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Resection or preservation of the metatarsal heads in rheumatoid forefoot surgery? A randomised clinical trial

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ABSTRACT

Background: Despite impressive results of the pharmacological management of rheumatoid arthritis, still certain patients suffer from rheumatoid forefoot problems. Surgical treatment of these forefoot deformities can be an option. In literature no high-quality studies on this topic can be found.
The goal of present study is to compare the results of a metatarsal head (MTH) resecting technique with a MTH preserving technique in the operative treatment of severe rheumatoid forefoot deformity.
Methods: Patients suffering from well-defined rheumatoid forefoot deformity were prospectively enrolled in three institutions. This non-blinded study had a randomised clinical design and eligible patients were randomly assigned to undergo either resection of preservation of the MTH. The primary outcome measure consisted of the AOFAS score. Secondary outcome measures were: the FFI, the VAS for pain and the SF-36.
Results: Twenty-three patients (10 in MTH preservation group) were included and analysed. After one year follow-up no significant differences in AOFAS score and additional outcome factors were found. A total of 10 complications in 23 patients were reported.
Conclusions: This randomised clinical study did not show significant clinical difference between a MTH resecting and a preserving procedure in patients suffering from rheumatoid forefoot deformity. Both procedures resulted in considerable improvement of pain and activity scores.

1. Introduction

Despite impressive results of the pharmacological management of rheumatoid arthritis (RA) progressive forefoot joint destruction still occurs in a subgroup of patients [1–8]. The standard operative procedure, advocated for the treatment of disabling forefoot pain in patients with rheumatoid forefoot deformity, remains to be resection arthroplasty with removal of the lesser metatarsal heads (MTH). Reports of MTH resecting techniques show a short-term success rate of 70–90%, and this rate is particularly explained by pain relief [9–11]. Long term outcome is more variable, with recurrence of deformity, metatarsalgia and gait disorders [10,12–16].

From a biomechanical point of view strong arguments exist in favor of preserving the MTH. As described by Hicks the metatarsal heads are an essential component of the weight-bearing forefoot and ligamentous tie-bar systems [17]. It is important to realize that the function of the toes is intimately related to the function of the plantar aponeurosis through the so-called windlass mechanism, as proposed in detail by Hicks in the 1950s [17]. In the push-off phase, when the toes are dorsiflexed at the metatarsophalangeal joints, the plantar aponeurosis is tightened, thereby shortening the foot and increasing the longitudinal foot arch. Together with active contracture of muscles, the fascia, thus, enhances bracing of the foot for propulsion. Apparently MTH resection disturbs this mechanism.

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The current more effective pharmacological treatment reduces the severity of damage and deformity of the metatarsophalangeal (MTP) joints. From this perspective joint preserving techniques become more feasible and resection-arthroplasty seems to become less necessary. Even in the treatment of feet with severe RA forefoot deformity positive results have been published using surgical methods that preserve the metatarsal heads [18–30]. Also, in several studies advantages in alignment and pain after MTH preserving procedures have been shown [19,24,30,31].

Stainsby et al. propagated a MTH preserving technique with resection of the proximal portion of the proximal phalanx [22]. This procedure might violate the windlass mechanism, as the plantar aponeurosis inserts at the base of the proximal phalanx. In the technique we apply, shortening of the lesser ray is accomplished at the level of the proximal interphalangeal joint (PIPJ). The metatarsophalangeal joint (MTPJ), as a whole, remains preserved [23,32].

While arguments exist in favor of MTH preserving surgery, the scientific evidence supporting this technique is sparse [31]. The goal of the present randomised controlled study is to compare the clinical and radiological results of a metatarsal head (MTH) resecting technique with a MTH preserving technique in the treatment of patients with rheumatoid forefoot problems.

2. Methods

2.1. Study population

Patients were prospectively enrolled in two institutions in The Netherlands (Sint Maartenskliniek, Nijmegen and the Isala Hospital, Zwolle) and one in Belgium (University Hospital Leuven). The local ethics committee obtained approval for this study (date of issue January 18 2008, NTR 1520). Patients were recruited after giving their written informed consent. The informed consent as the execution of the trial were in accordance with the Helsinki declaration.

All patients suffered from an established erosive RA forefoot deformity resulting in metatarsalgia, due to MTPJ deformity, often including typical dorsal dislocation of these joints (MTPJ). The forefoot deformity consisted of grade 3 deformity of one or more of the lesser MTPJ, according to the Nijmegen classification (Fig. 1) [32,33]. This implies the presence of erosive changes of the joints and extension contracture in one or more of the lesser MTPJ, with or without radiographic subluxation or dislocation. As a result the plantar soft tissues (including fat pad) of the contracted joints were displaced distally.

