ARTHROPLASTY OF THE FOREFOOT IN RHEUMATOID ARTHRITIS : LONG-TERM RESULTS AFTER CLAYTON PROCEDURE

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The present study aims to evaluate long-term results after Clayton resection arthroplasty in patients with symptomatic arthritis of the forefeet.

From 1970 to 1995, 109 patients with a total of 184 rheumatoid forefeet underwent Clayton's procedure at an average age of 60 years. Forty-seven of them returned with 82 operated feet for follow-up by means of patient history, physical examination and radiograph an average of 12.8 years later.

Overall outcome was judged as successful in 60 of the 82 cases with complete pain relief, remarkably improved gait capacity and use of normal shoes. Sixteen of the feet were definitely improved, but slight to moderate pain, inadequate balance and contact with the ground, limited walking distance and use of large shoes were signs of decreased operation success. The remaining 5 feet showed recurrent splay-foot deformity with intolerable pain, functional disability and restricted gait capacity even though specially made surgical shoes were used.

The Clayton procedure appears to be a suitable method for surgical correction of symptomatic rheumatoid forefeet.

Keywords : rheumatoid forefoot ; splay-foot ; resection arthroplasty ; Clayton procedure.

Mots-clés : avant-pied rhumatoïde ; résection arthroplastique ; opération de Clayton.

INTRODUCTION

Patients with rheumatoid arthritis (RA) often develop deformities of the forefoot and therefore suffer from severe pain and disability. Initially, the incidence of forefoot manifestations amounts to 16% (3) and in the long run, almost every patient's forefeet are affected and characterized by a splay-foot deformity (3, 4, 8). The main problem is displacement of the metatarsal heads downwards through the fat pad of the sole of the foot, so that they lie subcutaneously, and tender calluses and bursitis form under them. Additionally, dorsal dislocation of the lateral four toes at the metatarsophalangeal joints (MP joints) supports the development of hammer and claw toes whereas the great toe usually develops a valgus deformity.

Although specially made shoes or insoles ameliorate the symptoms, the need for surgical intervention may arise from the progression of the deformity in severe cases. Therefore, a number of different techniques have been developed and will be discussed afterwards.

MATERIAL AND METHODS

Patients

The patients studied were those who had Clayton resection arthroplasty for RA at the University Clinic Hospital Mainz in the 25-year period from 1970 to 1995. There were 184 arthroplasties in 99 female and 10 male patients. The average age was 60 years (range 34 to 82 years). After an average follow-up of 12.8 years, 47 patients with 82 operated feet returned for reexamination in February 1996. Twenty-five of the remaining operated patients had died meanwhile.

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Twenty-six patients had changed their place of residence or were in retirement homes too far away. Six further patients were hospitalized without prospect of early discharge. The other 4 patients had to be excluded. For the sake of comparable long-term results, exclusion criteria were determined as follows : primary static deformities, rheumatoid diseases other than RA, duration 5 years, occlusive arterial disease, diabetic foot and gout.

Indication

If conservative therapy (insoles, arch supports, specially made surgical shoes) was insufficient and the deformity had become permanent, chronic pain and progression of functional disability were indications for surgical intervention.

Operation

In contrast to the original method which includes a transverse dorsal incision and resection of the metatarsal heads and the bases of the proximal phalanges as advocated by Clayton (2), we resected the metatarsophalangeal joints (MP joints) II-V through the sole (Fig. 1). At the same time a transverse ellipse of plantar skin was excised in order to remove calluses or infected bursae and to draw the fat pad posteriorly under the metatarsal heads. Afterwards, the MP joint of the great toe was resected through a dorsomedial incision. For stabilization, Kirschner-wires (K-wires) were placed through the tip of the toe in a retrograde fashion. The tip of the wire was embedded into the base of the metatarsal to give stability to the pin and hold the interphalangeal joints in proper alignment.

