

Department of Orthopaedics (Head: G. Wiberg) and Department of Rheumatology
(Head: K. Berglund), University Hospital, Lund, Sweden.

RESECTION OF THE METATARSOPHALANGEAL JOINTS IN RHEUMATOID ARTHRITIS

HÅKAN BRATTSTRÖM & MERETE BRATTSTRÖM

Received 26.iii.69

The surgical treatment of depressed metatarsal heads with accompanying painful conditions in the forefoot has been discussed in several articles. These are, without exception, marked by great enthusiasm for the results gained; but this, in the main, seems to be based more on general impressions than on large follow-up series (Hoffmann 1911, Key 1950, Clayton 1960, 1963, Stamm 1964, Preston 1968). The follow-up series reported have been small (Fowler 1959, Lidström 1961, Schulitz 1968).

The object of the present work is to report the results from a large group of patients with the same basic disorder: rheumatoid arthritis.

The problems were: (1) the patient's concept of the value of the operation, (2) the dependence of the results of surgical methods, (3) possible relation between the result of the operation and the status of the illness (E. S. R.), duration, etc., and (4) complications.

Rheumatoid arthritis begins as synovitis, most often in the small joints of the hand and the foot. Destructions and deformities appear in the fore foot if the arthritis progresses. The usual changes are hallux valgus and bunion, depressed metatarsal heads with painful corns in the sole, and various degrees of cock-up deformities of the four lateral toes. In some patients, the small toes are subluxated or luxated on the dorsal aspects of the metatarsal heads (Figure 1 B). Both the metatarsophalangeal joints (MTP joints) and the PIP joints can show varying degrees of involvement by the rheumatoid arthritis, from slight synovitis to total joint destruction and/or ankylosis. These deformities give pain on a mechanical as well as on an arthritic basis, whether or not the rheumatic disease is active.

Pain arises from shoe pressure on the depressed metatarsal heads or the dorsum of the first PIP joint (Figure 1 B). This may cause great difficulties in walking. The patient cannot use his toes at take-off in gait, and he even tries to avoid loading on the fore foot. This gives a typical heel-walk. Each step is painful, and it is impossible to wear shoes; in the most advanced stage, the patient is totally unable to walk.

The unphysiological walk, in turn, unfavourably affects the loading on knee and hip joints.

Especially patients who also have arthritis in the talocrural joint can experience difficulties. If the arthritis there forces the patient to walk on his toes, the above-mentioned heel-walk is impossible and the weight must be put on the fore foot.

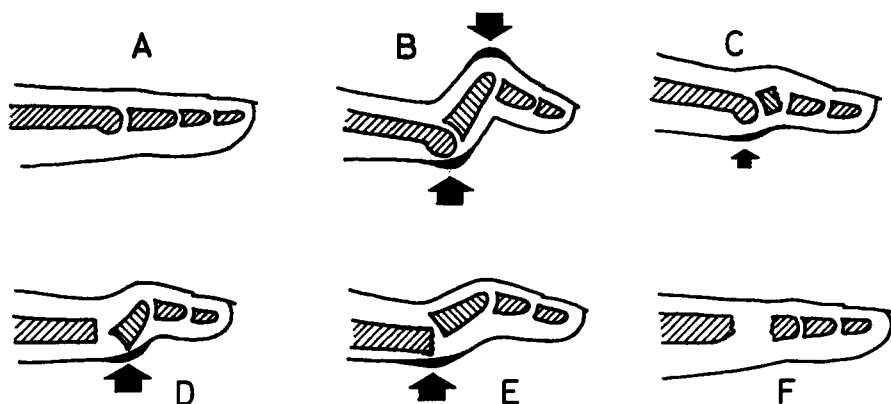


Figure 1. A. A normal toe. B. A toe deformed by rheumatoid arthritis: the basal phalanx has luxated up onto the dorsal side of the metatarsal head, and corns are formed at the arrows. C. An ordinary hammer toe operation; there is still a risk of pressure under the metatarsal head. D. Recurrence after metatarsal head resection: the basal phalanx presses against the sole. E. Recurrence with other mechanism: the basal phalanx has luxated up onto the dorsal side of the metatarsal stump and forces it against the sole. F. The skeleton after a joint resection (note the bevelled edge on the metatarsal stump).

OWN MATERIAL

We investigated those patients who, during 1962–1966, were surgically treated in the Orthopaedic Clinic in Lund for depressed metatarsal heads in one or more of the four lateral toes. All the patients had been hospitalized at the Rheumatology Clinic, which means that the material is to some extent selected. This Clinic is operated by the National So-

cial Insurance Board; therefore patients with disability pensions and those more than 65 years of age are practically excluded from treatment there.

