Frequency of Falls and Bone Fractures in the Elderly

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Abstract: It has been only some 10 years since the study of falls in the elderly was initiated in Japan. The frequency, or incidence, of falls depends on age, sex, ADL (Activities of Daily Living), health condition including underlying diseases, and living environment. However, the nature of such events and their preventive strategies remain unclear. In Japan, the frequency of falls in the elderly in medical and care institutions varies from approximately 10 to 40%, however, that among the elderly living at home is approximately 10 to 20% in Japan, being lower than that in foreign countries. Many studies have reported that the frequency of falls was higher in women than in men, and that it increased sharply with advancing age. Our studies showed that the incidence of fractures was approximately 10% among elderly fallers living at home, of which the rate of femoral neck fractures was estimated to be less than 10%. It is anticipated that awareness of the significance of falls and fractures will increase among ordinary people and medical professionals.

Key words: Fall; Community; The elderly; Fractures; Epidemiology

Introduction

On the other hand, in Japan, the research on falls has only been being performed for some 10 years. Although it is not possible to identify the reason why research in this field was only recently started in Japan, it may be because geriatrics itself was not fully established, and that falls were not recognized as a frequently occurring symptom among the elderly. However, the topics on falls have been broadcasted in the “Special Course in Medicine” of Nihon Shortwave Broadcasting and...
the subject of “Falls among the Elderly” was discussed at the 25th General Assembly of Japan Medical Congress. These facts indicate that the importance of falls has now been recognized in Japan.\(^1,2\)

**Significance of Falls**

This section describes the significance of falls. Falls are classified into “XX. External causes of injuries, disease, and death; sudden accident (V01-X59)” in the 10th revision of the International Classification of Diseases (ICD-10) along with traffic accidents. Among elderly people aged 65 years or older, 21,149 died of sudden accidents in 1996: the most frequent cause of death was sudden choking on foods or phlegm (25.6%), followed by traffic accidents (23.2%) and falls (17.9%) (Fig. 1). This indicates that the frequency of death as a result of falls exceeds two-thirds of that by traffic accidents. Various actions have been taken to reduce the incidence of traffic accidents involving elderly people at a national level, however, the actual situations of falls have not been fully understood, and preventive actions have only just begun to be implemented.

Falling is one of the direct causes of femoral neck fracture, which has recently been attracting widespread attention as a cause of the so-called “bed-ridden.” The relative significance of femoral neck fracture has become higher because of the reduced incidence of cerebral stroke, the major cause of the bed-ridden state, thanks to improved nutritional status and living environments, and because of the increased incidence of osteoporosis due to the increase in people in the old-old elderly group of 75 years or older.

Although investigators have come to pay close attention to osteoporosis as an underlying cause of femoral neck fracture, the magnitude in which osteoporosis contributes to such fractures is not well understood. Approximately 90% of femoral neck fracture are caused by falls, including stumbling and slipping. Accordingly, investigating how elderly people fall and taking preventive strategies is the most effective way of preventing femoral neck fracture and eventually the bed-ridden state.

**Definition of Falls**

We have investigated the frequency and cause of falls as well as the current condition of fractures among elderly people in Japan. We report the results of the investigation and discuss the fractures associated with falls.

It is important to clarify the definition of falls as well as the methods of investigation and calculation when investigating the frequency of falls because it is not possible to compare studies using different definitions or methods of investigation and calculation. According to the definition of Gibson\(^3\) reported in 1990, we defined falls as “falling down to the ground, or to the lower level against one’s will.”

There are two main methods for investigating falls. One is fall registration systems based on fall records and accident reports in hospit-
The frequency of falls and fracture: Differences among institutions, hospitals, and communities

The frequency or incidence of falls depends on age, sex, activities of daily living (ADL), health condition including diseases, and living environments.

The frequency of falls among elderly patients living in institutions varies from about 10 to 50% (Table 1). Such a large difference in the frequency may be a result of differences in the type of institutions, for example, between nursing homes for the elderly that are equipped with sufficient measures to prevent falls, such as hand rails and anti-skid floors, and general homes for the elderly that...
lack such preventive measures. It is also possible that there may be substantial differences among institutions in the health conditions of elderly people who are resident there, which may in turn, result in a difference in the frequency of falls.

Medical institutions, such as those for rehabilitation, have reported that the frequency of falls among inpatients ranged from about 30 to 40%, although some were reported to be approximately 10%. It is necessary to interpret the data from medical institutions carefully because all the data are based on inpatients and the investigational period was not always 1 year, however, the data may be indicative of a serious situation wherein approximately one third of inpatients hospitalized for treatment and recuperation sustain injuries, occasionally resulting in death, which are caused by accident of falls.

For the frequency of falls among elderly people living at home, many previous studies in the U.S. and Europe have reported that it ranged from less than 10% to some 20%, being lower than that of other countries (Table 2). The life expectancy of Japanese people is the longest in the world. In Tokyo and Okinawa pref. in particular, which have the greatest longevity in Japan, tend to have a slightly lower frequency of falls than other areas. Therefore, falls can be regarded as being an index of the degree of physical health. It can also be said that the long life expectancy of the Japanese may result from the fact that the country is composed of healthy people who are unlikely to fall.

