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Case Report Open Access

Characteristics and Treatment of Osteoporotic Vertebral Fractures after Stroke: Case Report and Literature Review

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Abstract

Stroke patients tend to fall easily in the chronic stage due to aprosexia and poor dynamic balance; they have a 2-4 times higher incidence of fractures than healthy persons. In addition, decreased bone density is found in stroke patients, and the risk of collapsed osteoporotic vertebra is high. Therefore, treatment of osteoporosis is needed in chronic stroke patients with dysfunction because it improves patients' functional prognosis to perform rehabilitation, which decreases the risk of falls and fractures

The course of re-acquiring activities of daily living (ADL) and the characteristics of stroke patients in the chronic stage with a collapsed osteoporotic vertebra were examined.

Case 1

A 62-year-old woman with an ataxic gait, aprosexia, and memory disturbance following a cerebellar infarction had been crutch walking since 2014. In May 2015, she developed low back pain after doing some housework and was admitted with a severe vertebral fracture [1-3]. On examination, she had cerebellar syndrome and trunk dystonia of the right half of the body. Her modified Rankin Scale (mRS) [4] score was 2.

She had a history of systemic lupus erythematosus and hypothyroidism and took prednisolone 10 mg a day. X-ray and magnetic resonance imaging (MRI) showed multiple lumbar vertebral fractures at the L2-L4 level, grade 3 on the X-ray classification by lateral vertebral assessment [5] (Figure 1a and 1b), and the osteo-sono-assessment index (OSI) [6] was 1.983. Rehabilitation for basic movement was not possible due to lumbar pain; she performed range of motion exercise, and a corset was made. She put on the corset on the 14th day after admission and started to walk to the rest room. However, pain worsened with walking.

X-rays showed a new vertebral fracture at the Th12 level on day 21 after admission. She required rest for approximately two weeks until the pain improved. In addition, teriparatide (TPTD) [7] was started for treatment of osteoporosis, with no side effects. Gait training using the walker was started 40 days after admission. Her walk pattern and walking ability using the walker were confirmed, and rising, standing position, trunk dystonia with walking, and fatigue were evaluated; basic movement ability and muscular strength maintenance and augmentation were planned. Furthermore, we planned living guidance for aprosexia. For higher nervous function, physical exercise, such as training for daily living or problem evaluation, was started. She was discharged home alone on day 90 after admission.

Figure 1a: On admission X-rays: Multiple lumbar vertebral fractures are found at L2-L4 levels.

After discharge, she could continue rehabilitation. Ten months after she returned home, there was no pain, and there were no exacerbations of the vertebral fractures or new fractures on X-ray (Figure 1c). The OSI was 2.001 at one year after the vertebral fracture.

When pain worsened, her Functional Independence Measure (FIM) [8] decreased, but it improved to that before onset and remained at the same level with continued treatment and rehabilitation after discharge (Figure 3).

Figure 1b: On admission MRI: The fracture reaches the body of the vertebral posterior surface.

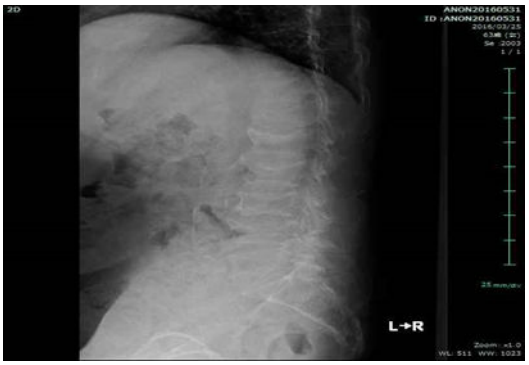

Figure 1c: Ten months after injury X-rays: Bone consolidation is seen, and there is no exacerbation of the vertebral fracture.

Case 2

A 56-year-old woman had left hemiplegia and aprosexia after a cerebral hemorrhage in 2014. She had no problems in ADL, and, as for walking ability, she could walk outside.

In June, 2015, she tripped and fell down at home. Since she had severe low back pain, she was admitted with a diagnosis of lumbar vertebral fracture to our hospital. She had mild paresis of the left hand, paralysis of the left leg, diminished ipsilateral reflexes, and a diminished left plantar reflex on neurological examination. Her mRS [4] score was 2. She was hemodynamically stable with blood pressure of 115/72 mmHg. X-rays and MRI showed a first lumbar vertebral compression fracture, grade 0 on X-ray classification by lateral vertebral assessment (Figures 2a and 2b). The OSI was 2.007.

As in case 1, range of motion exercise and gait training were started on the 14th day after admission. And we conducted higher brain function training for aprosexia. The pain was controlled with a non-steroidal anti-inflammatory drug (NSAID) for two weeks. A bisphosphonate (BP) [9] agent was also started two weeks after hospitalization. She could perform most personal movements by herself four weeks after admission, and she improved to independent walking at 8 weeks. She was discharged to home 84 days after hospitalization. There was no progression of the compression fracture at 8 months after discharge on X-rays (Figures 2a, 2b and 2c). The OSI one year after the vertebral fracture was 1.98. She performed vocational training to return to working as a clerk. The change in the Functional Independence Measure (FIM) was the same as in Case 1, and it decreased when the pain was severe, but the FIM recovered to the level before fracture and was at same level at discharge, and no functional decline was seen at 8 months after onset (Figure 3).

Figure 2a: Lumbar vertebral X-rays and MRI in case 2. On admission X-rays: X-rays on admission show a first lumbar vertebral compression fracture.

