Course of radiographic damage over 10 years in a cohort with early rheumatoid arthritis.

Lindqvist, Elisabet; Jonsson, K; Saxne, Tore; Eberhardt, Kerstin

Published in:
Annals of the Rheumatic Diseases

DOI:
10.1136/ard.62.7.611

2003

Link to publication

Citation for published version (APA):

Total number of authors:
4
Course of radiographic damage over 10 years in a cohort with early rheumatoid arthritis

E Lindqvist, K Jonsson, T Saxne and K Eberhardt

doi:10.1136/ard.62.7.611

Updated information and services can be found at:
[http://ard.bmjjournals.com/cgi/content/full/62/7/611](http://ard.bmjjournals.com/cgi/content/full/62/7/611)

**References**

This article cites 46 articles, 11 of which can be accessed free at:
[http://ard.bmjjournals.com/cgi/content/full/62/7/611#BIBL](http://ard.bmjjournals.com/cgi/content/full/62/7/611#BIBL)

4 online articles that cite this article can be accessed at:
[http://ard.bmjjournals.com/cgi/content/full/62/7/611#otherarticles](http://ard.bmjjournals.com/cgi/content/full/62/7/611#otherarticles)

**Rapid responses**

You can respond to this article at:
[http://ard.bmjjournals.com/cgi/eletter-submit/62/7/611](http://ard.bmjjournals.com/cgi/eletter-submit/62/7/611)

**Email alerting service**

Receive free email alerts when new articles cite this article - sign up in the box at the top right corner of the article

**Topic collections**

Articles on similar topics can be found in the following collections

- Rheumatoid Arthritis (713 articles)

**Notes**

To order reprints of this article go to:
[http://www.bmjjournals.com/cgi/reprintform](http://www.bmjjournals.com/cgi/reprintform)

To subscribe to *Annals of the Rheumatic Diseases* go to:
[http://www.bmjjournals.com/subscriptions/](http://www.bmjjournals.com/subscriptions/)
Course of radiographic damage over 10 years in a cohort with early rheumatoid arthritis

E Lindqvist, K Jonsson, T Saxne, K Eberhardt

Objective: To investigate development of radiographic damage in hands and feet of patients with early rheumatoid arthritis (RA) monitored prospectively for 10 years, and to search for prognostic factors.

Patients and methods: 181 patients with early RA (mean disease duration one year) were assessed annually with radiographs of hands and feet during years 0–5 and at year 10. Radiographs were evaluated according to Larsen (range 0–200). Predictive factors for progressive disease for years 0–5 and 5–10 were evaluated by logistic regression analyses.

Results: 82/168 (49%) patients had erosions at inclusion and almost all became erosive with time (90% after two years and 96% after 10 years). Radiographic progression was most rapid during the first two years and 75% of all damage occurred during the first five years. The median Larsen score increased from 6 at inclusion to 41 after five years and 54 after 10 years. Only 5.3% of all evaluated joints become maximally eroded, the second metacarpophalangeal joint being the most commonly affected. Mean ESR during the first three months and rheumatoid factor status were significant predictors for radiographic progressive disease, it was not possible to predict non-progressive disease.

Conclusions: Joint damage in hands and feet developed early and progression was most rapid during the first years of disease. The different rates of progression at different stages should be considered in the design of trials of drugs aimed at retarding joint damage. Disease activity at study start influenced the degree of joint damage during the entire 10 years.
hydroxychloroquine and d-penicillamine were the most commonly used DMARDs whereas at the 10 year follow up methotrexate was the most frequently used drug. Altogether 136 (75%) of the patients were treated with DMARDs during 57% of the follow up time. Table 1 lists the different drugs used. Eighty three (46%) patients received low dose oral glucocorticoid treatment during some period of the study. Clinical outcome after 10 years is presented more extensively elsewhere. 39

**Methods**

**Clinical and laboratory assessment**

Joint inflammation was assessed by an active joint count (defined as swollen and either tender or painful on motion). The 50 joints evaluated included all but two from the Ritchie index—namely, the neck and subtalar joints. Disability was evaluated using a Swedish version of the Stanford Health Assessment Questionnaire (HAQ) disability index. 29 The erythrocyte sedimentation rate (ESR) was analysed according to Westergren.

**Radiographic assessment**

Radiographs of hands and feet (standard film in anteroposterior projection) were taken annually from study start to year 5 and at year 10, comprising seven examinations for each patient. The first examination was performed at a mean (SD) of 9.4 (6.2) months after the onset of symptoms.