Postoperative care

Patients obtained surgical heel sandals with forefoot relief for immediate mobilization. During the first days, they were only allowed to walk as necessary with crutches. Two weeks postoperatively, skin sutures and K-wires were removed and replaced by special splay-foot dressings. Patients were then allowed to ambulate in surgical heel sandals and were encouraged to do physical exercise. During the night and recreation times, they used a Clayton splint. As soon as swelling and pain had diminished sufficiently, patients were permitted to ambulate in ready-to-wear shoes with retrocapital supporting pads or in specially made surgical shoes. Meanwhile, physical foot exercise was continued to support the active mobility of the toes.

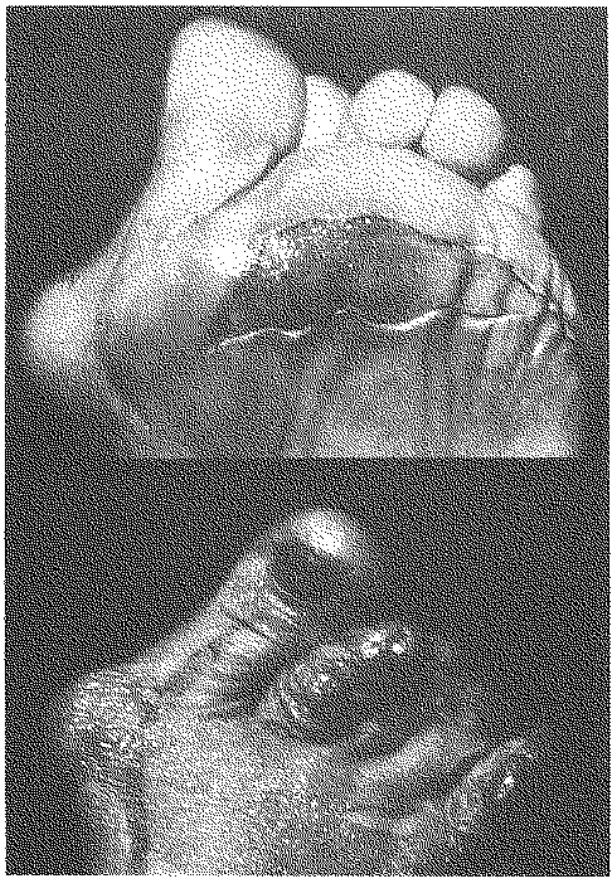

Fig. 1. — Operative approach : *plantar* excision of a transverse ellipse of skin, *dorsomedial* incision over the great toe's joint.

Follow-up

Follow-up included patient history, physical examination and radiographs. Subjective parameters such as pain, gait capacity (unsteadiness, walking distance), shoe-fitting and cosmesis were assessed by interview. Objective functional parameters included the range of motion, force and touching the ground with the toes, standing on tip-toe and heel-toe gait. Objective morphological criteria like prominence of the metatarsal stumps, calluses, toe dorsiflexion at the MP joint, fibular drift of lateral toes and recurrent hallux valgus- or hammer- and claw-toe deformity were assessed by examination with the patient supine. Morphological investigation was completed by radiographs. They were judged by toe and metatarsal indices (metatarsal alignment), metatarsal rounding off and sesamoidal support of the first metatarsal, ankylosis, residual fragments, secondary ossifications and osteoporosis.

Pain	painless mild moderate severe	1 2 3 4
Gait capacity	unlimited slightly limited severely limited	1 2 3
Standing on tip-toe	unlimited unsteady impossible	1 2 3
Deformity	absent slight conspicuous	1 2 3
Complications	absent, temporary severe	1 2
Score :	5 – 8 points 9 – 11 points 12 – 15 points	very satisfying sufficient poor

Fig. 2. — Miehlke's score for rheumatoid forefeet.

Evaluation

Miehlke's score for rheumatoid forefeet was applied (8, Fig. 2) and compared with actual radiographs and reports, the patient s own information and radiographs prior to operation.

RESULTS

Success rate

According to Miehlke's score, the overall outcome was judged as very satisfying in 60 of the 82 cases. These patients had painless forefeet, showed remarkably improved gait capacity and wore normal shoes. Physical examination confirmed the subjective assessment with the exception of a more or less decreased active movement of toes. Radiographs were unremarkable and in accordance with ages (Fig. 3).

