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Opening first metatarsal osteotomy and resection arthroplasty of the first MPJ in the treatment of first ray insufficiency associated with degenerative hallux valgus☆

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ABSTRACT

Background: Opening wedge proximal metatarsal osteotomy combined with first metatarsophalangeal arthroplasty can be used to correct first metatarsus primus varus with a high intermetatarsal angle and a short first metatarsal.
Methods: 147 feet in 138 patients with degenerative first metatarsophalangeal arthrosis, ≥15° of metatarsus primus varus and, a short first metatarsal were included. Preoperative and postoperative clinical, radiographic, and subjective outcome measurements were taken (Scale AOFAS).
Results: The mean first intermetatarsal angle decrease was 7.79 ± 1.43° and the mean increase in first metatarsal length was 2.88 ± 0.45 mm. The pre-intervention mean values were 52.6 points in the AOFAS scale, and an overall result of 92.95 obtained after surgery ($P < 0.001$).
Conclusions: The opening proximal first metatarsal osteotomy without internal fixation and with first metatarsophalangeal resection arthroplasty can correct severe hallux valgus with an intermetatarsal angle ≥15° and a short first metatarsal, achieving low rate of complications.

1. Introduction

Hallux valgus is one of the most common morphological changes encountered by the foot surgeon. Originally described by Hueter in 1870 [1], hallux valgus is defined as a subluxation of the first metatarsophalangeal joint (MTPJ), associated with lateral deviation of the first toe and medial deviation of the first metatarsal (MTT), and often accompanied by valgus rotation (pronation) of the first toe. A number of surgical interventions are available to surgeons for the correction of the deformity of hallux abductovalgus (HAV), including soft tissue procedures, arthroplasty, osteotomy, and arthrodesis. These techniques can be used alone or in combination. Osteotomy is often used to correct metatarsus primus varus, and to regain balance of the first MTPJ. In this retrospective case series study, we describe the results of surgical correction of HAV with severe degenerative joint disease localized to the first MTPJ, along with a short first metatarsal (index minus in the metatarsal formula) and a large (≥15°) first intermetatarsal angle (IMA), using a modification of previously described techniques [2,3], combining Brandes–Keller–Lelièvre [4–6] technique with an opening proximal osteotomy of the first MTT and a resection arthroplasty of the first MTPJ. Unlike the previous technique, we use bone obtained from the wedge arthroplasty of the first phalanx of the hallux as an autologous graft for the proximal osteotomy, rather than using the bone of the buniectomy. It is in our view a better quality of cortical bone graft allows greater elongation of the first metatarsal.

2. Patients and methods

This retrospective case series study including all consecutive cases of severe degenerative hallux valgus with daily activity pain, which underwent surgery between January 1995 and December 2007. The technique performed in all cases was a Brandes–Keller–Lelièvre [4–6] procedure with an opening proximal osteotomy of the first MTT (Fig. 1). Release of the adductor hallucis tendon was combined with this bony procedure to facilitate sesamoid realignment. None of these patients underwent adjunct surgeries, such as hammertoe repair, other metatarsal osteotomies, heel cord release, hindfoot surgery, or any other operations at the time of the first ray surgery. After this procedure, the patient was maintained in a below the knee plaster cast for a duration of 4 weeks with thromboembolic prophyaxis, allowing heel weight bearing on the

☆ Level of clinical evidence: 4. Case series study.

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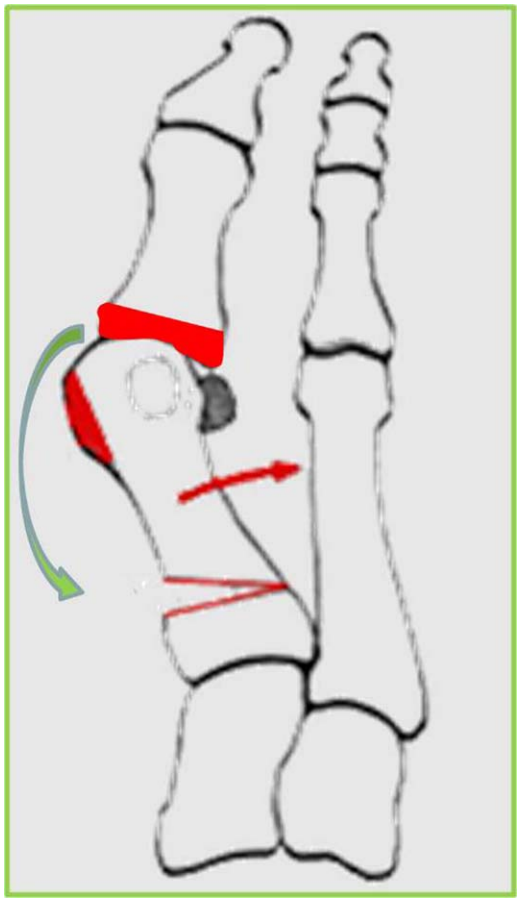

Fig. 1. Schematic representation of the surgical technique. The resected base of the proximal phalanx of the hallux is fashioned into a tricortical bone graft that is placed at the medial aspect of the base of the first metatarsal, after creation of an opening osteotomy and preservation of the lateral cortex. The medial eminence of the first metarsal head is also resected, however this bone is not used as a source of autogeneous bone, unless additional graft material is needed.

cast directly with the use of crutches. A decision about physiotherapy after removal of the cast was made according to the patient's level of pain.

Conventional radiographic projections of the foot were obtained before and after the surgery (Figs. 2–4). The hallux abductus angle (HAA) and first IMA were measured as described by Clark [8]. The metatarsal length pattern was also measured following the classical metatarsal formula. In accordance with the method described, this measurement is achieved by bisecting the shaft of the first and second metatarsals, afterwards we draw two tangential curves to the crossing point of these two MTT lines until they reach both first and second MTT heads. The difference in length between the first and second metatarsals, allows the description of index minus (first MTT shorter than second MTT), index plus–minus (equal length) and index plus (longer first MTT). The HAA and the first IMA, before and after the operation, were measured as well and compared in an effort to identify statistically significant changes. Paired null hypothesis tests were used to compare the preoperative and postoperative measurements, and statistical significance was defined at the 5% level ($P < 0.05$).

Bone healing was determined clinically and radiographically in the next 4 weeks after cast removal.

The subjective and objective clinical postoperative follow-up assessments were performed by two different observers not involved with the operations by using the AOFAS Clinical Rating System for hallux-first Metatarsophalangeal score [9], before and after the operation.

Fig. 2. Preoperative anteroposterior radiograph. First intermetatarsal angle (IMA) 19°. Degenerative hallux valgus with Hallux Abductus Angle 38°.

Fig. 3. Inmediate postoperative anteroposterior radiograph showing the foot in the cast, with the first ray in the corrected alignment. IMA 8° (variation of 11°).

3. Results

A statistical description of the case series can be found in Table 1. Overall, 138 patients underwent the operation, entailing 147 feet. The mean age of the cohort was 62.7 years (range 28–80). The average follow-up was 13 months (range 12–48), which corre-