Falls and Fear of Falling After Stroke: A Case-Control Study

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Abstract

Background: Falls are common after stroke, with potentially serious consequences. Few investigations have included age-matched control participants to directly compare fall characteristics between older adults with and without stroke. Further, fear of falling, a significant psychological consequence of falls, has only been examined to a limited degree as a risk factor for future falls in a stroke population.

Objective: To compare the fall history between older adults with and without a previous stroke and to identify the determinants of falls and fear of falling in older stroke survivors.

Design: Case-control observational study.

Setting: Primary teaching hospital.

Participants: Seventy-five patients with stroke (mean age ± standard deviation, 66 ± 7 years) and 50 age-matched control participants with no previous stroke were tested.

Methods: Fall history, fear of falling, and physical, cognitive, and psychological function were assessed. A $\chi^2$ test was performed to compare characteristics between groups, and logistic regression was performed to determine the risk factors for falls and fear of falling.

Main Outcome Measures: Fall events in the past 12 months, Fall Efficacy Scale–International, Berg Balance Scale, Functional Ambulation Category, Fatigue Severity Scale, Montreal Cognitive Assessment, and Patient Healthy Questionnaire–9 were measured for all participants. Fugl-Meyer Motor Assessment was used to quantify severity of stroke motor impairments.

Results: Twenty-three patients and 13 control participants reported at least one fall in the past 12 months ($P = .58$). Nine participants with stroke had recurrent falls ($\geq 2$ falls) compared with none of the control participants ($P < .01$). Participants with stroke reported greater concern for falling than did nonstroke control participants ($P < .01$). Female gender was associated with falls in the nonstroke group, whereas falls in the stroke group were not significantly associated with any measured outcomes. Fear of falling in the stroke group was associated with functional ambulation level and balance. Functional ambulation level alone explained 22% of variance in fear of falling in the stroke group.

Conclusions: Compared with persons without a stroke, patients with stroke were significantly more likely to experience recurrent falls and fear of falling. Falls in patients with stroke were not explained by any of the outcome measures used, whereas fear of falling was predicted by functional ambulation level. This study has identified potentially modifiable risk factors with which to devise future prevention strategies for falls in patients with stroke.

Introduction

The incidence of stroke has increased worldwide partly because of aging populations. Falling is one of the most common complications after stroke, with a reported prevalence of 14% to 73% [1]. Identifying risk factors associated with falls in persons with stroke has therefore become an important topic in stroke rehabilitation. Previous studies have found that patients who had a history of falling during hospitalization were more likely to fall after discharge [2,3]. Attributes of physical function, such as balance [2–4] and lower extremity strength [5], have also been shown to predict falls among stroke survivors. Other factors, such as taking more medications [2], impaired cognition [6], and depression [5], have also been identified as potential risk factors. However, these risk factors are also related to falls in the general older population [7–9]. Few
studies have included age-matched control participants to directly compare fall characteristics between older adults with and without stroke [10,11].

The consequences of falling, which include hip fractures, soft tissue injuries, hospitalization, disability, immobility, and fear of falling, are potentially devastating [12–14]. The relationship between fear of falling and falls appears controversial. Previous studies have demonstrated that patients with a history of falling often reported greater concern for falling [5,15,16]. However, Friedman et al [17] showed that fall status at the acute phase did not predict development of fear of falling measured at 20 months [17]. In contrast, it was the fear of falling that developed immediately after the stroke occurred that predicted falls at follow-up [17,18]. It has been hypothesized that fear of falling disrupts the vicious cycle between fear of falling and falls appearances controversial. Previous studies have demonstrated that patients with a history of falling often reported greater concern for falling [5,15,16]. However, Friedman et al [17] showed that fall status at the acute phase did not predict development of fear of falling measured at 20 months [17]. In contrast, it was the fear of falling that developed immediately after the stroke occurred that predicted falls at follow-up [17,18]. It has been hypothesized that fear of falling limits patients’ mobility, which in turn leads to further deterioration in physical function (balance, strength, and endurance) and leads to falling [19,20]. In addition to its effects on falls, fear of falling is also associated with anxiety [20], poor community reintegration [21], and poor quality of life [22]. Hence, understanding the development of fear of falling after stroke is critical to disrupt the vicious cycle between fear of falling and falls in stroke survivors. Compared with falls, fear of falling after stroke has received relatively less attention.