In 17 of the 82 feet, persisting symptoms such as slight to moderate pain during a "flare-up", lack of balance and contact with the ground, limited walking distance (at about 1 km) and large, but not specially made shoes diminished the success of the operation. Physical examination showed that patients were able to but did not permanently touch the ground and standing on tip-toe was particularly difficult. Radiological findings such as fibular drift of the lateral toes and slightly prominent metatarsal stumps had to be scored. However, both patients and the follow-up investigator considered the present situation markedly improved and satisfying, so that these patients would undergo the operation again or recommend it without exception.

The remaining 5 feet showed recurrent splay-foot deformity with intolerable pain, functional disability and restricted gait capacity, even though specially made surgical shoes were used. Physical examination showed features comparable to the preoperative situation. Radiographs showed improper metatarsal alignment, insufficient metatarsal rounding off, prominence of the metatarsal stumps, fibular drift of the lateral toes, ankylosis and secondary ossification.

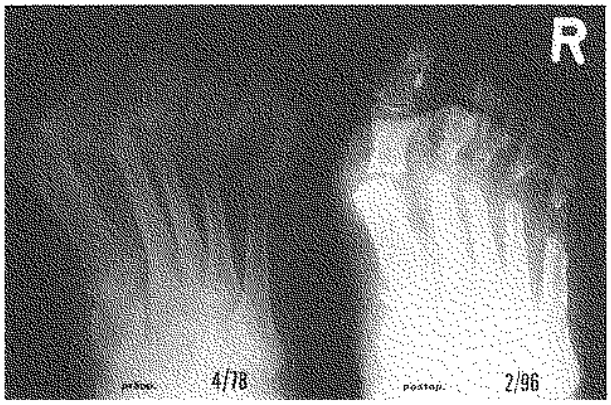

Fig. 3. - 59 years-old patient, suffering from rheumatoid arthritis for over 20 years ; radiological findings prior to and 18 years after Clayton procedure.

Complications

Abnormal wound healing was observed frequently (21 feet) owing to breakdown (12 feet), hematoma (5 feet), infection (3 feet) or delayed healing (2). Other postoperative complications occurred less frequently and consisted of transient hypoesthesia of the great toe (2 feet), deep vein thrombosis (1 leg) and ischemia of the toes (1 foot). Nevertheless, these disturbances did not at all influence the outcome at follow-up.

DISCUSSION

The goals of forefoot arthroplasty are to relieve pain, to correct deformity with concomitant ambulatory and cosmetic improvement, and ideally to allow the use of ready-to-wear shoes. Clayton rated metatarsal head resection as the most satisfactory operative procedure available for the rheumatoid forefoot (2). Several reported series and the present investigation confirm this view as realistic and the named goals as obtainable, if operative and postoperative care are meticulously performed and patients are adequately informed of the progressive nature of their disease (1, 5-7, 9, 10). From the review of published series of forefoot arthroplasty and in accordance with our own results, the following conclusions can be drawn. In 80-90% of the patients, a satisfactory result with markedly increased pain relief, walking endurance, and footwear variety warrant the procedure. The result will likely be compromised by : inadequate relaxation of the soft tissues about the MP joints from insufficient bony resection, unequal lengths of the metatarsal remnants or metatarsals which do not cascade in a gentle curve from metatarsal II — V (metatarsal index : I = II > III > IV > V), bony fragments remaining in the forefoot weightbearing pad after removal of the MP joints.

According to the technique advocated by Kates et al. (5) a plantar incision allows better access to the MP joints II-V and therefore a more adequate bony resection with meticulous metatarsal rounding off. Moreover, an elliptic piece of skin with calluses and infected bursae was removed simultaneously and brought the MP joints into flexion and the forefoot pad under the weightbearing area. Therefore the plantar approach was preferred in the present series, and the remarkable success rate of 93% (77 of 82 feet) satisfactory results might result from the variation. Apart from this, stabilization of the toes with K-wires was supposed to contribute to the successful outcome.

Failure in 5 cases was attributable to improper surgical technique and progression of the disease, especially as the observation period in the present follow-up was rather long (12.8 years in comparison with 2.3 to 6.9 years).

