Analysis of Risk Factors for Falls in the Elderly with Dementia

NAOHKO KANEMURA¹, RYUJI KOBAYASHI¹, KAE INAFUKU², MASATAKA HOSODA¹, AKIRA MINEMATSU¹, HISATO SASAKI¹, SACHIKO TANAKA¹, KUNJI SHIRAHAMA¹, TAKEHITO UEDA¹, CHIE KAMODA¹, HIDETAKA MIYAMOTO³, HIROSHI MAEJIMA³, OSAMU YOSHIMURA³

¹Graduate School of Medical Sciences, Health Sciences Major, Hiroshima University School of Medicine: 1–2–3 Kasumi, Minami-ku, Hiroshima City 734-8551, Japan. TEL +81-82-257-5433
²Amano Hospital
³Institute of Health Sciences, Hiroshima University School of Medicine

Abstract. We conducted a prospective study on the actual state of fall occurrence and the related fall factors of some dementia patients admitted to a certain geriatric hospital. Information on falls was obtained from the fall assessment recorded by staff. The number of these subjects totaled 110 (20 males and 90 females). The period of this study was 6 months. Their fall rate during that period was as high as 56%. The frequently occurring places and peak time of fall coincided with the places and times slots in which their activity was enhanced. Most of the injuries suffered due to falls were minor ones, and there were no bone fractures stemming from falls. As for the factors related to a fall, sex, age, complication, MMS score and administered internal medicine was no significant between fallers and nonfallers. Of the subjects affected with cerebrovascular diseases during or before this study period, those with vascular dementia showed the most remarkable trend to fall. It was thought that the results will be useful when applied to the carried out care of elderly persons with dementia.

Key words: Fall, Dementia, Prospective study

(INTRODUCTION

The fall frequency increases as the physical function of elderly persons weakens. In some cases, such falls can lead to injuries such as bone fractures, and, as a result, the “activities of daily living” (ADL) declines. Once a fall is experienced, a fear over possible further falls, or predictable pain/bone fracture, can deactivate victims’ daily life even if the injury caused by the fall is a minor one. This phenomenon sometimes results in giving rise to the post-fall syndrome¹. Dementia is an exemplified risk factor involved in the fall. Such symptoms as disorientation and dromomania are considered to constitute the cause of injurious falls², ³. The number of patients affected with dementia increases with aging⁴. According to Aevarsson⁵, the annual dementia attack rate among the elderly persons over the age of 80 is 9.1% (male: 6.1%, female: 10.3%). With the ratio of the aged in our society becoming higher, the number of falls triggered by dementia is anticipated to become larger, with a consequent increase fallers’ medical expenses.

Though research into fall factors has so far been intensively conducted on elderly persons selected as subjects of study in different regions and home institutions, most of the data consequently obtained particularly on the aged suffering dementia were...

retrospective. Thus, this time, the authors’ research team conducted a prospective study on the actual state of fall occurrence and related fall factors of some dementia patients admitted to a certain geriatric hospital.

**METHOD**

1. **Subjects**
   As the subjects of study, 110 senile dementia patients (20 males and 90 females) were selected from a geriatric hospital. Their age bracket was 81 ± 6.8 years. They were observed and examined for 6 months from April 1 to September 30, 1998. They consisted of 3 kinds of groups; 38 subjects (8 males and 30 females) affected with Alzheimer Dementia (AD), 40 subjects (11 males and 29 males) with Vascular Dementia (VD), and 32 subjects (1 male and 31 females) with Mixed Alzheimer/ Vascular Dementia (MIX).

2. **Investigation of Fall**
   The information pertaining to falls was obtained from the replies to a questionnaire prepared in advance. This questionnaire covers the items concerning time of fall, place of occurrence, circumstantial fall description, and injury, if any. In the following cases, nurses in charge responded.
   • Fall witnessed by the hospital staff.
   • The case where the subject was found lying on the floor due to a cause considered to have been triggered by nothing other than a fall.
   • Fall reported by the subject or an eyewitness to the hospital.