The other inclusion criteria were: age between 18 and 85 years and mental competence. Finally, all subjects had unsuccessfully been treated with conservative measures for duration of minimally six months.

Patients were excluded in case of: (a) previous ipsilateral forefoot surgery; (b) active rheumatoid arthritis (synovitis of the MTPJ as cause of pain); (c) simultaneous surgical intervention on the same foot, during the same session, other than forefoot surgery; (d) specific comorbidity (i.e. arterial insufficiency, complex regional pain syndrome, diabetes mellitus, neuropathy and an active infection) and (e) pre- existent impaired mobility which would hamper postoperative rehabilitation (e.g. hemiplegia).

The patients were interviewed and examined by orthopaedic surgeons, at the outpatient clinic, prior to their inclusion. Independent assessors, who also collected the scientific data,

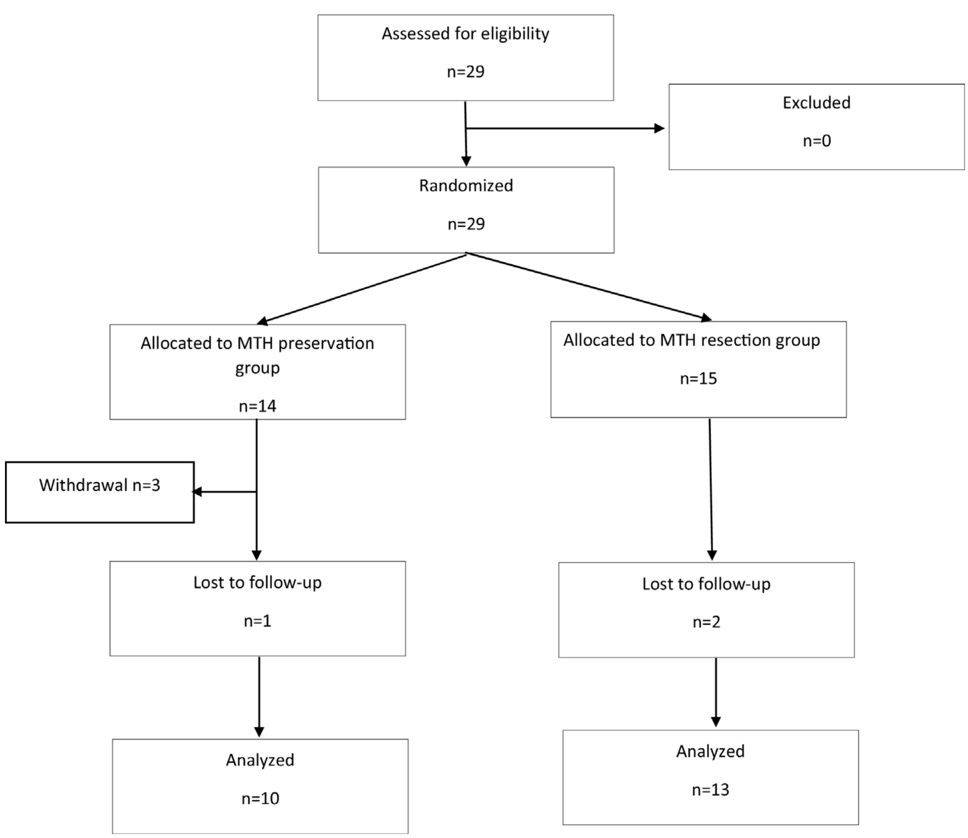
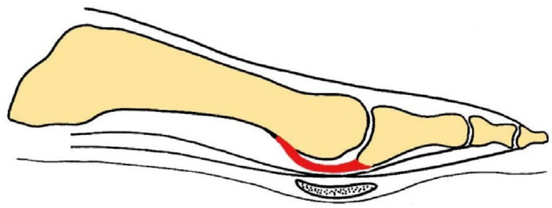
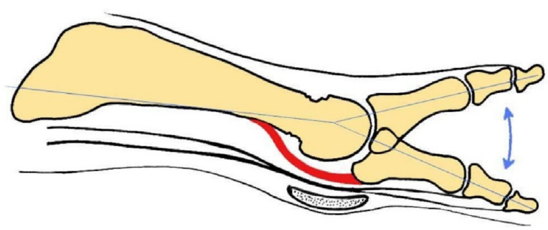


Fig. 1. CONSORT diagram.

a. **Grade 0.** No clinical changes in the MTP joints, no or mild radiographic changes (Larsen 0-1).



