

The foot: still the most important reason for walking incapacity in rheumatoid arthritis

Distribution of symptomatic joints in 1,000 RA patients

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Background and purpose Our knowledge of frequency of foot involvement in rheumatoid arthritis (RA) is still often based on a study from Finland in 1956. Great changes in the treatment of RA may have led to a different situation. We investigated the distribution of joint involvement in RA patients today, with special attention given to the feet and subjective walking ability.

Methods 1,000 RA patients answered a questionnaire concerning joints affected, joint surgery, foot problems, and subjectively experienced reasons for walking incapacity.

Results In 45% of the patients, the forefoot was involved at the start of the disease. In 17%, the hindfoot/ankle was involved at the start. Only hand symptoms were commoner. 80% of patients reported current foot problems, 86% in the forefoot and 52% in the hindfoot/ankle. Difficulty in walking due to the feet was reported by 71%. For 41% of patients, the foot was the most important part of the lower extremity causing reduced walking capacity, and for 32% it was the only part.

Interpretation After the hand, the foot was the most frequently symptomatic joint complex at the start of the disease, but also during active medical treatment. The foot caused walking disability in three-quarters of the cases and—4 times as often as the knee or the hip—it was the only joint to subjectively impair gait.

In most of the literature dealing with rheumatoid foot problems, the frequency of foot involvement is usually based on references to previous authors; few have actually performed an investigation of their own. Many references go far back in time. Most often, Vainio's study of 955 adults from 1956 is referred to (Vainio 1956). There have been later investigations, but these have usually included considerably fewer patients (Jacoby et al. 1973, Minaker and Little 1973, Vidigal et al. 1975, Fleming et al. 1976, Spiegel and Spiegel 1982, Kerry et al. 1994, Michelson et al. 1994), except for one recently published study of 285 patients that assessed problems strictly in the forefoot (Matricali et al. 2006). The studies above were clinical, while others have been based only on radiographic findings (Thould and Simon 1966, Haas et al. 1999). Great changes in the medical and surgical treatment since the 1950s may have led to a different scenario (Konttinen et al. 2005). Our aim was to carry out an up-to-date investigation of the distribution of joint involvement in rheumatoid arthritis (RA), especially regarding the foot. How often do patients with RA find their feet bothersome, compared to their other joints? Are the feet less troublesome today thanks to modern medicine? Are they just as troublesome as in 1956 in spite of modern treatment, or are they even more troublesome today due to successful surgery of other joints?

Table 1. Joints involved in the debut (n = 997)

| Percentage of | Forefoot | Hindfoot/ankle | Knee | Hip | Finger | Wrist | Elbow | Shoulder |
|---------------|--|----------------|------|-----|---|-------|-------|----------|
| All | 45 | 17 | 32 | 10 | 58 | 44 | 14 | 28 |
| | Foot as one entity: 53 (85% forefoot, 32% hindfoot/ankle) | | | | Hand as one entity: 72 (81% finger, 62% wrist) | | | |

Patients and methods

During 2005, 1,000 patients with rheumatoid arthritis according to the definition of the American College of Rheumatology (Arnett et al. 1988) were enrolled in the study during an ordinary visit to the Rheumatology Outpatient Clinic. The patients were asked to answer a questionnaire concerning sex, age, duration of illness, current medication, debut joints, currently affected joints, joint operations, foot problems, and subjective reasons for reduced walking capacity. Three hospitals, the Karolinska University Hospital, the Söder Hospital, and Danderyds Hospital, Stockholm, Sweden, were involved in the study.

The questionnaires, anonymous but numbered, were handed out by a nurse. The patients then filled in the questionnaires voluntarily while sitting in the waiting room. The forms could be deposited in a special box without any connection to the oncoming visit to the doctor. Questionnaires were distributed to 1,287 patients, 1,000 of whom filled them in (78%). The rate of missing answers in the separate questions was low, and varied between 2 and 15. The question on duration of illness was an exception, with 59 missing answers. Each percentage given in this paper is based on the actual numbers of answers.

The study was approved by the Regional Ethics Board.

Statistics

Categorical data were summarized using frequency counts and percentages. Continuous data are presented as mean and standard deviation (SD) or as median and interquartile range (P25; P75). Associations between variables (affected joints, medicines, etc.) are presented in contingency tables. Logistic regression analysis was performed to evaluate the association between “walking disability” and age, adjusted for sex and duration of dis-

ease, and between “currently affected joints” and treatment (biological and non-biological), adjusted for duration of disease. Disease duration was log-transformed before analysis, as the distribution was positively skewed. We considered p-values of < 0.05 to be statistically significant.