In the present study, fall history between older adults (>60 years) [23] with and without stroke was compared to identify the risk factors that specifically contribute to stroke-related falls. The purposes of this study were to compare the fall history between older adults with and without a previous stroke and to identify the determinants of falls and fear of falling in older stroke survivors.

Methods

Participants

Seventy-five patients with a previous stroke were recruited from outpatients and local support groups using a convenience sampling technique. Potential participants underwent a telephone or in-person screening to determine their eligibility. Participants were included if they fulfilled the following criteria: aged 60 years or older, had stroke onset more than 3 months ago, were able to follow 3-step commands, lived at home or at an assisted living facility, and were able to provide informed consent. They were excluded if they had other neurologic diagnoses or were medically unstable, as determined during the screening interview. Participants were deemed medically unstable if they were acutely unwell and were receiving inpatient treatment or had seen a doctor in the previous 2 weeks for a new medical complaint or had uncontrolled hypertension. Fifty age-matched control participants who had not had a stroke were recruited from the local community through word-of-mouth advertising. The inclusion criteria for nonstroke control participants were: aged 60 years or older and physically able to complete the testing procedure. They were excluded if they had been diagnosed with any neurologic diseases (eg, Parkinson disease, multiple sclerosis, or stroke), or were unable to provide consent. All participants signed a written consent prior to participation in the study. The study was approved by the local institutional review board.

Procedure and Outcome Measures

This study was a cross-sectional observational study. Each participant was assessed with standardized questionnaires and tests by trained researchers with the exception that the nonstroke participants were not assessed with the Fugl-Meyer Assessment. The testing was performed over 2 or 3 visits within a 1-month period to avoid fatigue associated with lengthy testing. Frequent breaks were provided during testing as well to ensure that participants were given sufficient rest between tests and performed at their highest possible levels. Breaks were given upon the participant’s request or when the tester deemed it was necessary (eg, upon signs of fatigue or decreased attention). Testing was resumed when the participants believed they had had sufficient rest. Each visit lasted 60 to 90 minutes.

Demographic characteristics and medical history including age, height, weight, living environment, socioeconomic status, comorbidities, and stroke history were obtained during the first visit. Comorbidities were self-reported by the participants and were recorded using the Charlson Comorbidity Index [24]. The index was developed in 1987 and consists of 19 categories of comorbidities of patients based on the International Classification of Disease diagnosis code. Each category has an associated weight, and the sum of all the weights yields a single comorbidity score. A score of zero indicates no comorbidities, and the higher scores are associated with greater likelihood of mortality or higher resource use [24].

Fall history was obtained using retrospective recall, which included the presence of falls and the total number of falls experienced in the past 12 months. For participants who had reported falls, a detailed fall history including location, use of mobility devices, and injury associated with falls was obtained. We defined falls as “an episode of unintentionally coming to rest on the ground or lower surface” [17]. The 16-item Fall Efficacy Scale—International (FES-I) [25] was used to assess fear of falling. Participants rated their concern for falling on 16 common activities on a Likert scale ranging from 1 point (not at all concerned) to 4 points (very concerned). The total score (sum of the 16 responses) ranging from 16 to 64 points was used for data analysis. A higher total score indicates a greater...
concern for falling. The FES-I has been tested in persons with stroke [16]. A cut-off score of 27 points on the 16-item FES-I was used to differentiate high concern for falling from low concern [26].