The reported complications were quite common and expectable, if medical treatment with steroids is taken into account. In part because of this, we preferred internal stabilization with K-wires instead of compression dressings (Vainio), and we supported them with casts.

CONCLUSIONS

The findings and evaluation at an average of 12.8 years after Clayton resection arthroplasty showed, that satisfactory results were achieved in 77 of the rheumatoid forefeet followed-up. Patient benefits consisted of pain relief, undisturbed or at least improved ambulation with markedly increased walking endurance and much better shoefitting. Recurrence of the deformity with its characteristic complaints rarely occurred, so that most of the patients concerned would consent again to the operation. All in all, the Clayton procedure with the variations described can be recommended as a suitable method for surgical correction of symptomatic rheumatoid forefeet.

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SAMENVATTING

A. KARBOWSKI, M. SCHWITALLE. Arthroplastiek van de voorvoet bij chronische gewrichtsreuma : langetermijn resultaten na Clayton-operatie.

Dit onderzoek heeft als doel de langetermijn resultaten te evalueren van een Clayton-resectiearthroplastie bij patiënten met symptomatische artritis van de voorvoet. Tussen 1970 en 1995 hebben 109 patiënten met in totaal 184 reumatische voorvoeten op gemiddeld 60-jarige leeftijd een Clayton-operatie ondergaan. Van deze patiënten zijn er 47 met in totaal 82 geopereerde voeten na gemiddeld 12,8 jaar nogmaals onderzocht, waarbij is gekeken naar de ziektegeschiedenis, de resultaten van een lichamelijk onderzoek en een röntgenfoto.
De algemene uitkomst van dit onderzoek was succesvol voor 60 van de 81 gevallen, omdat deze patiënten volledig pijnvrij waren, een opmerkelijk verbeterd loopvermogen hadden en normaal schoeisel konden dragen. Bij 16 patiënten was de toestand duidelijk verbeterd, maar het succes van de operatie werd als verminderd beoordeeld omdat sprake was van lichte tot matige pijn, gebrek aan balans en contact met de grond, beperkte loopafstand en noodzaak tot het dragen van groot schoeisel. De overige 5 voeten betroffen teruggekomen naar buiten gedraaide platvoeten met niet-acceptabele pijn, functionele invaliditeit en belemmerd loopvermogen, zelfs bij gebruik van orthopedisch schoeisel. De Clayton-operatie kan als een passende methode worden geacht voor operatieve correctie van symptomatische reumatische voorvoeten.

RÉSUMÉ

A. KARBOWSKI, M. SCHWITALLE. Arthroplastie de l'avant-pied dans la polyarthrite rhumatoïde : résultats à long terme de la technique de Clayton.

Cette étude a pour objet l'évaluation des résultats à long terme d'une arthroplastie par résection selon la technique de Clayton, chez des patients souffrant d'arthrite rhumatoïde symptomatique de l'avant-pied.
Entre 1970 et 1995, 109 patients représentant un total de 184 avant-pieds rhumatoïdes ont subi une intervention chirurgicale selon la technique de Clayton. Leur moyenne d'âge était de 60 ans. Quarante-sept patients, soit 82 pieds opérés, sont revenus, en moyenne 12,8 ans plus tard, pour une nouvelle étude qui a consisté en l'interrogatoire du patient, un examen physique et une radiographie.
Les résultats globaux ont été considérés comme satisfaisants dans 60 cas sur 81 avec une disparition totale de la douleur, une remarquable amélioration de la démarche et la possibilité de porter des chaussures normales. Dans 16 cas, on a enregistré une amélioration notable, mais le succès de l'opération n'a pas été total car les patients présentaient une douleur légère ou modérée, un manque d'équilibre et de contact au sol, une limitation du périmètre de marche et étaient obligés de porter des chaussures larges. Quant aux 5 cas restants, une déformation récurrente en metatarsus latus a été constatée chez les patients ainsi qu'une douleur inacceptable, des troubles fonctionnels et une ambulation limitée malgré l'utilisation de chaussures orthopédiques.
La technique de Clayton peut être considérée comme une technique appropriée pour corriger chirurgicalement les déformations rhumatoïdes symptomatiques de l'avant-pied.