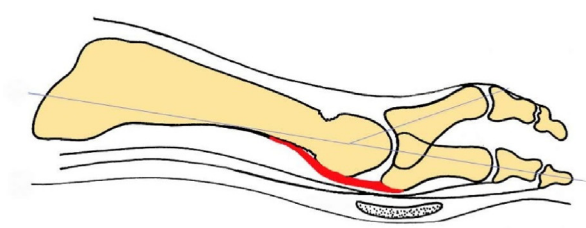
b. **Grade 1.** Decreased mobility of one or more of the joints, particularly of plantarflexion, with the ability to reduce the plantar soft tissues under the metatarsal heads, and with adequate quality of the plantar soft tissues and/or radiographic erosive changes (Larsen 2-5) or evident intra-articular changes.



c. **Grade 2**. Loss of plantar flexion in one or more of the MTP joints (up to 0^0), and loss of the ability to reduce the plantar soft tissues under the metatarsal heads, and/or with inadequate quality of the plantar soft tissues

A. with a hallux valgus of more than 20^0

B. without a hallux valgus of more than 20^0.



d. **Grade 3.** Extension contracture in one or more MTP joint, with or without radiographic subluxation or dislocation

A. with a hallux valgus of more than 20^0.

B. without a hallux valgus of more than 20^0.

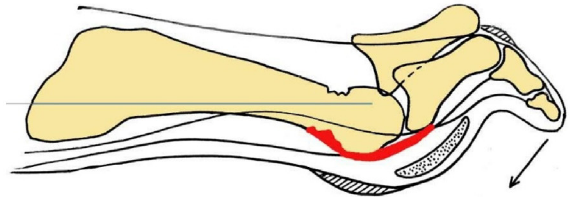


Fig. 2. The Nijmegen classification of forefoot disorders in patients with rheumatoid arthritis.

performed the actual inclusion and follow up visits, following a standard protocol.

2.2. Design of the study

The current study had a randomised controlled design and eligible patients were randomly assigned to undergo either preservation or resection of the MTH. The randomisation was carried out according to an allocation concealment mechanism. One independent person sequentially assigned different subjects to the different interventions, by means of block randomisation (10 subjects per block), using www.randomization.com. These data were recorded in non-transparent envelopes [34]. The allocation sequence was concealed to the participating physicians and researchers. Prior to the surgical intervention the surgeon received an envelope that was opened at the operating room and the included patient was assigned to the revealed treatment.

2.3. Clinical and radiographic outcome

The following clinical data were collected at base line: demographic data, medical history, comorbidity, ASA classification, RA disease duration and RA medication [35]. Follow-up (FU) was at 3 months and 1 year postoperatively. Two specific foot outcome measures were applied: the American Orthopaedic Foot and Ankle Society scale (AOFAS) and the Foot Function Index (FFI) [36–38]. The primary outcome measure was the AOFAS score. The AOFAS forefoot score has a maximum score of 100 points; the higher the score the better the condition. Two questions of the AOFAS scale, focussing on MTPJ function and functional limitations (item no. 2 and 4), were evaluated separately. The secondary outcome measures were: the FFI, the VAS for pain score and the SF-36. The FFI is a Patient Reported Outcome Measure (PROM). The applied version of the FFI is divided in a pain subscale (section B; consisting of 9 items) and an activity scale (section C; 9 items). The higher the score on the FFI scale the worse the condition. Pain was assessed using a visual analogue scale (VAS 0-10) and general health was assessed by the SF-36, with application of the physical functioning (0–100) and pain (0–100) subscale [39].

All patients were graded according to the Nijmegen classification, scoring the severity of the forefoot deformity (Fig. 2) [32,33]. This is a clinical classification system scoring MTPJ alignment and function, with evaluation of the position of the plantar fat pad. Standardized weight-bearing radiographs (anterior–posterior (AP) and sagittal plane) were obtained preoperatively and after one year postoperatively. The radiographs were used to evaluate the Larsen score, the alignment, positioning and congruency of the MTPJ and possible complications [40]. All clinical and outcome measurements were performed by independent well-instructed research nurses, limiting observer bias. One orthopaedic surgeon (J.S.) performed the radiographic assessment.

2.4. Operative techniques

The operative procedures were discussed and practised in details by the participating surgeons during a cadaveric session prior to the study, aiming at reduction of performance bias throughout the course of the study. All procedures were performed in accordance with the methods described by Louwerens and Schrier [32].

Regardless of the surgical procedure performed on the lesser rays, patients underwent correction and stabilisation of the first ray through first MTPJ arthrodesis. Subsequently, one of the allocated interventions of the lesser rays was performed. Fusion of the first MTPJ was performed in appropriate dorsiflexion and with correct alignment [41]. The method of osteosynthesis could differ per treating surgeon.