The Montreal Cognitive Assessment (MoCA) that has been validated in various populations, including stroke survivors, was used to identify cognitive impairments [27]. The MoCA consists of 16 items in 11 categories with a maximal score of 30 points [28]. A MoCa score that is greater than 26 points indicates normal cognitive function [28]. The Patient Health Questionnaire (PHQ-9) was used to assess the presence and severity of depressive symptoms. The PHQ-9 is a self-reported 9-item questionnaire rated on the frequency of occurrence of depressive symptoms in the prior 2 weeks [29]. The PHQ-9 questionnaire has been tested in geriatric and stroke populations [29,30]. A cut-off score of 10 points has been established to detect depression after stroke [30].

Balance was assessed using the Berg Balance Scale (BBS). The BBS is a widely used scale to assess balance and fall risk. It consists of 14 items, and each item is rated on a 4-point scale, with the higher score indicating better balance. The 14 item scores are summed to yield a total score (maximum = 56 points) [31]. The reliability and validity of the BBS has been tested in elderly persons [31,32] and in persons who have had a stroke [33–35]. A cut-off score of less than 45 points on the BBS is associated with a greater risk of falls [31].

Participants’ functional ambulation levels were evaluated using the Functional Ambulation Category (FAC), which has been validated in persons who have had a stroke [36]. The FAC describes the individual’s walking ability, which ranges from independent outdoor walking to nonfunctional walking (ie, unable to ambulate or ambulates only in parallel bars). The scale is rated from 1 to 5 points, with the higher scores indicating better walking ability. A cut-off score of 4 points in the FAC was found to be sensitive in predicting community ambulation [36].

Poststroke fatigue is common yet often overlooked [37]. We measured fatigue with the Fatigue Severity Scale (FSS), a self-report 9-item questionnaire with questions about the impact of fatigue on daily life and its severity [38]. The FSS has been used widely in populations with neurologic disorders [38,39]. Each question is rated on a 1 to 7 scale (1 = strongly disagree, 7 = strongly agree). The minimal score of the FSS questionnaire is 9 points, and the maximum is 63 points; a higher score on the FSS suggests a greater fatigue severity. A cut-off score of 36 points has been recommended to indicate pathologic fatigue [38]. Poststroke fatigue has been shown to be associated with poor quality of life, reduced self-efficacy, and poor rehabilitation outcome [37]. Its association with falls and fear of falling after stroke is unknown.

All participants (those who did and did not have a stroke) were assessed with the aforementioned tests, and the participants who had a stroke were also assessed with the Fugl-Meyer Assessment (FM) to determine their motor impairment severity [40]. The FM is one of the most widely used quantitative measures of motor impairment in stroke research, [41] and its psychometric properties have been tested and found to be robust among stroke survivors [42,43]. The motor function domain of the FM yields a maximum score of 100 points (upper limb function maximum = 66 points; lower limb function maximum = 34 points). A higher score in the FM motor function indicates less motor impairment. The motor score of the FM can be used to determine stroke severity using the following established categories: severe (0-35 points), moderate severe (36-55 points), moderate (56-79 points), and mild (>80 points) [44].

Statistical Analysis

The χ² test or Mann-Whitney U test was used to compare fall history, fear of falling, and demographic data between the stroke and nonstroke groups. The participants with stroke were further categorized using the cut-off score of each outcome (FAC ≤4, BBS ≤45, FSS >36, MoCa <26, PHQ-9 >10, FES-I >27, and FM <80). The nonstroke participants were categorized using the same cut-off scores except for the FM, with which they were not assessed. To compare these outcomes between persons who did and did not fall, and between persons with high and low concern for falling, the χ² test was used.

Logistic regression was conducted to determine the significant predictors for falls and fear of falling. A univariate regression analysis was first performed to determine the independent effect of each predictor on the dependent variables (fall and fear of falling). The predictors with a P value less than .15 were then used for multivariate regression to examine the combined effect of the predictors.

