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Reconstructing the rheumatoid forefoot

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ABSTRACT

Introduction: The standard procedure when operating on the rheumatoid forefoot is resection arthroplasty of the metatarsophalangeal joints of the lesser rays. Good clinical results (with a follow-up of over 10 years) have been reported when this technique is used. Another technique is repositioning of the metatarsophalangeal subluxation or dislocation of the lesser rays.
Aim: To assess the results of forefoot reconstruction using the repositioning technique performed in 54 feet (39 patients) by one surgeon using this technique.
Methods: 39 RA patients (15 bilateral, 54 feet) were treated with the technique of repositioning the metatarsophalangeal subluxation or dislocation. All surgery was performed by one orthopaedic surgeon. In case of severe deformity or degeneration of the metatarsophalangeal joint of the hallux, an arthrodesis was performed. All patients were reviewed after a mean follow-up of 40 months (range 12–72 months) and an American Orthopaedic Foot and Ankle Society (AOFAS) foot score, and Foot Function Index (FFI) were obtained.
Results: When, in addition to repositioning the metatarsophalangeal joints, an arthrodesis of the hallux was performed, the mean AOFAS-forefoot score was 69.80 (SD = 11.8) at a mean of 40 months (SD = 15.6 months) postoperatively. In cases with no operation on the hallux, the AOFAS score was 42.2 (SD = 18.8) ($p = 0.001$). The postoperative FFI-scores were 23.0 (SD = 17.5) and 43.9 (SD = 14.6) respectively ($p = 0.026$). When comparing the patients who were satisfied (satisfaction VAS > 7) and those who were not, the most important factor was also fusion of the first metatarsophalangeal (MPJ) joint, without a fusion only 50% was satisfied, with a fusion the satisfaction rate was 93%. In four patients a recurrence of the deformity of one of the lesser rays developed, for which a re-operation has been performed.
Conclusions: Reconstruction of the rheumatoid forefoot by repositioning the metatarsophalangeal joints of the lesser rays, thereby preserving the joints, can be considered as a procedure that provides improvement in the clinical outcome. Best results were seen in patients in whom, in addition to reconstruction of the lesser rays, an arthrodesis of the hallux was performed.

1. Introduction

The standard surgical procedure for treatment of severe deformity of the lesser metatarsophalangeal joints (MPJ) in rheumatoid arthritis (RA) is removal of the metatarsal (MT) heads.

However, it is argued that from a functional and anatomical point of view, the forefoot is importantly disturbed by this procedure. Quite healthy MT-heads when treating forefoot pain in rheumatoid patients are often removed.

Looking at the pathophysiology of the deformity, it can be argued that, after resolving the synovitis, it is not the MP joint that causes the pain, but rather the deformity, with hyperextension at the MPJ and clawtoe position. Stainsby [1] proposed that from a basic pathomechanical point of view there is no difference between a severe claw toe deformity in rheumatoid and non-rheumatoid patients, the basic assumption is that symptoms are not related to the severity of erosive changes but are related to the severity of the anatomical change irrespective of the process that has induced the anatomical deformation. Dislocation of the MPJ results in dislocation of the plantar plate and plantar fat pad and the MT-head will become prominent and cause pain (Fig. 1). The goal of the applied surgical method in this study is to realign the joint and restore the plantar soft tissue coverage at the metatarsal heads and not to excise a deceased joint, because not the damaged joint is the cause of pain, but the deformity. Hallux valgus, on itself, is already a cause of metatarsalgia and will add to the above mentioned overload. Much is to say in favour of using a technique in which the MT-heads and the function of the plantar aponeurosis are preserved. By doing this it can be expected that unrolling of the forefoot is less affected and therefore a better function of the forefoot might be achieved. This study describes the results of 39

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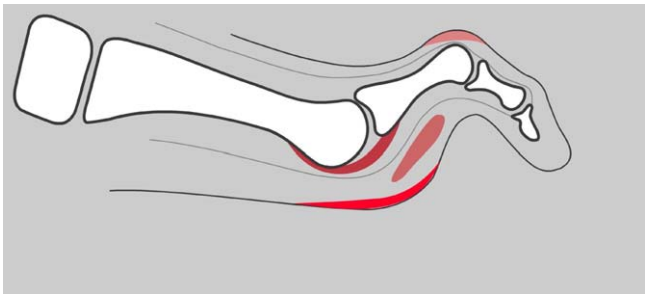

Fig. 1. Typical rheumatoid forefoot deformity, with fixed flexion deformity of the PIP-joint, dislocation of the MP joint and dislocation of the plantar fat pad.

patients who underwent an open reposition of at least two lesser MTP joints in rheumatoid arthritis.

2. Patients and methods

2.1. Patients

All patients with rheumatoid arthritis and typical RA forefoot deformity with metatarsalgia as a result of claw toe deformity with severe extension contracture of at least two lesser MP joints not sufficiently reacting on non-operative treatment were eligible for this study. These joints were commonly dorsally subluxated or dislocated as seen typically in RA deformity. Preoperatively a Foot Function Index (FFI) was obtained. As this operative technique is the standard technique which is used by the senior author (JWL) this is an observational study and therefore no approval of the ethical board was needed. We studied this technique in 39 patients, 15 bilateral, so 54 feet. All patients were reviewed after a mean follow-up of 40 months (range 12–72 months). The study population consisted of 6 males (10 feet) and 33 females (44 feet). 32 left feet were operated, 22 right. The mean age at the time of operation was 59 years (range 29–81; SD 12). In 30 cases (56%) all four lesser rays were involved and reconstructed, in 17 cases three rays were involved and two rays in 7 cases.