2.4.1. MT head resection

Each ray was separately approached through a dorso-linear incision, with exposure of the MTPJ and proximal interphalangeal joint (PIPJ). After lengthening or tenotomy of the extensor tendons a dorsal capsulotomy of the MTPJ was performed. Full release was often not achievable at this stage due to severe contracture and dislocation. Subsequently, a PIPJ resection arthroplasty was performed, in order to relieve the MTPJ through shortening. Hereafter further release of the MTPJ was performed. In case of dislocation of the MTPJ a systematic gradual release of the joints was done. The McGlamry raspatorium was used for final completion of the plantar release of the metatarsal heads (Fig. 3). In severe cases the flexor tendons, often dislocated to the dorsal aspect of the joint, were severed. Thereafter the metatarsal heads were resected. An oscillating saw was used to make cuts, starting on the dorsal aspect, proximal to the MT head, running plantar and proximally in an oblique fashion. Consequently the plantar aspect of the distal stump was oriented parallel to the weight-bearing surface of the foot. The length of the lesser metatarsals was related to the length of the second MT, with the third being slightly (two to three millimetres) shorter than the second MT, and so on (Fig. 4). Finally, the toes were realigned and stabilized by 1.00–1.25 mm K wires, which were positioned across the MTPJ into the metatarsal bones.

2.4.2. MT head preservation

This procedure was described in detail by Van der Heide and Louwerens [23]. Each ray was separately approached through a dorso-linear incision. The procedure exposing and releasing the MTPJ and resecting the PIPJ was identical to the method of MT head preservation described above. The McGlamry raspatorium was used for final completion of the plantar release of the metatarsal heads (Fig. 3). Hereafter, full repositioning of the plantar soft tissues, including the fat pad, was possible. Finally, the toes were realigned and stabilized by 1.00–1.25 mm K wires, which were positioned across the MTPJ in the metatarsal bone [Fig. 5].

2.4.3. Postoperative treatment

After surgery, a dressing with little to no compression was applied, for the duration of two weeks. Starting postoperatively, patients were permitted to mobilise with a forefoot relieving shoe, for a duration of six weeks. After two weeks the stitches were

Fig. 3. Use of the McGlamry raspatory to release the plantar adhesions to the MT head (Louwerens and Schrier, 2013) [32].