Results

Table 1 summarizes the demographic characteristics of the participants. A total of 125 individuals participated in this study, 50 of whom were nonstroke participants. Most of the demographic characteristics were similar for the 2 groups, except for gender and Charlson Comorbidity Index (Table 1). The difference in Charlson Comorbidity Index was largely driven by the fact that participants with stroke had a diagnosis of cerebrovascular disease or hemiplegia. A diagnosis of hemiplegia increases the index score by 4 points for participant ages between 60 to 69 years. This variable was therefore not included in the subsequent analyses because groups were divided based on the diagnosis of stroke.

The average number of months after stroke onset in the stroke group was 39, and this group had an average FM motor score of 66 points (moderate severity). The
side of stroke was equally distributed; 38 patients had left lesion involvement, whereas the other 37 patients had a right hemisphere lesion. Most of the patients had an ischemic stroke (N = 49), and 7 sustained a hemorrhagic stroke. We could not determine the type of stroke for 18 patients because their radiologic reports were not available.

Thirteen of the 50 nonstroke participants experienced a fall during the past 12 months, whereas 23 of 75 participants who had a stroke fell. The incidence was comparable between groups (26% versus 31%, \(P = .58\); Table 2). Nine of 75 stroke participants reported repeated falls (≥2 falls in 12 months), whereas none of the nonstroke participants had more than one fall (\(P = .01\)). Stroke participants were more likely to report indoor falls, whereas nonstroke participants tended to report more outdoor falls. However, this difference did not reach statistical significance. Other elements of the fall history did not differ between groups. Even though the fall incidence was similar between the 2 groups, stroke participants reported greater concern for falling compared with the nonstroke participants (\(P < .01\)). The number of participants with an FES-I score >27 points was greater in the stroke group than in the nonstroke group (\(P < .01\)).

Table 3 demonstrates within-group comparisons for the outcome measures between persons who did and did not fall for the stroke and nonstroke groups and between-group comparisons for persons who fell within the stroke and nonstroke groups. All nonstroke participants scored more than 5 points on the FAC and 45 points on the BBS and fewer than 10 points on the PHQ-9. Thus these outcomes were not compared for the nonstroke group because none was categorized based on these cut-off scores. Among the nonstroke participants, those who fell were significantly more likely to be women (\(P < .01\)). Persons in the stroke group who did not fall tended to have more severe motor impairment (\(P = .08\)) and poorer ambulation capability (\(P = .15\)) than did persons who fell, but these values were not statistically significant. We further compared these outcomes between persons with and without stroke who fell (\(N = 23\) versus 13, Table 3 between-group comparison). Because the nonstroke group consisted of more women than the stroke group, this variable was treated as a confounder in the between-group comparison. Persons without a stroke who fell were significantly more likely to be female than were persons with a stroke who fell (\(P < .01\)). After adjustment for the gender differences, there was no significant difference in age, fatigue, fear of falling, or cognitive status between persons with and without a stroke who fell.

Ninety-one participants reported high concern for falling (FES-I >27). Stroke participants were significantly more likely to report high concern for falling compared with nonstroke participants (\(P < .01\); Table 2). Stroke participants with high concern for falling had lower functional ambulation level (\(P < .01\)) and poorer balance (\(P = .01\); Table 4). A history of falls in the past 12 months was not associated with high concern for falling in both stroke and nonstroke participants. When we compared the participants with a high concern for falling between stroke and nonstroke groups, we found that fatigue was an important factor that distinguished stroke participants from nonstroke participants (\(P = .01\)), even after taking into account the gender difference between the groups (Table 4 between-group comparison).

To determine the predictors of falls in the stroke group, FM and FAC were entered into the forward logistic regression model because the univariate analysis on these outcomes yielded a \(P\) value less than .15 (Table 3). None of these outcomes survived the logistic regression, suggesting that they were not significant.
Table 3
Within- and between-group comparisons for risk factors for fear of falling and differences in characteristics of persons who fell among stroke versus nonstroke participants

