Brachymetatarsia of the fourth metatarsal, lengthening scarf osteotomy with bone graft

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Abstract

A 16-year-old girl presented with left fourth metatarsal shortening causing significant psychological distress. She underwent lengthening scarf osteotomy held with an Omnitech® screw (Biotech International, France) with the addition of two 1 cm cancellous cubes (RTI Biologics, United States). A lengthening z-plasty of the extensor tendons and skin were also performed. At 6 weeks the patient was fully weight bearing and at one-year follow up, the patient was satisfied and discharged. A modified technique of lengthening scarf osteotomy is described for congenital brachymetatarsia. This technique allows one stage lengthening through a single incision with graft incorporation by 6 weeks.

Introduction

Brachymetatarsia is a congenital shortening of the metatarsal of the foot. It can be either uni or bilateral, and is most commonly associated with the 4th toe but can affect any of the metatarsal bones. Patients may present due to metatarsalgia, soft tissue contractures, or psychological distress during adolescence. Operative intervention can improve function as well as cosmesis. Lengthening may be achieved through callotaxis using a mini-external fixator or through a single stage procedure utilising an osteotomy, bone grafting and soft tissue correction. This case illustrates the use of a lengthening scarf osteotomy augmented with cancellous bone graft cubes and soft tissue correction to treat brachymetatarsia. This modified technique provides improved metatarsal length and cosmetic benefit with a single operative procedure.

Discussion

The forefoot deformity known as brachymetatarsia is a malformation of any of the metatarsals. It most often affects the 4th toe and may be either uni or bilateral. The incidence of this rare deformity is reported between 0.02 to 0.05% and is up to twenty five times more prevalent in women compared to men. Although the main proportion of congenital brachymetatarsia is idiopathic in nature it can also be associated with endocrinopathies, such as pseudo-hypoparathyroidism, as well as systemic syndromes such as Turner’s syndrome. The underlying cause of this shortened metatarsal is thought to be due to the premature closure of the metatarsal epiphyseal growth plate, however, the aetiology behind this is not fully understood. There are a number of other acquired causes for the development of shortened metatarsals. Principally trauma and infection, however tumours, radiation exposure and previous surgery are also associated. Morton’s foot, a short first metatarsal, is another less common form of brachymetatarsia that becomes obvious by the age of 10 years old.

Patients with brachymetatarsia may present in a number of ways. The short toe may sit dorsally which affects cosmesis and impairs load transfer of the foot. This can lead to metatarsalgia and callouses particularly over the second and third metatarsal heads. With soft tissue imbalance, clawing of the toe may be problematic for shoe wearing.

The aim of surgery in these cases is to provide symptomatic relief and cosmesis. The two main methods of surgical correction are of distraction osteotomy providing a gradual increase in length, and the single stage osteotomy with bone graft to produce a rapid lengthening (Table 1).

Our case presents a modified surgical technique using a scarf osteotomy with afixing Omnitech® screw, alongside a tendon Z-plasty of the short and long extensor tendons to produce desirable results. By using a scarf osteotomy rather than a transverse, we allow for controlled elongation of the metatarsal with secured fixation. This decreases the chance of metatarsal shortening post operatively, which can be seen with the transverse osteotomy. It also removes the need for a holding Kirschner wire which is often inserted and removed at a later date once the transverse osteotomy has begun to heal. The cancellous bone blocks were held in place by compression screw fit. When the scarf osteotomy is performed, distraction at the site causes surround soft tissue compression and maintains a press fit for the bone blocks.

The management of brachymetatarsia can be complicated and it is particularly important to
consider that young women, the main patient group, desire a cosmetic improvement due to the already high levels of psychological distress. This was true in our case where it was felt that a single-stage operation would be the most appropriate method and would be the least restricting on her daily life. The scarf osteotomy augmented with bone graft cubes should decrease the risk of the patient requiring a second operation and early results have so far shown this. This case indicates the importance of patient selection when considering which operative procedure to undertake and to consider the long-term impact of the operation.

A lengthening scarf osteotomy with screw fixation and the use of cancellous bone blocks is a modified technique for the surgical management of brachymetatarsia that provides a good alternative to traditional techniques.

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