Occurrence and Risk Factors for Falls in Rheumatoid Arthritis

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Running title ‘Falls in Rheumatoid Arthritis’
Abstract

Objectives: There are few data concerning the occurrence of falls in patients with rheumatoid arthritis (RA). The aim of this analysis was to determine the one-year period prevalence of falls by age and gender in patients with RA and to determine the influence of concurrent medical therapy and disability on the occurrence of falls in this group.

Methods: A consecutive series of RA patients aged 35 years and over, attending hospital out-patient clinics at Hope hospital, Salford, were asked to complete an interviewer assisted questionnaire which asked about the occurrence and number of falls in the previous 12 months. Subjects who took part were asked about current therapy with anti-hypertensives, diuretics, sedatives or hypnotics, antidepressants, and a history of previous hip / knee surgery. They also completed the health assessment questionnaire (HAQ). Logistic regression was used to determine the association between these variables and falls in the previous 12 months.

Results: 253 men and women, mean age 62 years, were studied. 84 (33%) subjects reported falling in the previous year. Of these 52% had fallen on more than one occasion. 36% of women and 26% of men reported a fall in the previous year. There was no important increase in the frequency of falls with age. After adjusting for age and gender, those who had fallen in the previous year were more likely to report taking antidepressant therapy (OR=2.09), and to have impairment in both walking (OR=1.37) and rising (OR=1.41). HAQ score was higher in those who reported a fall than those who did not, though the difference was not statistically significant.

Summary: In this hospital-based survey, one in three RA patients reported falling in the previous 12 months. Falls were associated with self-reported impairment in lower limb function.
Introduction
Rheumatoid arthritis (RA) is associated with an increased risk of osteoporotic fracture, including hip fracture [1-3]. Osteoporotic fractures arise as a result of an interaction between increased bone fragility of which the major determinant is bone mass, and trauma, particularly falls. Data from many studies suggest that patients with RA have reduced bone mass compared to non-RA controls [4-6]. RA patients might be considered to be at increased risk of falls for a variety of reasons, including the presence of lower limb joint involvement resulting in impaired mobility, balance and postural stability, however, little is known about the occurrence of falls in RA.

The aim of this study was to determine the one-year period prevalence of falls by age and gender in patients with rheumatoid arthritis, and to determine the influence of concurrent medical therapy and disability on the occurrence of falls.

Materials and Methods
Subjects
Men and women with rheumatoid arthritis aged 35 years and over, attending hospital out-patient clinics at Hope hospital, Salford, either for clinical review or for blood monitoring for anti-rheumatic therapy were invited to complete an interviewer assisted questionnaire concerning falls. Subjects were asked about the occurrence of falls: “Have you fallen in the last 12 months?” and, if yes, “How many times?” We did not include a formal definition of falls though falls due to road accidents and violence were excluded.

Subjects were asked also about duration of RA, previous knee or hip surgery (any) and whether they were currently taking therapy which might influence their risk of falls (antidepressants / sedatives hypnotics / anti-hypertensives / diuretics). They were asked also to complete the Health Assessment Questionnaire (HAQ) [7]. Ethical approval for the study was obtained from the Salford and Trafford ethics committee.

Statistical Analysis
The proportion of patients who reported a fall in the previous year, and the proportion who reported more than one fall (multiple falls) in the previous year was calculated by gender and by 10-year age group. Logistic regression was used to explore risk factors associated with falls, with falls in the last year as the dependent variable, and the results expressed as odds ratios (OR) and 95% confidence intervals (CI). The analysis was repeated using multiple falls as the dependent variable. Statistical analysis was performed using STATA [8].

Results
Subjects
253 patients were interviewed, 72 men, mean age 61.1 years, and 181 women, mean age 62.3 years. The mean duration of disease was 13.4 years. 17.8% reported having had previous hip or knee surgery, 32.8% were taking concurrent anti-hypertensive therapy, 8.3% sedative / hypnotics, 17.4% diuretics and 15.4% antidepressant therapy, see Table 1.
Table 1. Subject characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>62.0 (11.2)</td>
</tr>
<tr>
<td>Duration of RA (yrs)</td>
<td>13.4 (10.2)</td>
</tr>
<tr>
<td>HAQ Score</td>
<td>1.86 (0.78)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip/knee surgery</td>
<td>45 (17.8)</td>
</tr>
</tbody>
</table>

Medication:
- Anti-hypertensives 83 (32.8)
- Diuretics 44 (17.4)
- Sedatives/hypnotics 21 (8.3)
- Antidepressants 39 (15.4)

Prevalence of falls
84 (33%) subjects reported falls in the previous 12 months. Of the 84 patients who fell in the previous 12 months, 44 (52%) fell on more than one occasion. Falls were more common in women than in men (36% vs 26%) though the difference was not statistically significant. Table 2 presents the proportion of patients who fell in the previous 12 months, and the proportion who fell on more than one occasion, by gender and age group. There was no significant trend towards an increased risk of falls (any or multiple) with age in either men or women. Of the 84 patients who reported a fall, 4 sustained a fracture (wrist, vertebra, nose, rib).

