

Fear of falling and Foot Pain, Impairment and Disability in Rheumatoid Arthritis: A Case-Control Study

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Abstract

Background: Fear of falling, foot pain, impairment and disability are commonly reported in rheumatoid arthritis (RA). However, the relationship between fear of falling and foot pain, impairment and disability has not been investigated in established RA. The aim of the study was to evaluate the relationship between fear of falling and foot pain, walking velocity and foot impairment and disability in women with established RA. A secondary aim was to evaluate differences between fear of falling, foot pain, walking velocity, and foot impairment and disability in women with established RA and age and sex-matched control participants.

Methods: Twenty-one women with established RA and twenty-one age and sex-matched controls were assessed for fear of falling, foot pain, foot impairment and disability and walking velocity. Pearson r-correlations were used to examine relationships between fear of falling and the foot measures. Independent samples t-tests evaluated the differences in fear of falling and foot measures between the two groups.

Results: In people with RA significant correlations were found between fear of falling and foot impairment ($r = 0.53, p = 0.015$), foot disability ($r = 0.77, p < 0.001$) and walking velocity ($r = 0.56, p < 0.001$). No correlation was found between fear of falling and foot pain ($r = 0.36; p = 0.11$). Significant differences between cases and control participants were found between fear of falling ($p = 0.001$), foot impairment ($p = 0.004$) and foot disability ($p < 0.001$).

Conclusion: Foot impairment and disability relates to fear of falling in women with established RA. A better understanding of fear of falling in people with established RA may contribute to more efficient falls assessments in order to identify at risk individuals.

Keywords

Rheumatoid arthritis, fear of falling, foot pain, foot impairment, foot disability

Introduction

Worldwide, falls constitute a significant burden to healthcare resources in both older adults and people with rheumatoid arthritis (RA) [1]. Falls have a multifactorial aetiology that can be resultant from the interaction of behavioural, intrinsic and environmental risk factors [2]. The feet are a common site of pathology in RA [3]. When first diagnosed, 53% of people with RA may have foot involvement [4] with an increase to between 90% and 100% seen as the duration of the disease increases [5,6]. Foot pathology in RA often results in poor physical functioning due to both structural and functional impairments [7]. Although disease activity can decline in RA, many people still suffer from reduced participation in activities of daily living and disability [8]. RA-related impairments and reduced physical functioning can also lead to an increased fear of falling; subsequently reducing quality of life and activity participation and increasing disability [9].

The relationship between fear of falling and foot specific measures such as foot pain, disability and impairment has not been investigated, even though RA has a significant impact on foot pain [10], function, impairment and disability [11]. Fear of falling has been associated with an increased risk of falls in people with RA [12], with fear of falling incidence between 10% and 60% in this population [13,1,9,14]. Generalised pain intensity has been associated with fear of falling in people with RA [9]. Foot pain has a negative impact on physical function and is an independent predictor of impairment in people with RA [7]. Previous studies have reported a reduction in walking velocity in people with RA [7,15,16], with one study suggesting that walking velocity is a strong determinant of foot impairment and disability [7]. Pain intensity and reduced physical function, evidenced by decreased walking velocity, have been reported to be predictors for fear of falling in RA [17]. The aim of the study was to evaluate the relationship between fear of falling and foot pain, walking velocity and foot impairment and disability in women with established RA. A secondary aim was to evaluate differences between fear of falling, foot pain, walking velocity, and foot impairment and disability in women with established RA and age and sex-matched control participants.

Materials and Methods

Twenty-one female participants aged over 18 years old with a history of RA, according to the 2010 ACR/EULAR classification criteria [18], were recruited from a podiatric rheumatology outpatient clinic in Auckland, New Zealand. Twenty-one female age-matched participants with no history of RA, were recruited from a podiatry clinic as the control group. Participants were excluded from the study if they had a history of neuromuscular or cognitive disorders, were diagnosed with diabetes mellitus or were unable to walk more than 10 metres unaided. The Auckland University of Technology Ethics Committee approved the study and participants provided informed written consent.

Participant characteristics were recorded including age, gender, ethnicity and body mass index (BMI). Clinical characteristics included disease duration, C-reactive protein level and presence of rheumatoid factor and anti-CCP antibodies from most recent blood tests, current medications and co-morbid conditions. A 100mm visual analogue scale (VAS) was used to measure foot pain in the past week. Patient-reported foot disability and impairment were measured using the Leeds Foot Impact Scale (LFIS), a validated measure of the impact of foot disease in RA [19]. Foot disability was represented by the total score (LFIS_T; range 0 to 51) of the LFIS and foot impairment by the first subscale (LFIS_{IF}; range 0 to 21) [19]. Scores of ≤ 6 were considered mild, from 7–13 were considered moderate, and ≥ 14 were considered severe for the FIS_{IF} [3].

Walking velocity was measured using the GAITRite® Electronic walkway (CIR Systems Inc., New Jersey, US), a low profile walkway consisting of 18,432 sensors embedded in a 61cm wide and 488cm long mat. In their own shoes, participants were instructed to walk at their self-selected walking speed. Three walking trials were conducted. To reduce fatigue, participants rested for 1 minute between each walking trial. The GAITRite® has been shown to have excellent intra-session reliability for the measurement of walking velocity in participants with established RA [20].