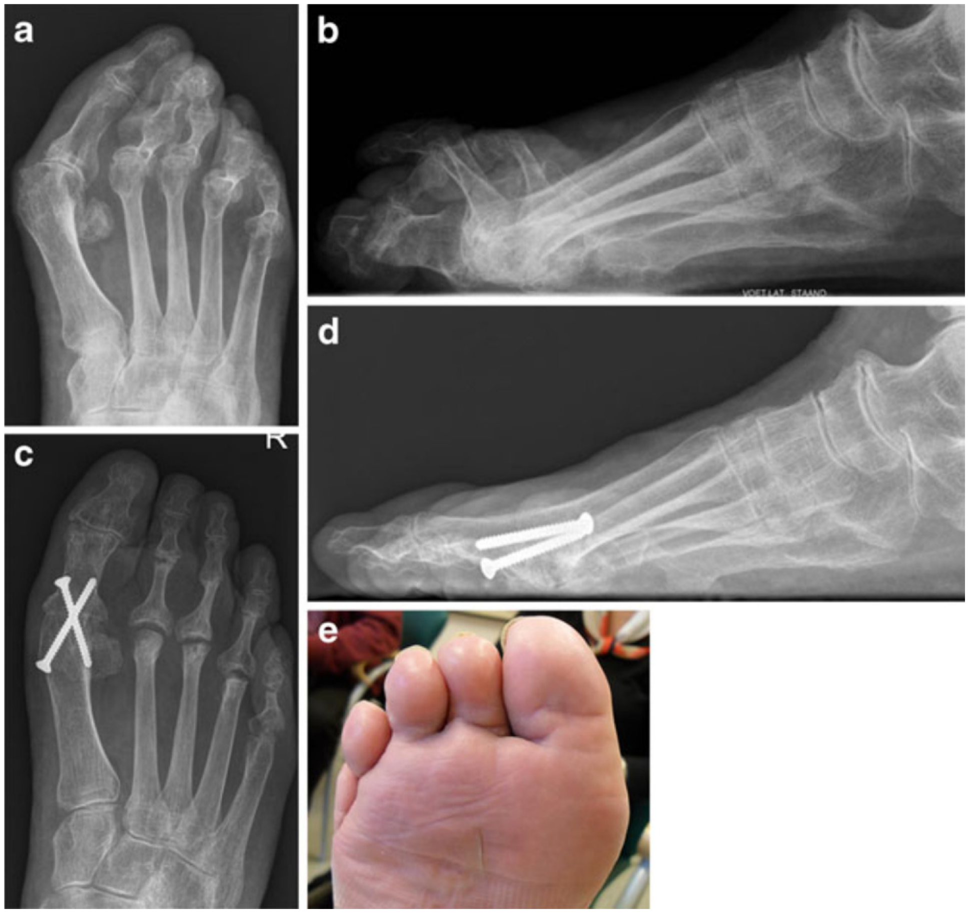


Fig. 4. a. Preoperative AP view. b. Lateral view demonstrating severe extension contracture of the lesser MTPJ. c. AP view one year postoperatively, after first MTPJ fusion, resection of lesser MT heads, tenotomy of the extensor tendons and PIPJ resections. d. Lateral view illustrating good re-alignment. e. Plantar aspect of the forefoot one year postoperatively, with good clinical result (Louwerens and Schrier, 2013) [32].

removed. The K-wires were removed after 4–6 weeks. Subsequently, after union of the first MTPJ, the patients were permitted to fully weight bear on comfortable shoes. The patients were instructed how to move and mobilize the resected or reduced MTPJ.

2.5. Statistics

Student's *t*-test and the chi-square test were used to analyse baseline variables. A two way ANOVA, with between factor surgery

Table 1
Preoperative demographic data and baseline results.

	MT head resection [SD]	MT head preservation [SD]	*P* value
Demographic data			
N	13	10	
Gender (male/female)	2/11	1/9	0.70
Age (years)	65 (9)	63 (9)	0.67
Body weight (kgs)	69 (13)	73 (21)	0.56
Height (cms)	166 (8)	169 (9)	0.51
Baseline results			
ASA classification (I/II/III)	1/7/5	1/6/3	0.91
Follow up 3 months (months)	3.2 (0.3)	2.9 (0.3)	0.013
Follow up 1 year (months)	13 (5)	13 (2)	0.82
Larsen score (3/4/5)	1/2/10	1/5/4	0.17
FFI B	54 (21)	58 (25)	0.74
FFI C	39 (20)	50 (16)	0.16
AOFAS	36 (21)	31 (19)	0.57
VAS pain	5.8 (1.5)	6.9 (1.3)	0.11
SF-36 physical functioning	49 (28)	39 (17)	0.43
SF-36 pain	65 (19)	45 (15)	0.24

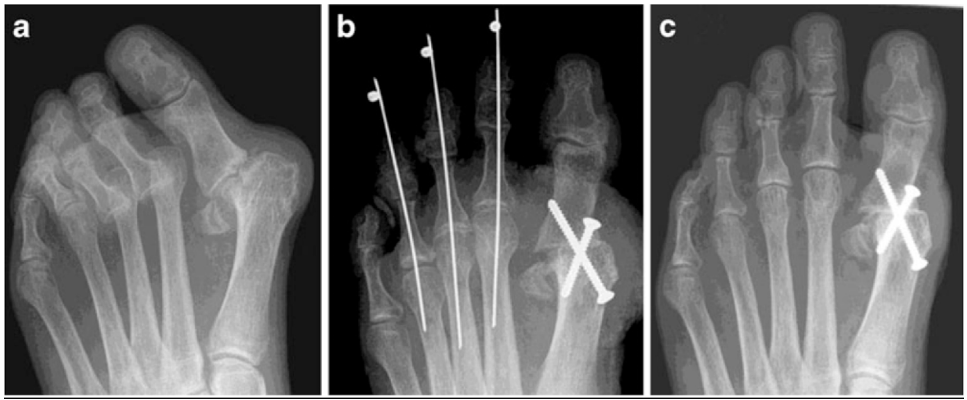


Fig. 5. AP view before surgery, with dislocation of the MTPJ, but otherwise intact MT heads (except for the first MTPJ). b. Postoperative AP view, after first MTPJ fusion, lengthening of the extensor tendons, release of the lesser MTPJ, PIPJ resections, anatomical reduction of the lesser MTPJ and 1.25 mm K-wire fixation. c. AP view one year postoperatively showing good alignment (Louwerens and Schrier, 2013) [32].

(MTH resection or preservation) and within factor measurement time (preoperative, 3 and 12 months postoperative), was used to indicate differences in outcome factors AOFAS, FFI B, FFI C, VAS pain and SF-36. When a significant main measurement factor was found, a Bonferroni post hoc test was used to indicate which measurement times were significantly different. The level of assumed significance was set at $p < 0.05$.