<table>
<thead>
<tr>
<th>Within-Group Comparison</th>
<th>Stroke (N = 75)</th>
<th>Nonstroke (N = 50)</th>
<th>Between-Group Comparison</th>
<th>Stroke and Nonstroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>Faller (N = 23), (N = 52), N (%)</td>
<td>Non-Faller (N = 13), (N = 37), N (%)</td>
<td>Faller (N = 29), (N = 51), N (%)</td>
<td>Non-Faller (N = 21), (N = 49), N (%)</td>
</tr>
<tr>
<td>Age &gt; 70 y</td>
<td>10 (44) 18 (35), .46</td>
<td>6 (46) 15 (41), .72</td>
<td>10 (43) 6 (46), .88</td>
<td>23 (4.07-4.37)</td>
</tr>
<tr>
<td>Gender = F</td>
<td>7 (30) 19 (37), .61</td>
<td>12 (92) 15 (41), &lt;.01</td>
<td>7 (30) 12 (92), &lt;.01</td>
<td>0.04 (0.00-0.34)</td>
</tr>
<tr>
<td>FSS &gt; 13</td>
<td>8 (35) 21 (40), .65</td>
<td>2 (15) 3 (8), .45</td>
<td>8 (35) 2 (15), .17</td>
<td>4.02 (0.54-32.60)</td>
</tr>
<tr>
<td>FES-I &gt; 27</td>
<td>19 (83) 43 (83), .99</td>
<td>8 (62) 21 (57), .76</td>
<td>19 (83) 8 (62), .33</td>
<td>2.66 (0.37-19.04)</td>
</tr>
<tr>
<td>MoCA &lt; 26</td>
<td>13 (57) 27 (56), .98</td>
<td>7 (54) 15 (41), .41</td>
<td>13 (57) 7 (54), .93</td>
<td>0.93 (0.17-5.10)</td>
</tr>
<tr>
<td>PHQ-9 &gt; 10</td>
<td>3 (13) 9 (18), .62</td>
<td>0 (0) 0 (0), .55</td>
<td>3 (13) 0 (0), 2.66</td>
<td>2.66 (0.37-19.04)</td>
</tr>
<tr>
<td>DM &lt; 80</td>
<td>8 (35) 29 (57), .88</td>
<td>0.41 (0.15-1.12)</td>
<td>8 (35) 0 (0), .55</td>
<td>2.66 (0.37-19.04)</td>
</tr>
<tr>
<td>FAC ≤ 4</td>
<td>10 (44) 32 (62), .15</td>
<td>0 (0) 0 (0), .55</td>
<td>10 (44) 0 (0), .55</td>
<td>2.66 (0.37-19.04)</td>
</tr>
<tr>
<td>BBS ≤ 45</td>
<td>11 (48) 30 (59), .38</td>
<td>0.64 (0.34-1.73)</td>
<td>11 (48) 0 (0), .55</td>
<td>2.66 (0.37-19.04)</td>
</tr>
</tbody>
</table>

Boldface P values indicate a significant difference between comparisons.

CI = confidence interval; F = female; FSS = Fatigue Severity Scale; FES-I = Fall Efficacy Scale—International; MoCA = Montreal Cognitive Assessment; PHQ-9 = Patient Health Questionnaire—9; FM = Fugl-Meyer; FAC = Functional Ambulation Category; BBS = Berg Balance Scale.

* Adjusted for gender.

Table 4
Within- and between-group comparisons for risk factors for fear of falling and differences in characteristics of persons with fear of falling in stroke versus nonstroke participants