   In this research, the term “fall” has been defined in conformity with Gibson’s definition, that is, the state of fall where any portion of the body other than the sole touches the floor or ground against his or her will.

3. **Related Factors**
   The clinical and nursing records of the subjects were evaluated to obtain information necessary for elucidating various factors considered related with the fall. The items of investigation were sex, age, complication, dementia, administered internal medicine. As to Item 'a', the subjects were classified into the 3 groups of AD, VD and MIX on the basis of examination of the results of computed tomogram (CT) of the head and the clinical record. With regard to Item 'b', the evaluation of the perceptive function was performed in accordance with the guideline given in the Japanese language version of the Mini-Mental State (MMS).

4. **Statistical Analysis**
   An subjects of the study were divided into two groups, one consisting of those who experienced falls during the 6 month period of this study (hereinafter referred to as “fall-experience group”) and the others with no fall experience during the same period (hereinafter referred to as “non-fall group”). In regard to MMS and ages, comparisons between fallers and nonfallers were analyzed using unpaired t-test. Meanwhile, the differences in degrees of dementia and between the age groups were compared to compute the odds and the 95% confidence interval.

**RESULTS**

1. **Result of Investigation of Fall Cases**
   • Ratio of Fallers
     The number of falls totaled 184 during the 6 month study period. Those who fell down were 60 (54.5% of the entire subject group of this study), 39 of whom fell for 2 times or more. Those who fell frequently showed a trend to fall under similar circumstances (Table 1).
   • Place of Fall
     The fall rate of the fallers who spent most of the time in the hall in the daytime was the highest (42%), followed by the fall rate in the corridor (21%) and the bedroom (17%) (Table 1).
   • Time of Fall
     The peak time of falls occurred at 10:00 in the morning, then followed by 20:00, 13:00 and 18:00 (Table 1).
   • Conditions of Fall
     The fall rate was the highest at the time of walking (45%), followed by 16% while standing up, and 12% for the balance lost while sitting down (Table 1).
   • Injuries
     Fifty-nine percent of the subjects did not suffer any injuries resulting from the fall. Even the injuries brought about by falls were mostly minor ones such as bruises or scratches that did not need any medical treatment at all. There were no cases of bone fractures.
     The injuries caused to the head (33.0%) and
face (31.8%) jointly accounted for 64.8% of the total injured portions of the body (Table 2).

2. Result of Examination on Fall Factors

The number of male subject fallers was 12 (60%) and that of female subject fallers 48 (53%). This indicates the higher rate of falls on the male subjects, but there was no significant difference in fall frequency between the two sexes. The age bracket of fallers was divided into two age groups; 82.3 ± 6.5 years of age for the fall-experience group, and 80.6 ± 7.1 years of age for the non-fall group. Here, there was also no significant difference in ages between these age groups (Table 3). Table 4 shows the examination results of the odds of those in the age group of 60s.

Of the subjects affected with cerebrovascular diseases during or before this study period, those with VD showed the most remarkable trend to fall (Table 5).

There was no significant difference in MMS between the fall-experience group and non-fall group (Table 3). Results of the other items indicated no significant differences between fallers and nonfallers.

### DISCUSSION

1. Investigation of Fall Cases

The fall rate during the 6 month study period accounted for 54.5%. According to other studies, the annual fall rate of elderly persons accommodated in institutions for the aged ranges approximately from 13% to 50%2). It is not adequate to simply compare these figures with the results of this study due to the differences in study methods and subjects’ physical conditions, but the
The fall rate of the subjects was comparatively high. According to Asada\(^7\), the fall rate of those affected with dementia is 3 to 6 times higher than that of those not affected with dementia.

The place where falls occurred most was in the hall. It was reported\(^8, 9\) previously that falls occurred mostly in bedrooms, yet, from this study, we have found that the fall rate in bedrooms was 17\% preceded by the fall rates in the hall and corridor. At the dementia ward, subjects were requested not to stay in the bedroom except for sleeping at night. Rather, they were asked to spend time in the hall during the day. Therefore, it is believed that the rate of fall was frequent in the hall and during daytime. The fall tended to occur while being engaged in activities such as moving between bedroom and dining room, or preparing for sleep. Thus, it can be said that the fall rate increases when the activities the subjects were involved in became intensified. With these data in mind, it is extremely important to take measures necessary to prevent falls.