Results

There were 75% females and 25% males in the sample (n = 998), with an average age of 60 years (19–88) (n = 996) and a median duration of illness of 10 years (4; 19 (P25; P75)) (n = 941).

Debut joints: 997 patients answered this question. In 45% of patients the forefoot had been involved at the debut and in 17% the hindfoot/ankle had been involved. Finger joints had been involved in 58% and the wrist in 44% (Table 1). When more than one joint was involved in the debut, the disease had started in median 2 joints (1; 3). Forefoot-finger involvement was the most usual combination (in 29% of patients), followed by forefoot-wrist (20%). Hindfoot/ankle-finger involvement combined was reported by 11% of patients and hindfoot/ankle-wrist combined also by 11%. Involvement of both the forefoot and the hindfoot/ankle as the debut combination was reported by 9%. Forefoot-knee combined was reported by 14% of patients and hindfoot/ankle-knee combined by 9%.

Currently involved joints: Of 992 patients, 94% declared that they had affected joints. 80% stated that they had current foot problems, 86% of which were located in the forefoot and 52% of which were located in the hindfoot. Both parts of the foot were currently affected in 45% of patients. The hands were currently affected in 83%.

The distribution and number of currently affected joints were also compared for patients with or without anti-TNF treatment, but no differences were found (Table 2).

Table 2. Currently affected joints (n = 992)

| Percentage of | Foot | Knee | Hip | Hand | Elbow | Shoulder |
|--------------------------|------|------|-----|------|-------|----------|
| All | 80 | 55 | 29 | 83 | 36 | 57 |
| Patients on anti-TNF | 82 | 52 | 31 | 81 | 41 | 58 |
| Patients not on anti-TNF | 79 | 56 | 28 | 83 | 34 | 56 |

Table 3. Joints affecting the subjective walking capacity (n = 996)

| | Foot and ankle | Knee | Hip |
|---------------------------|----------------|------|-----|
| Most obstructing joint, % | 41 | 16 | 9 |
| Only obstructing joint, % | 32 | 8 | 7 |

When more than one joint was currently involved, a median of 3 joints were affected (2; 5). Here, foot-hand-shoulder was the most usual combination in 47%, followed by foot-hand-knee in 45%. When two joints were involved, foot-hand was the most common combination (in 72% of patients) followed by foot-shoulder (in 50%).

Walking disability: Of 996 patients, 71% stated that they had difficulty in walking due to their feet, with a correlation to duration of illness ($p < 0.0001$) but not to age ($p = 0.6$). On the question of which joint affected the patient's subjective walking capacity the most, 41% stated the foot. In 32%, the foot was the only joint that affected the gait (Table 3).

Characteristics of foot patients: Of the patients with current foot problems (797 patients), 68% had insoles and 93% of them used them. Of these patients, 90% still experienced walking disability.

21% had been operated on in the forefoot, and 7% in the hindfoot/ankle. 96% of the patients who had already had an operation in the forefoot or in the hindfoot/ankle still reported walking disability due to their feet.

Other operations reported: Operations on other joints were reported—in the hands (25%), in the knees (12%), in the hip (12%), in the shoulder (5%), and in the elbow (4%).

Medication: Of the 1,000 patients, 96% were on some active medication, with a median of 2 types (1; 2). 27% were on glucocorticoids, 73% were on Methotrexate, 16% were on sulphasalazine, and

31% were on anti-TNF treatment. 30% used NSAIDs. Other medications (cyclophosphamid, hydroxychlorokin, leflunamide, azathioprin, chlorokin phosphate, ciclosporin, chlorambucil) were each taken by less than 6% of patients.

Debut panorama related to current involvement: Current involvement of other joints was much higher (> 40%) after a debut involving the forefoot and the hand, compared to a debut involving the hip, elbow, hindfoot, shoulder, or knee (10–40% involvement of other joints later in the disease), with the lowest figure for current involvement occurring after a debut in the hip.

Discussion

In this observational, cross-sectional study of 1,000 patients with RA, the foot was reported to be involved at the debut of the disease in 53% of the patients (forefoot, hindfoot/ankle, or both). This was almost as frequent as debut in the hand, which is better known as the debut localization of RA. Debut in the foot has been reported in 19–46% of cases in other studies (Jacoby et al. 1973, Minaker and Little 1973, Fleming et al. 1976, Kerry et al. 1994). In these studies, the distinction between forefoot and hindfoot/ankle is not always clear though, making comparisons somewhat uncertain. The reasons for the higher percentage noted in our study are not obvious. Perhaps the size of the study and the self-reporting model of the questionnaire were contributory factors. In all, our results clearly confirm the great significance of symptoms in the foot as an initial symptom of RA and they emphasize the importance of reflecting on the RA diagnosis in cases with diffuse pain in the forefoot.