During the mentioned period, 89 patients were operated on. 4 died before the follow-up investigation. The material thus includes 85 patients, with 138 operated feet.

Further data concerning the material are given in Tables 1 and 2.

All the patients have a definite rheumatoid arthritis according to ARA criteria, and are classified under Steinbrocker's roentgenological criteria as belonging to Group 3 or 4. All had pronounced foot symptoms in the form of loading pain, recurrent callosities with a tendency to infections, and great difficulties in fitting shoes. For a few, foot troubles were the sole indication for hospital treatment.

Table 1. 138 operated feet.

	Male	Female	Total
No. of patients	18	67	85
No. of feet	28	110	138

Table 2. 138 operated feet.

Minimum observation time	18 mths
Mean observation time	30.6 mths
Mean duration of disease at operation	14.6 yrs
Mean age at operation	50.2 yrs
Mean E. S. R. at operation	46.8 mm/h
Steroid treated > 1 year during period of disease	52 feet

Table 3. Number of operated feet per year during the study period.

					Not included in the material	
1962	1963	1964	1965	1966	(1967	1968)
17	22	19	40	40	(42	25)

OPERATION INDICATIONS

Operation was proposed following a failure of conservative treatment when the patient had both pronounced subjective complaints and destruction of one or more MTP joints with dorsal subluxation of the basal phalanges. In the absence of destruction, patients were managed

with support, injection treatment, or synovectomy. We have not operated upon even badly deformed feet if the patient has had no complaints, or if involvement of hip or knee has prevented walking.

The so-called partial phalangeal resection (Figure 1 C) has not usually been thought sufficient; instead, an operation on the metatarsal joint has been indicated. It is these latter operations that are dealt with in this article.

Activity of the disease as shown by a high E. S. R. or current cortisone treatment was not held to contra-indicate operation.

Many sources have suggested that the patient's co-operation is necessary in all rheuma-surgical operations, and that a reluctant patient is an absolute contra-indication for surgery. This ruling has some exceptions in our experience. In operations for forefoot disorders the results are so good and the patient's co-operation is of such slight importance that some persuasion is justifiable.

Pressure sores on the sole have sometimes called for a few days of pre-operative skin care and avoidance of weight-bearing but have never prevented the operation.

OPERATION METHODS

Hoffman (1911) was the first to describe these operations. He removed all five metatarsal heads by a plantar incision; his method is also recommended by Campbell (1963). Clayton (1963), Dybowski (1967), and Preston (1968) resected the metatarsal heads as well as the base of the basal phalax on all five toes; Fowler (1959) and Milch (1964), however, resect the base of the basal phalanx and then shape the metatarsal head and remove that part facing the sole of the foot. Fowler made an oval excision of the plantar skin. All these authors are radical in that they recommend operating on all four small toes, even if only one or two give symptoms (usually the big toe must also be treated). Thompson (1937) and Key (1950) recommended a more selective surgery by treating only the joints that showed symptoms. Lidström (1961) suggested resection of the second, third, fourth metatarsal heads as routine. Fowler (1959), Lidström (1961), and Dybowski (1967) used plaster after the operation. Preston (1968) and Campbell (1963) fixed the position during the first postoperative period by drilling a Kirschner-wire through the toe skeleton up into the corresponding metatarsal bone. Both plantar and dorsal incisions were used; most authors use a separate incision for the big toe.

Our operations were performed in a bloodless field under lumbar



Figure 2. Development of operation methods. A. Single metatarsal head removed. B. Metatarsal heads 2, 3, and 4 removed routinely. C. Joint resection in all 4 lateral joints, possibly also in the big toe. This is the present method. Note, the stump ends form an even arc.

or general anaesthesia. If both feet were to be operated, they were usually treated at the same operative procedure. In 128 feet, the operations were performed by an experienced orthopaedic surgeon. All patients were operated through plantar transverse incision immediately distal to the prominences of the 4 lateral metatarsal heads. If the big toe was operated on, it was done through a separate medial incision.

Flexor tendons, nerves, and vessels were retracted where necessary, although they were usually found to be displaced to the side of the metatarsal heads. The metatarsal head was snipped off, and the plantar aspect bevelled to present a smooth, weight-bearing surface. In the first operations only joint heads showing symptoms were removed, usually No. 3 (Figure 2 A), or sometimes all three middle joint heads (Nos. 2, 3, and 4) irrespective of whether or not all gave symptoms (Figure 2 B). This later procedure follows Lidström's recommendation.