Figure 2b: Lumbar vertebral X-rays and MRI in case 2. On admission MRI: The fracture at the level of the first lumbar vertebra reaches the body of the vertebral posterior surface, with only slight compression of the body of the vertebra.

Figure 2c: Lumbar vertebral X-rays and MRI in case 2. Eight months after injury X-rays: Bone consolidation is seen, and there is no exacerbation of the vertebral fracture.

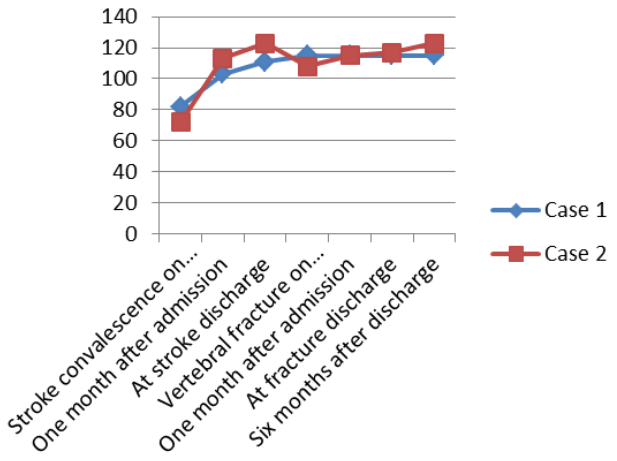

Figure 3: Change of FIM of Cases 1 and 2. The ADL has improved to greater than that during stroke convalescence in both cases and has recovered to the ADL before the fracture.

Discussion

The risk of fracture after stroke has often been reported; it is stated that the risk of fracture after stroke is 2-4 times that of a healthy person [1]. In addition, bone density is decreased in stroke patients, and osteoporosis is thought to be associated with fractures [10]. Kang et al. [2] reported that most post stroke bone fractures occurred in the lower extremity, indicating that fragile bones are a risk factor, and bone mineral density (BMD) is a useful indicator of bone resorption and can be used to identify patients at risk of post-stroke bone fracture.

Sato et al. [11] reported that decreased BMDis common in stroke patients. In the present cases, to estimate BMD, the OSI was determined by measuring bone density at the calcaneus. The OSI was significantly lower in the two present cases than in persons of the same age. The OSI before cellebellar infarction was 2.021, and OSI decreased after cellebeller infarction. Active mass decreased, and the likelihood that caused a decreased of the bone density more was considered as this reason by late effects of cerebral stroke. Todorovic et al. [12] reported osteoporosis in patients with stroke and compared the bone density of stroke patients with the normal, and stroke patients were higher in a ratio of osteoporosis. In this reason, the most common risk factor for stroke was arterial hypertension, heart disease, heredity, dyslipidemia, and diabetes mellitus and risk factors for osteoporosis were assessed in research as well. Regarding the treatment of osteoporosis, BP agents are often used, and these drugs slow bone breakdown due to their strong affinity to the skeleton, low toxicity to other tissues and organs in the body, and simple frequency of administration [13]. Many drugs are used to treat osteoporosis in Japan, including vitamins, selective estrogen receptor modulators (SERMs), BPs, and TPTD, and their mechanisms of action vary. These drugs are able to reduce the fracture risk, but TPTD in particular is suitable for severe osteoporosis. Recent studies showed that TPTD rebuilds bone and reverses osteoporosis [14]. In the present cases, neither patient had received treatment prior to the fractures. In case 1, the patient had multiple vertebral compression fractures, and there were re-fractures during hospitalization, as well as osteoporosis with steroid treatment, so that TPTD was started to stimulate bone formation. The OSI improved after treatment for osteoporosis was started. In case 2, there was one vertebral body fracture, the degree of pressure was slight, and BP treatment was started. The OSI decreased slightly one year after the fracture, but there were no further fractures or recurrence of pain, and BP treatment was continued; the patient still needs to be followed. The degree of improvement of the OSI was higher with TPTD, there were no fractures after discharge in both cases, and the course was good. The choice of osteoporosis treatment should be made based on the patient's age, the presence of vertebral body fractures, and the severity of paralysis in the long term, and it was thought important to choose a drug that would be effective.

With respect to ADL evaluation, functional impairment of stroke is measured using the FIM and the mRS score. Kanis et al. [15] reported that hospitalization of stroke patients with adverse changes in motor function and body composition leads to a long-term increase in fracture risk. Nyberg et al. [16] reported that male sex, poor ADL performance, urinary incontinence, bilateral motor impairment, impaired postural stability, visuospatial hemi-neglect, and use of diuretics, antidepressants, or sedatives were factors related to increased fracture risk after stroke, and they stated that poor ADL performance became a fracture risk after stroke. However, in the present two cases, the patients were able to walk independently, and it was assumed that it was not poor ADL performance, but aprosexia and decreased balance ability that were the causes of the fractures.

Case 1 had low bone density, and rehabilitation involved gradually increased loading doses. It was finally possible to achieve independence in ADL without fractures by doing rehabilitation while regulating the loading dose. Various medical personnel need to cooperate in the treatment of osteoporosis and continue rehabilitation to prevent refracture.

Conclusion

For the vertebral fractures that occur in the chronic stage after a stroke, we chose an appropriate drug and were able to combine it with rehabilitation from a higher brain function perspective and frequent exercise usability tests, and approaches to fall prevention were taught. Furthermore, each case was given a rehabilitation menu depending on the clinical condition and symptoms, which prevented fracture

recurrence, and the patients were able to return to their pre-fracture ADL.

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Authors' Contributions

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Conflicts of Interest

None declared.

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