80% of the patients in our study reported current foot problems. This corresponds well with the results of earlier studies, with frequencies of current foot involvement of 77–94% (Vainio 1956, Vidigal et al. 1975, Kerry et al. 1994, Michelson et al. 1994, Matricali et al. 2006). This finding is notable, as the medical and surgical treatments have changed markedly. Over the last decade especially, earlier and more aggressive combination therapy

has been advocated. The introduction of anti-TNF drugs has also brought about far-reaching changes to the medical treatment of RA (Konttinen et al. 2005). One-third of our patients were on biological treatment, the same level as reported recently in the Netherlands (Boonen et al. 2006). Unexpectedly, we did not find any significant differences in currently affected joints reported between the patients who were on, and who were not on, biological drugs. However, we do not have data concerning the duration of the arthritis in each case before the introduction of this treatment. There might have been extensive involvement of different joints already, as anti-TNF treatment is usually introduced in more severe cases when other treatments have failed. If this assumption is correct, the finding of the same amount of subjectively affected joints in both groups may actually support the positive effect of the biological drugs, even if true remission is reportedly obtained in only a small proportion of patients (Hyrich et al. 2006). Also, on average, our patients stated that 3 joints (median) were currently affected, as compared to 13 joints reported in the mid-1990s (Michelson et al. 1994), which is perhaps an effect of the modern medication. The decrease in surgical procedures in RA patients recently shown by Weiss et al. (2006) may also support this, as well as the earlier but less radical foot surgery reported by Boonen et al. (2006). Moreover, our study does not include any quantification of the involvement or the level of pain, just the presence of subjective symptoms.

If the debut involved the forefoot, the fingers, or the wrist, this seemed to imply a higher risk of future involvement of other joints. Disease severity has also been shown radiographically to be related to the progression of foot deformities (Shi et al. 2000).

In 3 out of every 4 cases, the foot caused walking disability and was 4 times as often the only joint in the lower extremity impairing the gait (32% as compared to 8% for the knee and 7% for the hip). This correlates well with the findings of Kerry et al. (1994). Successful knee and hip surgery might be a reason for the lower percentage of patients who reported reduced walking capacity due to these joints. On the other hand, only 12% reported having had an operation in each of these two joints, which is on a par with other studies (James et al. 2004).

The forefoot still seems to cause trouble more often than the hindfoot/ankle (86% vs. 52% in our study). This is in accordance with other reports (Vainio 1956, Vidigal et al. 1975, Kerry et al. 1994, Matricali et al. 2006)—except for that of Michelson et al. (1994) who found 80% ankle symptoms compared to 68% forefoot problems. Hindfoot involvement often starts insidiously and proceeds with a slowly developing valgus deformation. It is often difficult to clinically distinguish ankle symptoms from talo-navicular involvement in the hindfoot, both for the patient and the physician. Thus, we combined symptoms from these two joint systems, the ankle and the hindfoot, into one entity. Forefoot synovitis often has a more distinct, painful onset with the stress brought upon the MTP joints during the lift-off phase of walking, and is possibly more easily recognized.

Insoles had been prescribed in two-thirds of the patients with foot problems, and were used by almost all. These are high figures compared to other reports, where 5–15% of patients had special shoes or insoles (Kerry et al. 1994, Michelson et al. 1994). Different local prescribing traditions and variation in accepting to wear special shoes may be one reason for these differences. Matricali et al. (2006) reported use of insoles in 42% of cases and custom-made shoes in 25%; together with our findings, this is perhaps a sign of an increasing trend. The use of orthoses may be encouraged, as they have been shown to reduce pain and alter pressure distribution in painful forefeet—and also to reduce excessive subtalar eversion during the stance phase in symptomatic valgus hindfoot deformity (Hodge et al. 1999, Woodburn et al. 2003). The figure for having walking disability despite the use of insoles was high, but as two-thirds of the patients used their insoles, some positive effect must be experienced.

Surgery had been performed on the forefoot in 21% of patients and on the hindfoot/ankle in 7% of cases, which is similar to that reported in the Matricali study (2006). Over 90% of our patients reported walking disability even in spite of this which may be a reflexion of less successful foot surgery, high demands, and unrealistic expectations. However, good results up to 6 years after certain forefoot surgery have been shown in a prospective study (Gronal et al. 2006).

In conclusion, involvement of the foot is still of great importance in patients with rheumatoid arthritis. We suggest that more attention should be given to assessment and treatment of foot problems in these patients.

Contributions of authors

LG designed and organized the study, collected and analyzed the data, and wrote the manuscript. BT participated in study design and analysis, and collection of data. BN participated in study design and collection of data. PW participated in study design and revised the manuscript. AS designed the study, analyzed the data, and revised the manuscript.