The radiographs were evaluated according to Larsen and Dale. 21 Thirty two joints were assessed: metacarpophalangeal (MCP) I–V, interphalangeal (IP) I, proximal interphalangeal II–V, and the wrist in both hands, and IP I and metatarsophalangeal (MTP) II–V in both feet. Each joint was compared with a standard reference film. The changes were graded from 0 to 5; 0 being normal; 1, joint space narrowing, soft tissue swelling or periarticular osteoporosis; 2–5, increasing degree of erosions and destruction. A joint damage score (JDS) was calculated by adding all the scores, the wrist multiplied by five, resulting in a span of 0–200. 22

The scoring was made by one of two assessors, one being an experienced rheumatologist (Eva Fex) who read the films from the remaining 75 patients from years 0–5 in chronological order. The other assessor was an experienced radiologist (KJ) who read the films from the remaining 75 patients from years 0–5 in chronological order. KJ evaluated all the 10 year evaluations separately. Clinical and laboratory information was not available at the time of radiological evaluation. The score for each joint was registered separately. Erosive disease was considered present if any individual joint had a Larsen score of ≥2.

The rate of progression was calculated by subtracting the JDS year by year. The rate of progression during five years was calculated by subtracting the JDS at inclusion from that at year 5 and the JDS at year 5 from that at year 10. Progression was defined as an increase in the Larsen score of 11 units or more. 23

Reliability of the radiological scoring was evaluated using the intraclass correlation coefficient (ICC). For determination of interobserver agreement both assessors scored 105 examinations chosen at random independently. ICC (95% confidence interval (CI)) was 0.97 (0.96 to 0.99). Owing to the death of EF no intraobserver agreement was performed on her readings. Intraobserver reproducibility for KJ was assessed on 58 examinations (three quarters with an interval of 3–6 months and a quarter with an interval of five years). The ICC (95% CI) was 0.95 (0.92 to 0.97). In 18 patients we also examined the agreement between the scores for the 10 year examination if read separately or if the whole series of radiographs from year 0–10 were available. The ICC (95% CI) was 0.96 (0.90 to 0.99).

**Statistical analyses**

Non-parametric tests were used for comparisons within and between groups (Wilcoxon’s test, Mann Whitney’s test, or χ² test, when appropriate). Reliability testing of the radiographic scorings was performed using the ICC. The demographic data and different clinical variables at baseline were candidate predictive factors. Only variables producing significant associations (p<0.10) with radiographic progression during years 0–5 and 5–10, respectively, in bivariate analyses were entered into multivariate models. We performed regression analyses with radiographic outcome both as dichotomised (logistic regression) and continuous (linear regression) dependent variable. Analyses for progression from baseline to year 5 and from year 5 to 10 were performed separately. In the logistic regression analyses exponent B was considered an odds ratio and was calculated with 95% CI.

In the description of the development of structural changes over time all available radiographs each year were used. However, for the prediction we only included patients with complete data in the analyses (122 for years 0–5 and 121 for years 5–10).

**RESULTS**

The study comprised seven radiographic examinations for each patient. The median number of examinations obtained for each patient was 6 (range 3–7). All radiographs were available for 79 (44%) patients. Figure 1 shows the numbers of radiographs assessed each year. Ten year radiographs were available in 157 patients (87%). Of the 24 patients missing from the 10 year follow up, 15 had died, 5 had moved from the

---

**Table 1 DMARDs used during the 10 years**

<table>
<thead>
<tr>
<th>DMARD</th>
<th>Total No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxychloroquine</td>
<td>85</td>
</tr>
<tr>
<td>d-Penicillamine</td>
<td>77</td>
</tr>
<tr>
<td>Methotrexate</td>
<td>49</td>
</tr>
<tr>
<td>Sulfasalazine</td>
<td>35</td>
</tr>
<tr>
<td>Auranofin</td>
<td>23</td>
</tr>
<tr>
<td>Aurothiomalate</td>
<td>15</td>
</tr>
<tr>
<td>Azathioprine</td>
<td>15</td>
</tr>
<tr>
<td>Chlorambucil</td>
<td>9</td>
</tr>
<tr>
<td>Podophyllotoxins</td>
<td>9</td>
</tr>
<tr>
<td>Cyclosporin</td>
<td>3</td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>3</td>
</tr>
<tr>
<td>Infliximab</td>
<td>3</td>
</tr>
<tr>
<td>Podophyllotoxins</td>
<td>9</td>
</tr>
<tr>
<td>Cyclosporin</td>
<td>3</td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>3</td>
</tr>
<tr>
<td>Infliximab</td>
<td>3</td>
</tr>
</tbody>
</table>
Radiographic progression

Erosive disease developed early and 82/168 (49%) of our patients had erosions already at baseline. After two years 151/167 (90%) of the patients had developed erosions. At the end of the study the number of patients with erosive disease had increased to 150/157 (96%).

At 10 years the median (interquartile (IQ) range) Larsen score was 54 (28–80) with a maximal score of 162/200. Nine patients (6%) had a Larsen score of 120 or higher. Figure 1 shows the median Larsen scores each year.

Figure 2 shows the annual progression rates for the first five years and from year 5 to 10. The box plots show the median and 10th, 25th, 75th, and 90th centiles.

