarso-phalangeal joint, malalignment and non-union or delayed unions [8,10-13]. Non-unions are demanding complications that can result by many factors, such as which include infection, inadequate fixation, medical comorbidities, and comminution. Clinically it is represented by persistent pain and disability [14]. Fixation is a controversial topic. Many authors suggest that fixation is not necessary because the weight bearing may bring the metatarsal segment in the correct position [8,11-13].

In this paper, we report a patient with pseudoarthrosis and hyperextension of the second metatarsal occurred after a proximal metatarsal osteotomy performed without fixation, which was been

successfully treated with bone graft and plating. The radiographic examination did not show an atrophic nonunion, suggesting that excessive motion can be considered the main etiologic factor for nonunion rather than impaired vascularity. Stable fixation is mandatory in the salvage procedure and lead to complete symptoms remission. Currently, no widely accepted treatment for metatarsalgia and its complications are accepted. In this case report, treatment of metatarsal non-union with bone graft and plating after prior failure of the procedure without stable fixation achieved a safe and effective result.

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