3. Results

3.1. Clinical outcome

Twenty-nine patients with rheumatoid arthritis were enrolled in the study. Out of this group 15 patients were treated according to the method of MTH resection and 14 underwent MTH preservation. Three patients (two from the MTH resection group) withdrew from the study and did not complete the postoperative follow-up of one year. One of these patients had suffered a cerebral stroke eight months after the surgical intervention. The two other patients expressed to have motivational problems and, despite our encouragement to complete the study period, cancelled the appointment for the one year postoperative follow-up. Three other patients (MTH preservation) were excluded, as in these patients no first MTPJ fusion was performed. These six patients were not included in the statistical analysis (Table 1 and Fig. 1).

All patients had suffered from rheumatoid arthritis for a period of minimally 30 months, reported high pain scores and poor functional ability. Most patients used combination therapy at the time of surgery: 18 patients were treated with synthetic DMARDS, five with biologicals and eight with steroids. There were no significant differences between the two groups for any of the subject characteristics, except for the difference in duration of 3 months FU.

Fig. 5 shows the mean and standard deviation of the outcome factors for both groups at preoperative examination, three and 12 months postoperatively. Table 2 shows the corresponding values for the outcome factors after one-year follow-up. The two way ANOVA revealed a main effect for measurement time for all outcome parameters ($p < .01$). A significant improvement in all outcome scores between preoperatively and three months postoperatively and between preoperatively and 12 months postoperatively for both groups was found. The outcome scores between three and 12 months postoperatively were not statistically significantly different. Neither main effect for groups nor an interaction was found (p-values were $>.06$). Furthermore, all other domains of the SF-36 revealed no statistically significant between, within and interaction effects.

A decrease of the VAS pain score and FFI subscales was found in both groups. Furthermore, an increase in SF-36 subscales and the AOFAS score was found.

Analysis of difference in functional limitations and MTPJ function (item number 2 and 4 of the AOFAS score) did not show statistical significant difference ($p = .76$ and $p = .15$ respectively) between the two groups (Fig. 6).

3.2. Nijmegen classification

Table 3 shows the postoperative clinical situation of the lesser MTPJ and soft tissues, according to the Nijmegen Classification. The Chi square test revealed no statistically difference in distribution of the classification scores between the two groups ($p = .29$).

3.3. Radiological outcome

The feet in both groups showed adequately aligned lesser MTPJ on standard radiographs. With exception of one patient after MTH

Table 2
Mean (standard deviation) of the outcome scores of MT head resection and MT head preservation group after one year FU.

	MTH resection [SD]	MTH preservation [SD]	Statistics
FFI B	16 (12)	27 (27)	$p = .46$
FFI C	22 (13)	27 (27)	$p = .14$
AOFAS score	73 (13)	64 (26)	$p = .12$
VAS pain	2.2 (2.6)	2.6 (2.6)	$p = .83$
SF 36 physical functioning	57 (32)	44 (18)	$p = .47$
SF 36 pain	81 (16)	63 (26)	$p = .12$

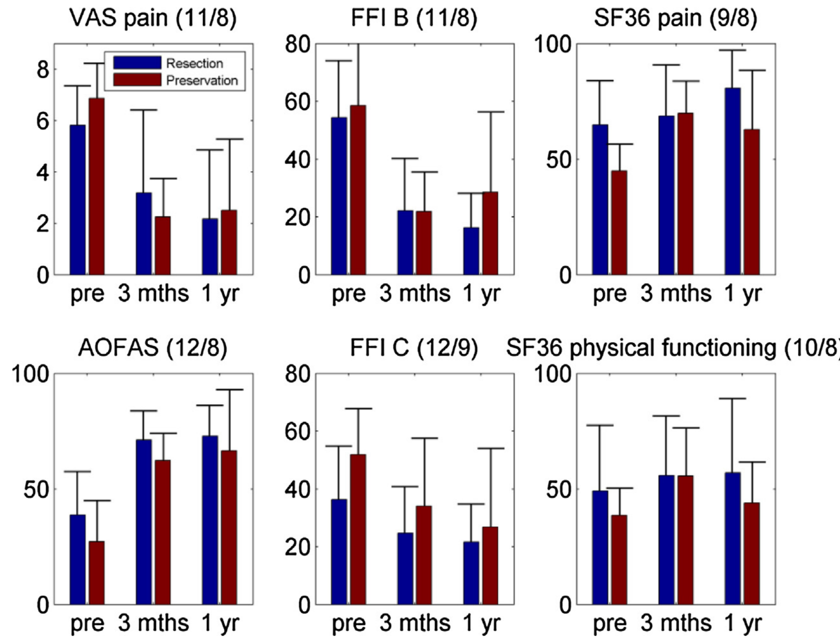


Fig. 6. The course of the different outcome scores within time and comparison between the two groups. In parenthesis the number of patients per group (resection/release) with complete follow-up data per specific outcome score.

