Radiological articular involvement in the dominant hand in rheumatoid arthritis

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SUMMARY Scoring the severity of joint involvement in the x-rays of hands of patients with rheumatoid arthritis showed significantly greater joint destruction in the dominant hand. The difference was seen in all the joints, and especially in the wrists, but with the exception of the metacarpophalangeal joint of the thumb. The grip strength was not, however, different in the 2 hands.

Physical rest has been shown to have a potent anti-inflammatory effect, and paralysis of a limb either as a result of a cerebrovascular accident or poliomyelitis protects against joint disease, whether due to osteoarthritis, rheumatoid arthritis, or gout. In contrast, bone cysts, or geodes, are usually but not always more frequent in patients with rheumatoid arthritis who do heavy manual work, owing to the inflamed synovium being forced into the joint-articular porous cancellous bone. In view of the fact that there is a greater use of the dominant hand we considered it of interest to determine whether articular damage in patients with rheumatoid arthritis was different in the 2 hands.

Materials and methods

All the patients had seropositive 'definite' rheumatoid arthritis, as defined by the diagnostic criteria of the American Rheumatism Association. The patients were selected at random from those attending a special Hand Clinic at this hospital. The radiographs of the hands were compared with standard radiographs prepared by Larsen. Each distal interphalangeal joint, proximal interphalangeal joint of the thumb, and wrist joint were graded on a scale from 0 to 5, grade 0 being normal, grade 1 slight changes, grade 2 definite changes, grade 3 minimum destructive changes, grade 4 severe destructive changes, and grade 5 mutilating changes. On this grading the maximum score for each hand was 75. Twenty hand radiographs were scored by one observer who was unaware of the dominant hand. One week later the same observer rescored the radiographs again without knowledge of which patient they belonged to, and in a different order from the first scoring. However, the order of reading the radiographs was not randomised. In this way it was possible to determine the intraobserver error in scoring the x-rays.

Grip strength was determined in all 20 patients included in the x-ray study, and in a further 45 patients the grip strengths were measured as the mean of 3 readings in each hand by a single observer who was unaware of the patient's dominant hand.

Results

The results of the scoring of the radiographs of the 2 hands were analysed by a 3-way analysis of variance, the factors being the right versus left hand, the patients, and the 2 observations made at a week's interval. From Table 1 it can be seen that there was

Table 1 Results of analysis of variance of hand radiograph scores

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (cfm)</td>
<td>19</td>
<td>19489.2</td>
<td>1025.75</td>
<td>35.06</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Readings (1 and 2)</td>
<td></td>
<td>4.05</td>
<td>4.05</td>
<td>0.14</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Left vs. right</td>
<td></td>
<td>288.80</td>
<td>288.80</td>
<td>9.87</td>
<td>&lt;0.0026</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td>18.05</td>
<td>18.05</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>57</td>
<td>1668-10</td>
<td>29.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (cfm)</td>
<td>79</td>
<td>21468-2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DF = degrees of freedom. SS = sum of squares. MS = mean squares. F = F distribution. P = probability value. cfm = Corrected for the mean.

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no significant difference in the hand scores measured at a week’s interval. There was, however, a highly significant difference between the 2 hands (P < 0.0026). The right hand was dominant in all 20 patients, and the mean score was 23–35 compared to 19–45 in the nondominant left hand.

The results of the x-ray scores on individual joints are summarised in Table 2. It can be seen that the scores were all higher in the dominant hand with the exception of the metacarpophalangeal joint of the thumb, but the differences were statistically significant (P < 0.05) only by a one-tailed Student t test for paired values in the wrist.

The mean score (±SD) of the grip strength of the dominant hand was 126.3 ± 65.1 mmHg and for the nondominant hand 125.3 ± 68.8. The correlation coefficient between the grip strengths in the 2 hands was r = 0.82. In essence there was no significant difference between the grip strength in the dominant and nondominant hand.

Discussion

Despite a very extensive literature on the radiology of bone and joint changes in rheumatoid arthritis it is surprising that there is no information on differences between the dominant and nondominant hand. From the results of this study it seems that when carefully assessed such differences can be detected. There was a statistically significant difference in joint damage in the dominant hand compared to the nondominant hand. These differences it should be noted, would not be appreciated on casual inspection of the joint x-rays, such as is done on routine radiological reporting. The differences were most marked in the wrist joint, and indeed the only joint which did not show greater changes in the dominant hand was the metacarpophalangeal joint of the thumb.

In normal subjects the bone is slightly denser in the dominant limb and the grip strength some 5 to 10% stronger.10-18 In the present study the grip strength in the dominant hand was no greater than in the nondominant hand. Perhaps this was due to the greater joint destruction in the former.

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References

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