Table 2. Prevalence of falls by gender and age-group

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th></th>
<th>Men</th>
<th></th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Any fall</td>
<td>&gt; 1 fall</td>
<td>Any fall</td>
<td>&gt; 1 fall</td>
<td>Any fall</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>N</td>
<td>n (%)</td>
<td>n (%)</td>
<td>N</td>
<td>n (%)</td>
</tr>
<tr>
<td>35-44</td>
<td>11</td>
<td>4 (36.4)</td>
<td>3 (27.3)</td>
<td>7</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>45-54</td>
<td>36</td>
<td>16 (44.4)</td>
<td>9 (25.0)</td>
<td>17</td>
<td>4 (23.5)</td>
</tr>
<tr>
<td>55-64</td>
<td>57</td>
<td>19 (33.3)</td>
<td>13 (22.8)</td>
<td>20</td>
<td>5 (25.0)</td>
</tr>
<tr>
<td>65-74</td>
<td>56</td>
<td>20 (35.7)</td>
<td>6 (10.7)</td>
<td>17</td>
<td>4 (23.5)</td>
</tr>
<tr>
<td>75+</td>
<td>21</td>
<td>6 (28.6)</td>
<td>5 (23.8)</td>
<td>11</td>
<td>4 (36.4)</td>
</tr>
</tbody>
</table>
**Risk factors for falls**

After adjusting for age and gender, compared to those who did not fall in the previous 12 months, those who did were more likely to report taking antidepressant therapy (OR=2.09), see Table 3. Diuretic therapy (OR=1.79) and sedative therapy (OR=1.96) were also associated with an increased risk of falling though the confidence intervals embraced unity. An increasing number of therapies taken by an individual (range 0-4) was associated with a significant increased risk of falling (OR=1.44). Previous hip/knee surgery was associated with an increased risk of falling (OR=1.84) though the confidence intervals embraced unity. Duration of RA did not appear to influence susceptibility to falls.

The mean HAQ score was 1.98 in fallers and 1.79 in non-fallers though the difference was not statistically significant. In terms of the individual HAQ domains, increased difficulty walking (OR=1.37; 95%CI 1.02, 1.84) and rising (OR=1.41; 95%CI 1.06, 1.89) were associated with an increased risk of falls, see Table 4. Repeating these analyses using multiple falls (vs single or no falls) as the dependent variable did not influence the results (data not shown).

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**Table 3. Risk factors for falls: age, gender, previous knee/hip surgery and medications**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td></td>
</tr>
<tr>
<td>35-45</td>
<td>Referent</td>
</tr>
<tr>
<td>45-55</td>
<td>1.18 (0.38, 3.66)</td>
</tr>
<tr>
<td>55-65</td>
<td>0.85 (0.28, 2.57)</td>
</tr>
<tr>
<td>65-75</td>
<td>0.91 (0.30, 2.75)</td>
</tr>
<tr>
<td>75+</td>
<td>0.89 (0.26, 3.07)</td>
</tr>
<tr>
<td>Gender (F vs M)</td>
<td>1.58 (0.86, 2.89)</td>
</tr>
<tr>
<td>Previous hip/knee surgery¹</td>
<td>1.84 (0.95, 3.57)</td>
</tr>
<tr>
<td>Anti-hypertensives¹</td>
<td>1.00 (0.56, 1.79)</td>
</tr>
<tr>
<td>Diuretic¹</td>
<td>1.79 (0.90, 3.58)</td>
</tr>
<tr>
<td>Sedative¹</td>
<td>1.96 (0.79, 4.85)</td>
</tr>
<tr>
<td>Anti-depressant¹</td>
<td>2.09 (1.04, 4.20)</td>
</tr>
<tr>
<td>Number of drugs (0-4)</td>
<td>1.44 (1.04, 1.99)</td>
</tr>
</tbody>
</table>