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<th>Within-Group Comparison</th>
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<td>Non-Faller (N = 21), (N = 49), N (%)</td>
</tr>
<tr>
<td>Age &gt; 70 y</td>
<td>23 (37) 5 (39), .93</td>
<td>14 (48) 7 (33), .29</td>
<td>23 (37) 14 (48), .41</td>
<td>0.68 (0.27-1.71)</td>
</tr>
<tr>
<td>Gender = F</td>
<td>20 (32) 6 (46), .34</td>
<td>17 (59) 10 (48), .44</td>
<td>20 (32) 17 (59), .02</td>
<td>2.98 (1.20-7.40)</td>
</tr>
<tr>
<td>Fall = yes</td>
<td>19 (31) 4 (31), .99</td>
<td>8 (28) 5 (24), .76</td>
<td>19 (31) 8 (28), .58</td>
<td>1.33 (0.48-3.68)</td>
</tr>
<tr>
<td>FSS &gt; 23</td>
<td>24 (39) 5 (39), .99</td>
<td>3 (10) 2 (10), .92</td>
<td>24 (39) 3 (10), .01</td>
<td>5.30 (1.14-19.88)</td>
</tr>
<tr>
<td>MoCA &lt; 26</td>
<td>34 (58) 6 (50), .63</td>
<td>15 (52) 7 (33), .20</td>
<td>34 (58) 15 (52), .52</td>
<td>1.36 (0.54-3.44)</td>
</tr>
<tr>
<td>PHQ-9 &gt; 10</td>
<td>10 (16) 2 (15), .93</td>
<td>0 (0) 0 (0), .55</td>
<td>10 (16) 2 (15), .93</td>
<td>0.68 (0.27-1.71)</td>
</tr>
<tr>
<td>DM &lt; 80</td>
<td>31 (50) 6 (46), .76</td>
<td>1.21 (0.36-4.00)</td>
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</tr>
<tr>
<td>FAC ≤ 4</td>
<td>40 (65) 2 (15), &lt;.01</td>
<td>0 (0) 0 (0), .55</td>
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<td>BBS ≤ 45</td>
<td>38 (62) 3 (23), .01</td>
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FES = Fall Efficacy Scale; CI = confidence interval; F = female; FSS = Fatigue Severity Scale; MoCA = Montreal Cognitive Assessment; PHQ-9 = Patient Health Questionnaire; FM = Fugl-Meyer; FAC = Functional Ambulation Category; BBS = Berg Balance Scale.

* Adjusted for gender.
predictors for falls in persons who had sustained a stroke. Similarly, FAC and BBS were entered into the forward logistic regression model to determine their effects on fear of falling in the stroke group. Logistic regression analysis revealed that walking ability alone accounted for 22% of the variance in fear of falling in persons who had sustained a stroke, with the adjusted odds ratio of 9.75 (Table 5; 95% confidence interval = 1.98-48.04, P = .01).

Discussion

The purpose of this study was to compare the fall history in participants with and without a previous stroke and to determine factors associated with falls and fear of falling for stroke participants. This study was unique in the inclusion of age-matched nonstroke control participants and has highlighted several important findings. The results showed that stroke participants had a similar fall occurrence as the nonstroke participants but were more likely to report recurrent falls and a greater fall rate. Despite similarities in the occurrence of falls, the stroke participants had a greater concern for falling compared with the nonstroke participants. Their fear of falling was not explained by a history of falling but rather by reduced functional ambulation level.

In contrast to other studies [2,5,19], the fall occurrence in persons who had a stroke reported in this study was lower (31%) and not different from that of the control participants. However, Jalayondeja et al [18] and Kim [45] reported a similar fall incidence in their settings. These studies and the present study were conducted among Asians, and the cultural differences in activities and living environment may contribute to the discrepancy between Western and Asian countries. Consistent with previous studies [3,5], older adults with stroke were found to have a higher fall rate than non-stroke control participants. Persons with recurrent falls are considered particularly vulnerable and require immediate preventive measures [1]. This finding supports the need for fall prevention, such as a multifactorial fall prevention program [46], in this vulnerable group.

Despite a similar occurrence of falls, participants who had sustained a stroke were more likely to report high concern for falling compared with nonstroke participants. Fear of falling was not predicted by history of falling but by functional mobility. Persons with poor ambulation capability and balance were more likely to have a high concern of falling. Functional mobility alone explained 22% of variance in fear of falling among participants with a stroke. Previous studies have also found that patients who demonstrated low fall self-efficacy without a history of fall often had impaired functional mobility and balance [18,20]. Together, these findings suggested that patients who have had a stroke may have cognitively internalized their physical impairments into psychological limitations. Fear of falling has been found to lead to avoidance behaviors and reduced community reintegration in patients who have had a stroke [21]. These findings implicate the importance of addressing fear of falling in patients who have had a stroke, even in persons without a history of a fall. Interventions to improve functional ambulation and balance may play a critical role in both fall prevention and fall self-efficacy. In addition to physical therapy intervention, cognitive-behavioral therapy that focuses on cognitive restructuring has been found to be effective in reducing fear of falling in community-dwelling older adults [47]. Future studies are recommended to explore the efficacy of a multidisciplinary approach in addressing fear of falling after a stroke.