It is a well-known fact that the incidence of femoral neck fracture is higher among Caucasians in the U.S. and Europe than in Japan. However, it is also reported that bone density is higher, in other words, North Americans and Europeans have harder bones. The reason why the incidence of femoral neck fracture is higher among Caucasians in the U.S. and Europe in whom the bone is considered to be hard and unlikely to be fractured relates to the frequency of falls. Elderly people in Japan do not suffer from femoral neck fracture.

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**Table 2 Incidence of Falls among Elderly People Living at Home in Japan**

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Year</th>
<th>Area</th>
<th>Number of subjects (age)</th>
<th>Incidence of falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Yasumura et al.</td>
<td>1991</td>
<td>Nangai village, Akita pref.</td>
<td>276 (71.8 ± 5.8)</td>
<td>409 (72.4 ± 6.1)</td>
</tr>
<tr>
<td>Yasumura et al.</td>
<td>1994</td>
<td>Koganei, Tokyo</td>
<td>366 (71.6)</td>
<td>441 (72.1)</td>
</tr>
<tr>
<td>Yasumura et al.</td>
<td>1996</td>
<td>Nakasato village, Niigata pref.</td>
<td>532 (73.1)</td>
<td>785 (74.4)</td>
</tr>
<tr>
<td>Kano et al.</td>
<td>1997</td>
<td>Hamamatsu, Shizuoka pref.</td>
<td>219 (65 years or older)</td>
<td>315 (65 years or older)</td>
</tr>
<tr>
<td>Sakihara et al.</td>
<td>1997</td>
<td>Urasoe, Okinawa pref.</td>
<td>340 (Mean for men and women: 74.0 years)</td>
<td>497</td>
</tr>
<tr>
<td>Haga</td>
<td>1997</td>
<td>Otofuke, Hokkaido</td>
<td>369 (72.0)</td>
<td>481 (72.4)</td>
</tr>
<tr>
<td>Niino</td>
<td>1997</td>
<td>Koganei, Tokyo</td>
<td>285 (75.8 ± 5.1)</td>
<td>339 (76.2 ± 5.1)</td>
</tr>
</tbody>
</table>
because of the lower frequency of falls. Our investigation has shown that the incidence of fractures caused by falls among elderly people living at home is approximately 10% (8.7% in men and 11.5% in women). The rate of femoral neck fracture among all types of fractures is considered to be less than 10%. Assuming that approximately 20% of elderly people living at home fall once a year, it is expected that fractures occur in approximately 2%, and femoral neck fractures in about 0.2%, annually.

**Frequency of Falls and Fracture: Difference in Sex**

For the difference in sex in the frequency of falls and fractures, our investigation in rural areas, such as Nangai village in A kita pref. and Nakasato village in Niigata pref., has demonstrated the frequency to be higher in women (approximately 20%) than in men (17 to 19%) (Table 2). An examination of the standing position holding function of the subjects with a gravity center oscillation meter showed that the center of gravity was more oscillated in women than in men in all the age groups examined. Many studies have agreed on the higher frequency of falls in women than in men, and this may be partially explained by the difference in the above balance function.

**Frequency of Falls and Fracture: Difference in Age**

Many studies have reported the frequency of falls in the old-old elderly group (75 years or older) to be significantly higher than that in the young-old elderly group (74 years or younger), suggesting that the frequency sharply increased with advancing age. This tendency was seen in all the areas and subject groups examined. A national survey on the incidence of femoral neck fracture conducted in 1992 has shown that approximately 77,000 new cases with the fracture were found within the year, and that the incidence in women was approximately 0.1% in their sixties, 0.4% in their seventies, 1.4% in their eighties, and 2.6% in their nineties, indicating the sharp increase with advancing age. The sharp increase in femoral neck fracture in the old-old elderly group in spite of an annual reduction of bone density of only about 1 to 2% suggests that falls largely contribute to femoral neck fracture, when compared to osteoporosis.

It is clear, considering the projected future increases in the numbers of people in the old-old elderly group, that this factor may adversely contribute to an increase in the frequency of falls and thus to the incidence of femoral neck fracture.

**Factors Influencing the Frequency of Falls and Fractures and Preventive Measures**

The frequency of falls and fractures is closely related to the factors and causes of falls, as described in the above.

Some institutions have started local activities to prevent falls. For example, the Hamamatsu Municipal Public Health Center in Shizuoka Prefecture has been providing a lecture meeting system entitled “Look before you leap.” This is intended to investigate and prevent falls among the elderly as part of health education. They have also published and distributed free brochures, “Look before you leap,” which contain the results of their investigations. This has increased the awareness of falls among the elderly and has contributed to making them realize that falls should and can be prevented. Such preventive activities in Japan are far behind those being conducted in the U.S. and Europe, however, they are gradually becoming more widespread.
Conclusion

This paper outlines the frequency of falls and fractures in the elderly. Numerous issues concerning falls and fractures including their frequency remain to be examined. It is anticipated that more investigators will become aware of the significance of such studies.

REFERENCES