Most of the injuries caused by falls were minor, and, fortunately, there were no bone fractures. There is a report\(^10\) that in most cases, falls did not result in injuries for elderly persons of a region and institutions for the aged. This study showed a similar result, but in general, it is reported that approximately 5\% of the fallers are said to have suffered bone fractures\(^11\). According to Ikeda et al.\(^12\), before bone fractures, the self-gait capability was 71.7\%, however, with a femoral neck fracture, the capability dropped to 16.9\%. Hayashi\(^13\) report that 30\% of elderly persons in hospitals and institutions recovered from fall effects after medical treatment. Furthermore, treatments of bone fractures for those with dementia were difficult as proper rehabilitation could not be given due to their poor understanding ability. These conditions are apt to trigger a decrease in ADL and stimulate the tendency to be bedridden. In view of this, it is important to prevent injurious falls in advance. Physical restriction is considered as one of the means to prevent a fall, but there is a report that such a restriction increased the number of fall cases\(^14\). After all, it is not recommendable to impose such a restriction because view of the need to protect human rights. As to those with an experience of fall and those considered likely to fall, physical activity should not be restricted; rather, it should be considered important to prevent a fall or bone fracture using a protector against thighbone fracture and shock-isolating floor material, etc. It is also recommended to take appropriate measures to improve the environmental condition of the indoor facility in ways to avoid falls.

### 2. Investigation of Fall-related Factors

The result of this study further shows that aging did not necessarily push up the fall rate. According to previous studies\(^2, 15\), there was no significant

<table>
<thead>
<tr>
<th>Table 4. Comparisons between fallers and nonfallers by age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age distribution</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>60–69 years</td>
</tr>
<tr>
<td>70–79 years</td>
</tr>
<tr>
<td>80–89 years</td>
</tr>
<tr>
<td>90–97 years</td>
</tr>
<tr>
<td>(\chi^2=5.671), N.S.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5. Comparisons between fallers and nonfallers by diagnosis of dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>AD</td>
</tr>
<tr>
<td>VD</td>
</tr>
<tr>
<td>MIX</td>
</tr>
<tr>
<td>(\chi^2=3.264), N.S.</td>
</tr>
</tbody>
</table>
difference in fall frequency between the subjects in early seniority and late seniority. Due to various reasons, elderly persons become more and more deactivated as they become older. This is considered to constitute a cause for the decrease in the fall rate.

Although the MMS score of the fall-experience group tended to be lower than that of the non-fall group, there was no significant difference in its degree between these two groups. Buchner et al.\(^ {16} \) report that in the case of AD patients, the seriousness of dementia had nothing to do with the fall. According to Kubo\(^ {17} \), one patient affected with a central nervous system disturbance was examined at the geriatric hospital where he was under medical treatment, but no significant difference in relationship between falls and dementia was recognized at the time. Meanwhile, Kurita et al.\(^ {18} \) report that in the case of the AD and MIX patients examined at a home institution for the aged, the group having a lower MMS score had higher rates of fall and bone fracture, and that the fall rate of the MIX group was higher than that of the AD group. In this study, the research team didn’t recognize the relationship between the seriousness of dementia and falls. The interrelationship of the perceptive function and falls might not be cleared in the study since the VD patients were included as the subjects of study and an emphasis was placed on the physical functionality as well.

From this study, we have found that the rate of occurrence of fall of elderly persons with dementia was high, and that the ratio of those who stumbled was also high. This study also found several factors causing a fall. However, this study could not recognize any interrelationship of medication and fall\(^ {15, 16} \), or any correlation with wandering and problematic behavior\(^ {23} \). Hereafter, noting the repeated fall cases, we plan to continue to study the cause of the fall of elderly persons with dementia in greater detail.

**Acknowledgment**

We would like to thank the staff at Nakamura Hospital for cooperating with us in this research.

**REFERENCES**