- Arnett F C, Edworthy S M, Bloch D A, McShane D J, Fries J F, Cooper N S, et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 1988; 31: 315-24.
- Boonen A, Matricali G A, Verduyck J, Taelman V, Verschueren P, Sileghem A et al. Orthopaedic surgery in patients with rheumatoid arthritis: a shift towards more frequent and earlier non-joint-sacrificing surgery. *Ann Rheum Dis* 2006; 65: 694-5.
- Fleming A, Crown J M, Corbett M. Early rheumatoid disease. 1. Onset. *Ann Rheum Dis* 1976; 35: 357-60.
- Grondal L, Broström E, Wretenberg P, Stark A. Arthrodesis versus Mayo resection. Management of the first metatarsophalangeal joint in reconstruction of the rheumatoid forefoot. *J Bone Joint Surg (Br)* 2006; 88: 914-9.
- Haas C, Kladny B, Lott S, Weseloh G, Swoboda B. Progression von Fussdeformitäten bei rheumatoider Arthritis – eine radiologische Verlaufsbeobachtung über fünf Jahre. *Z Rheumatol* 1999; 58: 351-7.
- Hodge M C, Bach T M, Carter G M. Orthotic management of plantar pressure and pain in rheumatoid arthritis. *Clin Biomech* 1999; 14: 567-75.
- Hyrich K L, Watson K D, Silman A J, Symmons D P M. Predictors of response to anti-TNF-alpha therapy among patients with rheumatoid arthritis: results from the British Society for rheumatology biologics register. *Rheumatology* 2006; 45: 1558-65.
- Jacoby R K, Jayson M I, Cosh J A. Onset, early stages and prognosis of rheumatoid arthritis: a clinical study of 100 patients with 11-year follow-up. *Br Med J* 1973; 14: 96-100.
- James D, Young A, Kulinskaya E, Knight E, Thompson W, Ollier W et al. Orthopaedic intervention in early rheumatoid arthritis. Occurrence and predictive factors in an inception cohort of 1064 patients followed for 5 years. *Rheumatology* 2004; 43: 369-76.
- Kerry R H, Holt G M, Stockley I. The foot in chronic rheumatoid arthritis: a continuing problem. *The Foot* 1994; 4: 201-3.
- Kontinen Y T, Seitsalo S, Lehto M, Santavirta S. Current management: management of rheumatic diseases in the era of biological anti-rheumatic drugs. *Acta Orthop Scand* 2005; 76: 614-9.
- Matricali G A, Boonen A, Verduyck J, Taelman V, Verschueren P, Sileghem A et al. The presence of forefoot problems and the role of surgery in patients with rheumatoid arthritis. *Ann Rheum Dis*. 2006; 65: 1254-5.
- Michelson J, Easley M, Wigley F M, Hellmann D. Foot and ankle problems in rheumatoid arthritis. *Foot Ankle Int* 1994; 15: 608-13.
- Minaker K, Little H. Painful feet in rheumatoid arthritis. *Can Med Assoc J* 1973; 109: 724-5.
- Shi K, Tomita T, Hayashida K, Owaki H, Ochi T. Foot deformities in rheumatoid arthritis and relevance of disease severity. *J Rheumatol* 2000; 27: 84-9.
- Spiegel T M, Spiegel J S. Rheumatoid arthritis in the foot and ankle – diagnosis, pathology and treatment. *Foot Ankle* 1982; 2: 318-24.
- Thould A K, Simon G. Assessment of radiological changes in the hands and feet in rheumatoid arthritis. Their correlation with prognosis. *Ann Rheum Dis* 1966; 25: 220-8.
- Vainio K. The rheumatoid foot. A clinical study with pathological and roentgenological comments. *Ann Chir Gynaecol (Suppl)* 1956; 45: 1-107.
- Weiss R J, Stark A, Wick M C, Ehlin A, Palmblad K, Wretenberg P. Orthopaedic surgery of the lower limbs in 49 802 rheumatoid arthritis patients: results from the Swedish national Inpatient Registry during 1987 to 2001. *Ann Rheum Dis* 2006; 65: 335-41.
- Vidigal E, Jacoby R K, Dixon A S, Ratliff A H, Kirkup J. The foot in chronic rheumatoid arthritis. *Ann Rheum Dis* 1975; 34: 292-7.
- Woodburn J, Helliwell P S, Barker S. Changes in 3D joint kinematics support the continuous use of orthoses in the management of painful rearfoot deformity in rheumatoid arthritis. *J Rheumatol* 2003; 30: 2356-64.