Fear of falling was assessed using the Falls Efficacy Scale-International (FES-I) [21]. The FES-I measures participants' level of concern pertaining to falling during physical and social activities, both inside and outside the home, regardless of whether the participant can perform the activity [21]. The FES-I consists of 16 different activities, scored using a four point scale (1 = not at all concerned, 2 = somewhat concerned, 3 = fairly concerned and 4 = very concerned). The summed scores for the 16

activities for each participant were calculated. Scores of ≥ 23 indicated a high concern of falling [21]. The FES-I has demonstrated excellent internal and test-retest reliability, and excellent convergent and predictive validity within the community dwelling adult population [21,22].

Statistical analysis

The sample size was calculated to 20 participants per group by power analysis relating to differences in estimates by a previous study on postural stability in people with RA [23]. This presupposes mean (SD) walking velocity of 1.0 (0.18) m/s for the RA group and the mean (SD) of 1.3 (0.14) m/s for the control group. Power was set to 90% and significance level of 5%. Descriptive statistics for clinical and demographic characteristics were obtained. All variables were tested for normality by the Kolmogorov-Smirnov statistic. To evaluate the relationship between fear of falling and foot pain, impairment and disability, Pearson's r-correlation tests were conducted. To evaluate for significant differences between fear of falling, foot pain, impairment, disability and walking velocity, independent samples t-tests with 95%CI were calculated. A Bonferroni correction was utilised and the *p*-value was set at 0.008. All data was analysed using Statistical Package for the Social Sciences (SPSS) version 21 (IBM, New York, US).

Results

The demographic and clinical characteristics of the cases and controls are presented in Table 1. Participants were middle-aged females with no significant difference in BMI ($p = 0.63$). People with RA had a mean (SD) disease duration of 18 (12.5) years, the majority having rheumatoid factor positive RA ($n=18$, 86%) and taking methotrexate ($n =16$, 76%).

Investigating the relationship between fear of falling and foot measures, the results demonstrated positive correlations between fear of falling and foot impairment ($r= 0.53$; $p = 0.015$) and disability ($r = 0.74$; $p <0.001$) in people with RA. A negative correlation was demonstrated between fear of falling and walking velocity ($r = -0.56$; $p <0.001$). No significant correlation between fear of falling and foot pain ($r = 0.36$; $p = 0.11$) was found.

Evaluating the differences between cases and controls, people with RA had greater fear of falling ($p = 0.001$), foot impairment ($p = 0.004$) and disability ($p < 0.001$) (Table 2). No significant differences between foot pain ($p = 0.052$) and walking velocity ($p = 0.118$) were found between the two groups.

Discussion

Our findings suggest a link between fear of falling and foot-related disability and impairment in people with RA. The findings of a significant correlation between fear of falling and disability are similar to previous studies [24,16,9]. Furuya et al. [24] found that increasing disability (measured by the Japanese version of the HAQ) was associated with fear of falling. The current results also concur with a previous study between walking velocity and fear of falling in people with RA [17]. Jamison et al. [17] found that walking velocity was decreased in adults with RA who reported fear of falling. Fear of falling, and self-imposed activity limitation, can result from falls [17] and has also been associated with increased risk of future falls in adults with RA [12]. We found no correlation found between fear of falling and foot pain. Foot pain is the most common problem facing people with RA both generally and specifically related to their feet [25]. However, all participants in the study were part of an ongoing foot care programme where they received regular general podiatric care that included the reduction of foot pain with the use of non-surgical interventions that included foot orthoses and footwear advice.

We found that women with established RA appear to demonstrate a higher propensity in fear of falling compared with age-matched controls. Previous studies have reported similar findings [9,14,17,16]. The women with an increased fear of falling demonstrated greater foot impairment, disability and more co-morbid conditions. The differences in foot-related impairment and disability between cases and controls may have been attributed to factors that include lower limb muscle weakness [26], joint stiffness [25] or postural instability [23]. However, foot pain was not significantly different between the cases and controls. Both groups were women with a moderate level of foot pain. The control participants were all recruited from a podiatry clinic where they may have been seeking treatment for symptomatic foot problems, which may have resulted in the similar levels of foot pain observed in the two groups.

The current findings should be considered in light of some limitations. The study was a case-control study that limits the ability to determine causality. Only women based in Auckland, New Zealand were

recruited into the study, therefore the results cannot be generalizable to the wider RA population. To provide an insight into the causative aspect of the relationship between foot impairment, disability and fear of falling, a prospective observational study is required to include other intrinsic and extrinsic risk factors such as current footwear (indoor and outdoor), current medications and other foot-specific variables such as lower limb muscle strength. In the present study, walking velocity was used as an objective measure of foot-related impairment. A previous study reported that walking velocity is a predictor for fear of falling [17], which itself is a risk factor for falls [12]. Therefore walking velocity could be measured in clinical practice as part of a falls risk assessment programme. The results of this study have demonstrated the importance of the relationship between fear of falling and foot impairment and disability. Future research may increase the awareness around fear of falling and foot related impairment and disability which could be used to further develop falls risk assessments in a clinical setting. Appropriate footwear in preventing falls in people with RA should be considered for future studies. Footwear has a role to play in postural stability by facilitating somatosensory feedback to the foot by the proprioceptive system that detects and processes tactile stimulation/information [27].

Conflict of interest

The authors declare that they have no competing interests

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