*Adjusted for age and gender

¹Yes vs No /Don’t know
Table 4. Risk factors for falls – Functional ability+

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean HAQ (0-3)</td>
<td>1.34 (0.93, 1.93)</td>
</tr>
<tr>
<td>Walking¹</td>
<td>1.37 (1.02, 1.84)</td>
</tr>
<tr>
<td>Rising¹</td>
<td>1.41 (1.06, 1.89)</td>
</tr>
<tr>
<td>Dressing¹</td>
<td>1.16 (0.90, 1.51)</td>
</tr>
<tr>
<td>Hygiene¹</td>
<td>1.17 (0.89, 1.54)</td>
</tr>
<tr>
<td>Reaching¹</td>
<td>1.16 (0.87, 1.56)</td>
</tr>
<tr>
<td>Eating¹</td>
<td>1.16 (0.90, 1.50)</td>
</tr>
<tr>
<td>Gripping¹</td>
<td>1.09 (0.76, 1.55)</td>
</tr>
<tr>
<td>Activity¹</td>
<td>1.10 (0.85, 1.43)</td>
</tr>
</tbody>
</table>

¹From health assessment questionnaire  
*Adjusted for age and gender  
¹With difficulty or unable to do vs No difficulty

Discussion

In this study, one in three patients with RA aged 35 years and over reported falling during the previous year. Impaired walking and rising, and concurrent antidepressant therapy were associated with an increased risk of falls in this patient group.

There are several methodological issues which need to be considered in interpreting the results. Data concerning falls was based on self-report over the previous 12 month period and poor recall (forgetting falls) may have resulted in an underestimation of the true occurrence of falls. In a previous study of ambulatory men and women aged 60 years and over, 13% of subjects who reported a fall during weekly reporting did not report having experienced a fall at the end of a 12 month period [9]. Some caution is therefore required in interpreting the prevalence data. The effect of any misclassification due to poor recall would be, however, to tend to reduce the chance of finding significant biologic associations.

We studied RA patients attending a hospital outpatient department. Such cases are likely to be more severe than those managed in the primary care sector and our results should not be extrapolated outside this setting. Information about risk factors for falls including functional impairment was obtained by self-report using questionnaires and subject therefore to errors of recall. Objective measurements would have provided a more accurate indication of functional status. Finally, our study was cross-
sectional and it was not therefore possible to determine the temporal nature of any observed associations – it is possible, for example, that the occurrence of a fall may result in impaired walking and rising rather than the latter predisposing to falls. Prospective studies are required to confirm our findings and also to characterize the temporal nature of the observed associations.

As in most previous studies of non-RA subjects, falls were more common in women than in men [10-12]. In contrast, however, we found no important increase in the risk of falls with age in our sample [11,13,14]. The reason for this is unclear.

We did not include a control group of non-RA subjects and can not therefore comment directly on whether RA per se is linked with an increased risk of falls. In a previous population based survey, however, undertaken in the early 1990’s in the UK - using the same questionnaire as used here, the frequency of falls among women aged 50-79 years was 26% [15]. This compares with a frequency of 36% in our RA patient group at this age suggesting that those with RA may have an increased susceptibility to falling, however, caution is needed in interpreting the data because of methodological differences (design / setting) between the studies. There are few other comparative data, though in a cross-sectional study of 570 RA patients in California, mean age 64.9 years, the one year prevalence of falls (31%) was similar to our findings [16].

Previous studies have identified arthritis as a risk factor for falls in the majority, though not all studies [12, 17-19]. In most studies, however, the nature of the underlying arthritis was not specified. In a prospective study of elderly women, those with self-reported OA were more likely to fall than those without [20]. An increased risk of falling was also observed in those with hip pain [21]. In a prospective study of RA patients with evidence of functional limitation the risk of falls was increased by a factor of just over twofold compared to a group of controls without functional limitation [22]. Despite the relative lack of data concerning occurrence of falls in RA, there is evidence that falls are an important concern for patients, with up to 50% reporting fear of falling and just under 40% reporting modified activities due to fear of falls [16].

Our finding of an association between impaired walking and rising, and falls is consistent with impaired lower limb function as a risk factor for falls in RA. This is in keeping with studies in non-RA patients [10,23]. Similarly previous studies in non-RA subjects have suggested that various medications including antidepressants, sedatives and diuretics have been associated with an increased risk of falls with the risk increasing with increasing number of medications [17, 24-26]. Our results are consistent with these findings, though perhaps because of relatively small numbers some of the associations did not attain conventional levels of statistical significance.

Cross-sectional and prospective studies suggest that patients with RA have lower bone mass than non-RA controls and are therefore at increased risk of fracture [4-6]. Our data highlights the relatively high frequency of falls in RA. Measures to prevent fractures in this patient group should therefore focus not just on pharmacological therapy to prevent bone loss, but also measures to prevent falls.

In conclusion, falls in RA patients are common with one in three reporting a fall in the previous year. Measures to prevent falls in this group should be considered, particularly among those who are at increased risk of fracture.
**Acknowledgements**
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**Competing Interests**
None declared.

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