In connexion with a follow-up investigation in 1965, we found several patients with recurrence in operated joints or pain under non-resected heads; we therefore changed to a more radical method and resected the entire joint, i.e. both the metatarsal head and the base of the basal phalanx, and did this in all 4 small toes irrespective of whether the patient had symptoms in all of them (Figure 2 C). The plantar aspects of the resected ends were bevelled to provide a smooth, weight-bearing surface. We attempted to get the five metatarsal bones to form an even arc after the operation, with No. 1 and 2 of about the same length and thereafter a gradually decreasing length laterally (Figure 2 C). This "arc" is easily verified by palpation from the dorsal side. The big toe was not operated on routinely, unless there was a deformity (hallux valgus) as well as subjective complaints. We then either operated according to Keller or made a joint resection, as was done on the small toes; on occasion, only an exostosis chiselling was carried out. The patients were given a plaster of paris shoe, with which we tried to hold together the fore foot and to straighten the big toe. The plaster of paris was split. After one week, a heel was added and the patient was allowed full weight-loading. Three weeks after the operation, the plaster of paris was removed, and the patient was recommended to use a support for at least six months.

RESULTS AND DISCUSSION

Since the patients' subjective complaints were the main indication for operation, we thought it reasonable to assess the results by means of a questionnaire which was sent to each patient on two occasions.

The first group (metatarsal head resections) was followed up in 1965 and 1967; the second (joint resections) in 1967 and 1968. In addition, the majority of patients were seen when they attended for routine follow-up examination, a particular effort being made to investigate those patients who reported dissatisfaction with the operation or worsening of the condition between the two follow-up investigations.

We asked about ability to walk, pain in toes and fore feet (chiefly scar pain), numbness in the toes, whether they used a support or orthopaedic shoes, and about the tendency for hallux valgus. Finally, the patient was asked to express his opinion of the operation as excellent, good, fair, or poor.

Table 4 shows the results in the entire material.

Table 4.

Result	No. of feet	Observation time (mths)
Excellent	65 (47 %)	31
Good	38 (28 %)	31
Fair	17 (12 %)	31
Poor	18 (13 %)	28

No patient who classified the result as poor thought he was worse than before the operation.

No relation between the results and the length of the observation period seemed to exist.

The patients who had been given steroid treatment for more than 12 months during any period of the disease represent 52 feet (38 per cent) and the number treated with cortisone in "fair" and "poor" groups is 17 (78 per cent). This over-representation of cortisone patients in the "failures" can be explained by cortisone most probably having been given to those who had the most severe rheumatoid arthritis.

No certain influence on the activity of the disease—expressed by E. S. R. in the various result groups—was obtained (Table 5).

Table 5.

	Excellent+good	Fair+poor
Mean E. S. R.	50.2	45.2
Mean duration of disease	14.5	14.7
Mean age at operation	50.0	50.3

Nor did the duration of the disease (14.5 and 14.7 years) or the age of the patient seem to play any role for the result (Table 5).

However, if we distribute the material with regard to operation methods, another picture emerges (Table 6 and Figure 3).

Table 6.

	One or two heads resected	Heads 2, 3 and 4 resected	Joints 2, 3, 4 and 5 resected	Total
Excellent	3	22	40	65
Good	0	8	30	38
Fair	1	9	7	17
Poor	5	12	1	18
Total	9	51	78	138

In the groups with one or two heads resected, the poor results dominate (5 out of 9); in the group "Heads 2, 3, and 4 resected", the good results dominate (30 excellent or good out of 51).

Op.methods, 138 feet.



Figure 3. The operation results distributed according to different methods. See text.

The best results, however, are in the last group, where all four lateral joints—that is, both the base of the proximal phalanx and the metatarsal head—were resected: only 1 poor out of 78 operated. This patient was a 43-year-old woman who complained of scar pain and diffuse ache in the fore foot.

These results argue strongly in favour of the more radical operation.

COMPLICATIONS

In 1967, 1968, and 1969 approximately 300 feet have been operated on using a plantar incision, which some authors warn against as giving greater risk of infection and scar pain. Of these 300 feet, 5 developed a slight necrosis of the skin or an infection, without any delay in healing time. One patient developed a serious infection in one foot, which kept her bedfast for 3 weeks, but the functional end result was excellent. Out of the 138 feet in this investigation only one patient complained of scar pain (see below).

We are thus quite satisfied with the plantar incision, which gives a good approach to the joints and results in few complications.