Table 3
Nijmegen classification after one year FU.

	0	1	2	3
Resection	5	5	1	
Preservation	1	4	1	1

preservation, in which the second and third MTPJ were still radiographically dislocated (grade 3 according to the Nijmegen classification).

Among both the resection and preservation group all corrected first rays proved to remain well fused, aligned and stable, except for two patients. In one patient (MTH resection group) the first MTPJ arthrodesis led to an asymptomatic non-union. In another patient there was malalignment of the first MTPJ fusion (MTH resection group), with increased dorsoflexion position. These patients did not undergo a new procedure.

3.4. Complications

A total of 10 complications in 23 patients were reported (Table 4). Five complications occurred within the MTH resection group. Five occurred within the preservation group. Two patients complained of a sensational impairment. Of these, one patient (resection group) reported hypersensitivity located at the medial scar of the hallux; and one patient (after MTH preservation) reported plantar paresthesia with radiation into the second to fourth ray. There were two peroperative complications. In one patient (resection group) the screw fixation of the first MTPJ fusion proved to be inadequate, and for this reason additional K-wires were applied. This eventually led to an asymptomatic non-union of this joint (as described under “radiological outcome”). In one patient (MTH preservation) rupture of the skin occurred during surgery, as result of applying to much force on an atrophied skin.

Four patients were found to have malalignment of one or more toes (two in the resection group). Two patients (one in both groups) demonstrated residual hyperextension deformity in one or more lesser MTPJ (grade 2 of Nijmegen classification). One patient after MTH preservation showed recurrence of the deformity in the second ray (Nijmegen classification grade 3). One patient (MTH resection) showed a malalignment of the first ray, after MTPJ fusion, as described previously.

One patient (MTH preservation) suffered from complex regional pain syndrome and was treated with different drug therapies.

Table 4
Complications.

Complication	MTH resection	MTH preservation
Sensory deficit	1	1
Peroperative	1	1
Non-union first MTPJ	1	
Malalignment lesser MTPJ	1	2
Malalignment first MTPJ	1	
CRPS		1
Total	5	5

4. Discussion

In the current randomised controlled trial, concerning the operative treatment of rheumatoid forefoot deformity, no difference in clinical and radiographic outcome between metatarsal head resection and preservation was found.

Multiple arguments can be put forward to advocate an operative method in which the function of the MTH and MTPJ is preserved [22,32,42]. From a functional point of view resection of the MTP joints has been described as “an internal amputation”. The metatarsal heads are important weight-bearing structures and with resection often relatively healthy appearing metatarsal heads (joints) are sacrificed unnecessarily [43]. With improvement of medical strategies it is likely that these patients ask for higher demands, regarding overall function and quality of life. It is reasonable to presume that this is achieved by preserving normal function of the forefoot, including the lesser MTPJ [8,18–21]. By preserving the MTPJ the weight-bearing function and the longitudinal windlass mechanism remain effective [30,44,45].

The level of scientific evidence supporting preservation of the MT heads, among patient with rheumatoid forefoot deformity, is rather poor [32,46]. Current literature reports inconsistent outcome after these procedures [19,24,25,44,45,47–49]. Briggs and Stainsby demonstrated good subjective and objective results after a follow-up of 11 years in patients with claw toe deformity [22]. Bhavikatti et al. described results after joint preservation through Weil's shortening osteotomy, with improvement of AOFAS score from 39.8 to 88.7 and 83% no pain after a mean FU of 51 months [25]. Van der Heide et al. reported an AOFAS score of 69.80 (SD = 11.8) and a FFI-score of 23.0 (SD = 17.5) after a FU of 40 months, applying a surgical method identical to current study [23]. The present study confirms considerable improvement of the AOFAS score (from 29 to 67), achieved through a MTH preserving technique. Additional outcome factors of current study are also comparable to outcome as reported in the literature.

Procedures with resection arthroplasty of the lesser MTH continue to be the most advocated standard options for the operative treatment of severe rheumatoid forefoot deformity [45,50–52]. The reported success rate and patient satisfaction of these resection arthroplasty procedures are rather divergent [11,12,14,16,21,46,52,53]. Mid and long-term studies after resection arthroplasty procedures report a success rate of 70–90% [9,10,54]. After longer follow-up a relatively high percentage of persisting pain, callosities, recurrent deformity and bony prominence of the metatarsal stumps is reported, with a reoperation rate of 10–15% [9,10,12,14,15,21,55–57]. Thomas et al. reported an average AOFAS score of 64.5, in a patient group after resection of all five MTH, with a FU of 5.5 years [14]. The current study shows significant improvement of all outcome scores after MTH resection, with a mean AOFAS score of 73 (13) and a VAS pain score of 5.8.