In the vast majority of feet ($n = 41$; 76%) a combined fusion of the first MP joint and correction of the lesser rays was performed. In 13 feet the hallux was asymptomatic and sufficiently aligned and functioning and in these cases only the lesser ray deformities causing metatarsalgia were addressed.

2.2. Surgical technique

For each lesser MPJ a longitudinal dorsal incision is made. The toe-extensors are lenghtened, the MPJ capsule is opened and released. Full release is often not achievable at this stage due to severe contracture and dislocation. Using the same incision a resection of the proximal interphalangeal joint is performed (Fig. 2a), herewith correcting the contracture at the PIP-joint, but by shortening the basal phalanx at this joint also providing length in order to reposition the MP joint. This is performed for all rays to be corrected. Hereafter, further release, when necessary, of the MP joints is performed and adhesions to the metatarsal head on the plantar aspect are released with a Mc Glamry raspatorium (Fig. 2b). In severe cases the flexor tendons, often dislocated to the dorsal aspect of the joint, are severed. Now full repositioning of the plantar soft tissues including the fat pad is possible. Finally the ray is repositioned and with the MPJ fully aligned and the plantar soft tissues repositioned under the MT-head transfixed intramedullary with a K-wire through the phalanges of the toe and the metatarsal bone (Fig. 2c). The K-wires are removed after 4–6 weeks. After removal the patients are instructed to mobilise the MP joints.

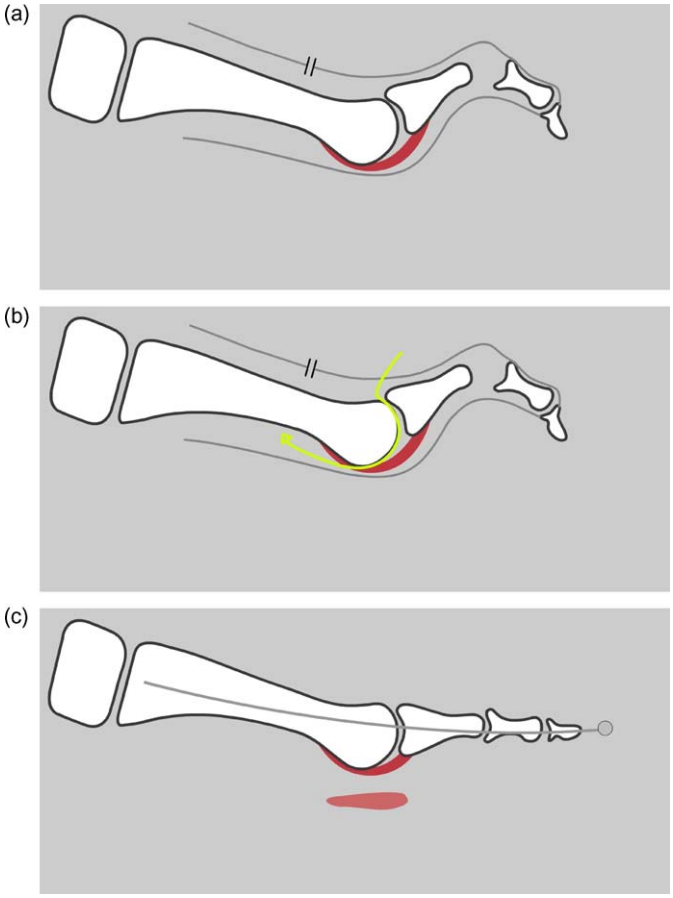

Fig. 2. Postoperative situation: after PIP-joint resection, lenghtening of the toe-extensors and reduction of the MP joint and fat pad the toe is transfixed with a K-wire. (a) Situation after lengthening of the extensor tendons and PIP-joint resection. (b) After opening the MP joint and releasing the plantar capsule from the metatarsal head. (c) The lesser ray is transfixed with a K-wire.

A potential complication of this operative technique is ischaemia of the toe as a result of too much lengthening when this is needed for repositioning. Due to tension, vascular structures are thought to become obliterated. Thorough release of tendons and adequate shortening of the phalanx at the PIP-joint help to decrease this tension. Postoperative removal of the K-wire was not necessary in this series of patients, but is indicated when the capillary refill remains insufficient.

In case of involvement of the metatarsophalangeal joint of the hallux, an arthrodesis of the first MP joint was performed. An oscillating saw was used to resect the first MP joint and subsequently this joint was fixed with two small fragment screws with a dorsiflexion angle between 20 and 30°, and a valgus of about 10°.

2.3. Outcome measures

Preoperatively a Foot Function Index (FFI), with its subscores, was obtained. This clinical score ranges from 0 to 100, important to mention is that in this score a lower score represents a better function. Postoperatively we obtained a FFI and AOFAS-forefoot score. Satisfaction and pain were scored on a visual analogue scale (VAS) ranging from 0 (no pain, or very dissatisfied) to 10 (the worst possible pain or very satisfied).

2.4. Statistical analysis

The pre- and postoperative Foot Function Index scores were compared using a paired *T*-test. For comparing the