FAILURES

Twenty-five cases were regarded as failures. These fell into three main categories: (1) patients who became worse between the investigations 1965 and 1967: 7 feet; (2) patients who were re-operated before investigation 1967: 13 feet; and (3) patients who were classified as "poor" in 1967 but were not re-operated: 5 feet.

Subjective complaints in these 25 feet were analysed in more detail. The results are shown in Table 7.

Table 7. Failures: 25 feet.

Complaint	No.	Remarks
Hallux valgus	15	1st joint not operated
Painful corns under operated joints	12	All had only head resection, in some the resected metatarsal bone protruded in front of the other; 4 had lack of dorsiflexion of the ankle
Painful corns under non-operated joints	15	Mostly 5th joint
Scar pain	1	

Of these, 15 feet were re-operated: 11 are now excellent or good, 4 still poor.

Table 7 calls for some discussion. Of 138 feet, 15 developed symptoms of hallux valgus in the operated foot; this occurred in those feet (95) where no operation on the big toe was performed on the first occasion. This is 16 per cent of the cases, and we do not consider this complication frequency to justify the big toe's being routinely included in the operation, as proposed by some authors (Hoffman 1911, Fowler 1959, Milch 1964), especially as an intact big toe aids in walking. Painful corns under operated joints can be explained partly by reference



A.

B.

Figure 4. A. Recurrence because of protruding stump end on 3rd metatarsal bone. B. Poor result due to pain under the 5th metatarsal head, which was not removed. Slight hallux valgus with pain.

to Figure 1 D and E, partly by, in some cases, the surgeon not making the resected metatarsal bones form an even arc but by letting one of the bones protrude (Figure 4). Lack of adequate dorsal flexion in the ankle joint can compel the patient to load the metatarsal bone stumps

exceptionally heavily, which causes a recurrence. Painful corns under non-operated joints need no comments. The patient with scar pains is the only "poor" in the group with joints 2-5 resected.

SUMMARY

In 85 patients with rheumatoid arthritis, 138 feet were operated on for deformity and pain in the MTP joints 2-5. If only single metatarsal heads are removed, the results are poor (5 out of 9 operated); they are better if heads 2, 3, and 4 are resected routinely; but best if the *entire joint* (both metatarsal head and the base of the phalanx) is removed in all small toes (1 poor out of 78 operated). Plantar incision results in few complications.

The results do not seem to depend on age of the patient or the activity and duration of the disease.

Of the patients 16 per cent whose big toe was not primarily operated, developed hallux valgus.

The causes of failure were: pain under remaining metatarsal head (15 cases), recurrence (12 cases: 4 of these had inadequate dorsiflexion of the talocrural joint), and scar pain (1 case). The causes of recurrences are analysed.

ACKNOWLEDGEMENTS

This investigation was financially supported by a grant from Alfred Österlunds Stiftelse.

REFERENCES

- Campbell (1963) A. H. Crenshaw (ed.) in *Operative orthopaedics*. C. V. Mosby, St. Louis, p. 862.
- Clayton, Mack L. (1960) Surgery of the fore foot in rheumatoid arthritis, *Clin. Orthop.* **16**, 136-140.
- Clayton, Mack L. (1963) Surgery of the lower extremity in rheumatoid arthritis. *J. Bone Jt Surg.* **45-A**, 1517-36.
- Dybowski, W. R. (1967) Personal communication, Warszawa.
- Fowler, A. W. (1959) A method of fore foot reconstruction. *J. Bone Jt Surg.* **41-B**, 507-13.
- Hoffman, Phil (1911) An operation for severe grades of contracted or clawed toes. *Amer. J. Surg.* **9**, 441-449.
- Key, A. (1950) Surgical revision of arthritic feet. *Amer. J. Surg.* **79**, 667-672.
- Lidström, A. (1961) Excision of metatarsal heads for pain under the anterior arch of the foot. *Acta orthop. scand.* **31**, 329-336.
- Milch, Robert A. (ed.) *Surgery of arthritis*. Williams & Wilkins Co., Baltimore.

- Preston, Robert L. (1968) *The surgical management of rheumatoid arthritis*, W. B. Saunders, Philadelphia.
- Schulitz, K.-P. (1968) Zur Morphologie des rheumatischen Fusses und seiner operativen Behandlung. *Z. Orthop.* **104**, 203-213.
- Thompson, T. C. (1964) Surgical treatment of disorders of the fore part of the foot. *J. Bone Jt Surg.* **46-A**, 1117-18.