None of the parameters obtained in this study significantly predicted falls in stroke participants, which may partly be due to the small sample size and low fall incidence among stroke participants. In contrast to previous studies [18,20], this study showed a counter-intuitive trend that stroke participants with more severe motor impairment (FM <80 points) were less likely to fall in the past 12 months. One possible explanation for this nonsignificant trend is that patients with more severe motor impairments were less mobile and often required human assistance in their daily activities such that exposure to the risk of falls is reduced by lack of mobilization and the presence of increased supervision. This finding is consistent with that of a previous report that also showed that the risk of falling was lower in persons with more involved strokes who had multiple impairments [48].

In this study, the presence of retrospective recall of at least one fall in the preceding 12 months was not associated with fear of falling in our stroke group. In 2015, Schmid et al [20] reported a similar finding in which stroke patients with fear of falling had a similar fall history as those without fear of falling. A recent study found that balance confidence was the best predictor of falling in older adults that was measured at 1-year follow-up [49]. Because ours was a cross-sectional study, the temporal relationship between fear of falling and falls could not be determined in our study population. However, it is plausible based on the findings of our study and the previous study that having a fall or falls did not lead to fear of falling in stroke patients, but having a fear of falling then increases the risk of falling in the coming year. The relationship between fear of falling and subsequent falls could be explained through modification of fear avoidance behavior [21].
In other words, low functional ambulation level or decreased balance may have a negative impact on patients’ self-efficacy, which may lead to avoidance behaviors [21] and limited activity participation [20] and subsequently increase fall risk. In 2016, Landers et al [49] found that fear avoidance behavior was the only remaining variable that predicted fall risk after removing balance confidence. The authors rationalized that avoidance behavior is a separate construct but is related to fear of falling and provides unique predictive values to falls. In the present study, the effect of fear of falling on physical activity or avoidance behavior was not explored, which might have obscured the relationship between fear of falling and falls. Future investigations should consider the inclusion of fear avoidance behavior as an outcome because it may be the intermediate modulator for fear of falling and falls.

Study Limitations

The present study was limited by its small sample size and cross-sectional design. The study included only persons aged 60 years or older who had a stroke a minimum of 3 months earlier, and thus the findings may not be applicable for younger persons who sustained a stroke and for those who are in the acute stages after a stroke. The relatively small sample size also may underestimate the contribution of other potential risk factors. A longitudinal design would have permitted a more accurate assessment of fall outcome after stroke using diary exercises, because the accuracy of retrospective fall recall has previously been challenged [50]. Furthermore, a prospective design would also help assign temporal relationships and causative effects of risk factors. In addition, the nonstroke cohort recruited in this study was relatively young and healthy as evidenced by the fact that none of them experienced ambulation (FAC >4 points) or balance (BBS >45 points) difficulty. This factor might have biased our findings and limited the generalizability of the results. Nonetheless, this study has identified new information on poststroke falls and on fear and falling. A larger prospective study should now be conducted to evaluate these findings further.

Conclusion

Compared with the persons who did not have a stroke, patients who had sustained a stroke were significantly more likely to experience recurrent falls and fear of falling. Fear of falling that developed after the stroke occurred was explained by functional ambulation. Our study highlights the need to assess fear of falling in persons who have had a stroke and identifies the risk factor associated with fear of falling. On the basis of these findings, strategies can be developed to address fear of falling by remedying the potentially modifiable risk factors identified in this study.

References


Disclosure

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