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LOCOMOTIVE SYNDROME

Osteoporosis as a Cause of Locomotive Syndrome: The Influence on Functional Mobility and Activities of Daily Living

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Abstract Osteoporosis, a cause of locomotive syndrome, influences functional mobility and activities of daily living in elderly people. The patients with vertebral fractures and/or with first hip fracture have a high risk of a subsequent hip fracture.

Keywords Osteoporosis · QOL · Hip fracture · Fracture risk

Introduction

Osteoporosis is a condition characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. Hip and vertebral fractures are associated with decreased life expectancy. Osteoporosis is one of the common diseases in Japan where the elderly people have been increasing more than ever before in recent years. Since the population over 65 years of age will increase from 26 % in 2015 to 30 % by 2025 in Japan, the number of the elderly people with osteoporosis will likely continue to increase. Therefore, osteoporosis and related fractures are one of the major public health burdens in Japan.

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Osteoporosis as a Cause of Locomotive Syndrome

Osteoporosis is one of the causes of locomotive syndrome, and it influences functional mobility and activities of daily living (ADL) in elderly people who are becoming concerned about becoming bedridden in super-aged society, such as Japan [1]. The vertebra, hip, humerus and distal radius fractures are frequent in the elderly people with frailty and osteoporosis. Fracture(s) occurring with minimal trauma (low energy) are clinical consequences of osteoporosis. These fragility fractures cause pain at the fracture site(s) and deformity after fracture union, leading to severe disability and a reduced quality of life (QOL). Since hip fractures are common cause of morbidity and mortality in the elderly, they are the most serious type of osteoporotic fractures for the patients and their families as economical and social burdens.

Three topics discussed in this review are listed below.

(1) Hip fractures, one of the major osteoporosis-related fractures, are frequent in elderly people, and most elderly people with hip fracture are frail in physical, mental and social aspects. Outcome after hip fracture is poor in short-term and long-term period, with increased mortality and decreased ADL. Hip fracture incidence and long-term change in Niigata Prefecture, Japan, was reviewed [2–5].
(2) Patients with prevalent fracture have a higher risk of subsequent fracture. Sustained fractures as an increased fracture risk were reviewed [6–17].
(3) Patients with osteoporosis had lower QOL, and fragility fractures reduce QOL. QOL in the patients with osteoporosis was reviewed [18–20].

Hip Fractures in Niigata Prefecture, Japan, in 1985–2010 [2–5]

Hip fracture is the most serious problem in the aged population because of impairment of mobility, leading to bedridden status in serious cases.

Miyasaka et al. and Niigata University Group reported the incidence of hip fractures from 1985 to 2010 and long-term change in Niigata Prefecture, Japan [2–5]. Total population of Niigata Prefecture was 2,369,191 with 26.2 % of percentage of population over 65 years of age in 2010. In 2010, 3218 hip fractures (281.5 fractures per 100,000 of population per year) were occurred in Niigata Prefecture, Japan [2]. In 1985, 655 hip fractures were occurred. The number of hip fracture in 2010 was fivefold compared to that in 1985. Long-term change from 1985 to 2010 indicates that the number and the incidence of hip fractures have been increasing, in Niigata Prefecture, Japan [2–5].

Taken together, osteoporosis-related fragility hip fractures will increase in Niigata, Japan, where aged population will likely continue to increase. And there are many elderly people requiring treatment for osteoporosis resulting from locomotive syndrome.

Outcome After Hip Fractures and Vertebral Fractures

It is reported that about half of the patients are able to walk without aids after a fracture among elderly people who were living independently prior to injury of a hip fracture [6–9].

Sakuma et al. [10] reported the outcome of hospitalized patients with osteoporotic fractures after discharge in the study carried out in 2004 in Sado City, Niigata, Japan. Of patients with vertebral fractures, 87 % were discharged to their home, and 11 % were transferred to another ward in the hospital for treatment. And 55 % of patients with hip fractures discharged to home and 36 % were to a nursing home. These results indicate that 45 % of patients with hip fractures and 13 % of patients with vertebral fractures were not able to be discharged to their home due to decreased physical function and/or lack of social welfare support. The elderly men/women after hip fracture were more likely to require longer hospital stay and less likely to return to independent living in their own houses.

Outcome after hip fractures due to fragility bone resulting from osteoporosis was poor because of impaired walking ability and decreased independency.

The Risk of Hip Fracture Risk: A Vertebral Fracture and An Initial Hip Fracture [10–13]

Once a patient has sustained a vertebral or a hip fracture, the subsequent vertebral or hip fracture risk increases 200–300 % [6–8, 16].

Sakuma et al. [10, 11] reported the 81 % of hip fracture patients had a vertebral fracture in the study of the incidence of osteoporotic fractures in 1 year in Sado City, Niigata prefecture, Japan. Imai et al. [12] reported similar result. These suggest that the patients with vertebral fractures have high risk of hip fracture [10–13].

It is reported that an initial fracture is a high risk of a subsequent hip fracture. Hagino et al. [16] investigated the incidence of subsequent hip fractures after an initial hip fracture. Seventy-seven hip fractures occurred in 77 patients during the 1-year follow-up period of 2328 patients after the first hip fracture, and forty (51.9 %) out of 77 fractures occurred within 6 months after the first hip fractures. This study showed that patients with first hip fracture have a high risk of a subsequent hip fracture. In addition, the half of second hip fractures occurred within 24 weeks after the first hip fracture [16].

QOL in the Patients with Osteoporosis [18–21]

Sakuma et al. [19] examined the QOL in the patients (6 male and 67 female) with osteoporosis (L2-4 BMD < 2.5SD) compared with the cases (20 males and 45 females) without osteoporosis as control. JOQOL (Japanese Osteoporosis Quality of Life Questionnaire, osteoporosis-targeted instrument) and walking ability were

Table 1 JOQOL: Japanese Osteoporosis Quality of Life Questionnaire, osteoporosis-targeted instrument (the Committee of Quality of Life Assessment for Osteoporotic Patients of the Japanese Society for Bone and Mineral Research) [18–20]

The domains	Number of questions
Pain	5 questions
Activity of daily living ADL	
Self-care tasks	4
Housework	5
Transfers	7
Leisure, social activities	5
General health perception	3
Posture, figure	4
Falls, mental factors	5
Family support	1
Total	38

examined (Table 1). Patients with osteoporosis showed lower JOQOL scores, especially the scores on posture/figure and fall/anxiety, compared to control cases. JOQOL scores were higher in those who have exercise and walking habitude. This indicated that exercise and walking are potent affecting factors on QOL in elderly people with osteoporosis.

Moreover, the elderly people with spinal deformity (kyphosis) due to vertebral fractures by fragility showed decreased JOQOL [20].

Conclusion

Osteoporosis, a cause of locomotive syndrome, influences functional mobility and activities of daily living in elderly people.

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Compliance with Ethical Standards

Conflict of interest Naoto Endo declares no conflict of interest.

Animal/Human Studies This article does not contain any studies with human or animal subjects performed by any of the authors.

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