There is a difference, however, between the MTH preserving method as applied in the present study and most of the methods used in the referred studies. This makes comparison with other methods rather difficult. In current study, shortening and stress relief, in order to reduce the MTPJ, are achieved by resection of the PIPJ (the distal part of the basal phalanx) and through capsulotomy and tenotomies. The joint and the attachments of the plantar aponeurosis and the length of the metatarsal are preserved. The goal is preservation of the integrity of the MTPJ and possibly the biomechanics of the ray.

No statistically significant differences in radiographic outcome between the groups were found. In contrast, Krause et al. found better sagittal alignment after a MTH resection procedure compared to MTH preservation [18]. Evaluation of the joints in the sagittal plane, on a lateral weight bearing radiograph, is difficult and probably inaccurate, due to over projection of all lesser rays. At clinical examination, one year postoperatively significant malalignment of the lesser MTPJ, in the sagittal plane, was established in three patients (2 in MTH preservation group).

A rather high complication rate of 10 complications in 23 patients was found in the current study. Malalignment of the lesser MTPJ in the sagittal plane (3 patients) was the most prevalent complication. Comparison of the complications between the present study and those reported in the literature is difficult due to the variety of methods applied in these studies. Applying the identical MTPJ preserving method as in the present study, Van der Heide et al. reported a lower complication rate, with 8 complications in 54 feet, with a mean FU of 40 months [23].

The present study design did not show advantage of one of the applied methods. Multiple reasons might explain this. Possibly the study design, with three participating centres and surgeons, could have influenced the results. Randomisation may lead to application of a specific treatment in less suitable patients (e.g. MTH preservation in severely damaged MTH), which influences outcome. The applied outcome factors may be deficient in detecting difference, with limited psychometric properties. The AOFAS clinical domains were designed to assess specific foot or ankle problems, are partly physician-based and limited evidence for reliability and validity exist. However, the AOFAS score is widely used for different purposes in scientific literature. In addition, a recent manuscript showed that the AOFAS score has good reliability and validity in a group of Brazilian patients suffering from rheumatoid arthritis [58]. In current study, possibly other factors as stiffness, pressure distribution and gait pattern could have differed. However, these factors were not taken into account.

This study has clear limitations. Although 3 centers were involved in the study, it was disappointing it took seven years to include this rather small number of patients. The prevalence of rheumatoid forefoot deformities seemed to decline dramatically by the time this study started. The primary explanation is the success of the pharmalogical treatment of rheumatoid arthritis, resulting in a rapid decline of severe forefoot deformities. The strict inclusion criteria also explain the small number of included patients with lengthy period of inclusion. On the other hand, these strict criteria limit selection bias. Two way repeated measures did not show any indication that inclusion of a higher number of patients, would prove significant difference between the two surgical procedures.

Irrespective of the flaws, the randomised clinical trial design with different validated outcome measures, a PROM, and radiographic outcome are strengths of this study. To our knowledge no comparable study on this topic has previously been performed. Additionally, the three surgeons followed the same treatment protocol after discussion and practice during a cadaveric session (reduced performance bias), and all outcome parameters were assessed by independent researchers (limited assessor bias). The included patients are a representative homogenous clinical population.

Based on the results of the present randomised study the use of both operative procedures can be equally recommended. No scientific grounds have been found to advise one of the procedures in particular. However, the study results do support the following strategy now applied at our departments. Treatment of rheumatoid forefoot deformity should be individualized. The less extensive the deformity the more tendency exists to advise a MTPJ preserving procedure, respecting and reconstructing the 'normal' functional anatomy. In cases with more extensive contracture of the soft tissues and important damage of the lesser MTPJ it is felt that resection-arthroplasty of the lesser MTP joints is favourable. The authors have experienced that performing the MT head preserving method can be technically demanding. Thus from a practical point of view in cases with severe deformity and/or less favourable skin conditions resection of the MT heads is recommended and in cases with less deformity (for instance dislocation of one MTP joint, only, and subluxation and contracture of other MTP joints) it seems a waste to perform a resection of these lesser MTP joints.

5. Conclusions

This randomised clinical study did not show significant clinical difference between a MTH resecting and a preserving procedure in patients suffering from rheumatoid forefoot deformity. Both procedures resulted in considerable improvement of pain and activity scores.

Conflict of interest statement

The authors declare that they have no conflicts of interest.

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