The annual progression rates of radiographic damage for each year during the first five years and from year 5 to 10 it was 11 (0–26.5). Hence, three quarters of the first five years of disease was 32 (10–55) and from year 5 to 10 it was 150/157 (90%) patients had erosions in the hands and 136/157 (87%) in the feet.

The right hand had a higher Larsen score than the left at inclusion and during the first three years but thereafter the differences between right and left sides disappeared. In the feet, there were no differences in involvement between the left and right side.

At baseline the three most commonly eroded joints were MTP V (15.5%), wrists (7.4%), and the IP joints of the big toes (6.5%). At year 5 the order was MTP V (61.7%), wrists (58.3%), and MCP II (44.0%), and at 10 years the wrists (72.6%), the MTP V (65.6%) and the MCP II (51.9%).

Maximally eroded joints

Figure 4 presents the number of patients with at least one joint with maximal Larsen score (5), each year. After 10 years 62/157 (39%) patients had at least one maximally eroded joint. Among these patients the median (IQ range) number of maximally eroded joints was 3 (1–6). However, only 5.3% of all the evaluated joints reached the maximal score during the study. The MCP II joint most frequently reached a score of 5, which occurred in 36/157 (23%) patients.

Relation to treatment

The radiographic progression was significantly higher in the patient group treated with DMARDs (n=122) for some time during the study period (p<0.001). Patients not treated with DMARDs (n=35) were significantly older (p<0.01) and more often RF negative (p<0.001). The patient group (n=77) treated with low dose oral glucocorticoids for some time during the study also showed significantly worse radiographic changes (p<0.001).

Prediction

Age, sex, RF, genotype, active joint count, ESR, HAQ, and Larsen scores at the beginning of the study were considered candidate predictive factors for radiographic progression or not during years 0–5 and 5–10, respectively (cut off value 11 Larsen units). During the first five years 75% of the patients had a progressive disease, while during the following five years the percentage of patients with radiographic progression had diminished to 50.4%.
The most important findings of this study were that joint damage occurred early in the course of RA and that radiographic progression was most rapid during the first years of disease. Almost half of our patients had erosive changes at the study start and after two years 90% had become erosive. Seventy five per cent of the joint damage as assessed by the Larsen index occurred during the first half of the study.

Studies of radiographic progression in patients with RA have shown diverging results. Several important factors should be considered when interpreting results from different studies, such as patient selection, disease duration at inclusion, the number of radiographic examinations performed in each patient during the study, the order in which the radiographs were evaluated, and the scoring method used. The most commonly used scoring methods are the Sharp index, the modified Sharp/van der Heijde index (SHS), and the Larsen index with different modifications. In the Larsen index an overall assessment of each joint is performed, including both joint erosions and joint space narrowing, whereas in the Sharp methods joint space narrowing and joint erosions are evaluated separately. There is, however, a rather good correlation between the scoring systems, and direct comparisons can be made if the percentage of maximal scores and number of joints with erosive changes are calculated. In the SHS method more weight is given to changes in the feet, which account for 37.5% of the total score compared with 25% in the Larsen score. Wrist is given equal importance in the two systems (25% of the total score).

Intraobserver reliability testing of our radiographic scoring became incomplete owing to circumstances explained in the “Methods” section, but interobserver reliability was very high. We therefore think that our scoring procedure has acceptable reliability, especially considering the longitudinal observational study design and that the study started in the middle of the 1980s. During recent years, a lot of work has been done to make radiographic assessment conform. Most emphasis has been put on randomised clinical trials where strict comparison between groups and small changes over a short time are important. However, for longitudinal studies even the new recommendations find a less strict approach acceptable.

Reading the films in chronological order might overestimate progression but reduce the measurement error.
quality of the films and the positioning become less important using this approach. 

Hualmans et al also read the radiographs in chronological order, whereas others read their radiographs in random order.

The findings of early erosive changes are in accordance with most comparable prospective studies. Our findings of early radiographic changes in the feet and the later appearance of changes in the hands also corroborate other investigations. The distribution of erosive changes with MTP V being the most commonly eroded joint in early disease followed by more intense engagement of the wrists and MCP II has also been reported previously. The pattern of progression of radiographic damage in the course of disease is important, as radiographic damage is generally measured in trials of new drugs and usually comparisons are made versus a predicted progression rate. The results for the rate of radiographic progression are still controversial. The most pronounced progression early in the disease course found in our study is supported by other studies. The progression among the patients with RA into 4–5 different groups depending on their pattern of radiographic progression, has also been reported previously.

ACKNOWLEDGEMENTS

Grants were obtained from the Swedish Medical Research Council, the Österlund and Kock Foundations, the King Gustav V 60 year Fund and Reumatikerförbundet. We would like to acknowledge the late Eva Fox who contributed to the work presented in the paper.

Authors’ affiliations

E Lindqvist, T Saxne, K Eberhardt, Department of Rheumatology, Lund University Hospital, Sweden

K Jonsson, Department of Radiology, Lund University Hospital, Sweden

REFERENCES


