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Ⅲ. 研究成果の刊行物・別刷

【平成22年度】

Original article

Nationwide survey of current medical practices for hospitalized elderly with spine fractures in Japan

ATSUSHI HARADA¹, YUKIHIRO MATSUYAMA², TETSUO NAKANO³, MASAO DEGUCHI⁴, SHIGEYUKI KURATSU⁵,
YASUNOBU SUEYOSHI⁶, YOSHIROU YONEZAWA⁷, NORIMITSU WAKAO², MASAFUMI MACHIDA⁸, and MANABU ITO⁹

¹Department of Restorative Medicine, National Center for Geriatrics and Gerontology, Gengo 36-3, Morioka-cho, Obu, Aichi 474-8511, Japan

²Department of Orthopaedic Surgery, Nagoya University School of Medicine, Nagoya, Japan

³Department of Orthopaedic Surgery, Tamana Central Hospital, Tamana, Kumamoto, Japan

⁴Department of Orthopaedic Surgery, Nagano Red Cross Hospital, Nagano, Japan

⁵Department of Orthopaedic Surgery, National Hospital Organization Kure Medical Center, Kure, Japan

⁶Sueyoshi Orthopedic Clinic, Kanazawa, Japan

⁷Yonezawa Hospital of Orthopaedics, Yonezawa, Japan

⁸Department of Orthopaedic Surgery, National Hospital Organization Murayama Medical Center, Tokyo, Japan

⁹Department of Orthopaedic Surgery, Hokkaido University Graduate School of Medicine, Sapporo, Japan

Abstract

Background. The status of hip fracture incidence and treatment is well known through nationwide surveys in Japan. However, there have been no similar studies on spine fractures. Therefore, we investigated current medical practices for them.

Methods. Altogether, 1200 hospitals were randomly selected for the survey with consideration of region and hospital characteristics. Questionnaire items included the number of hospitalized spine patients, imaging test implementation, type of conservative treatment, use of open surgery and vertebroplasty, and the number of these procedures performed in 2005.

Results. Responses were received from 473 hospitals. On the day of response, there were 14 372 hospitalized orthopedic patients (average 32.8/hospital). Among them were 1403 spine fracture patients (3.1/hospital), accounting for 13.5% of orthopedic patients. Of them, 91.9% received conservative treatment. The mean percentage of spine fracture patients who were hospitalized was 39.5%. The most reliable imaging test was said to be magnetic resonance imaging. Casting or bracing was used in most of the institutions. The most common analgesic treatment was oral nonsteroidal antiinflammatory drugs. Open surgery and vertebroplasty were conducted for spine fractures in the elderly at 26.5% and 16.3% of hospitals, respectively. In these hospitals, 624 and 257 patients underwent open surgery and vertebroplasty, respectively, in 2005.

Conclusions. In Japan, more than 90% of elderly patients hospitalized with spine fractures received conservative treatment. Surgical treatment, either open surgery or vertebroplasty, was performed at 30% of the hospitals. This study provides basic data that will contribute to planning improvements in spinal fracture treatment in the elderly.

Introduction

Osteoporotic fractures are a major factor in declining physical independence and quality of life of elderly people, and there is great interest in their incidence, treatment, prognosis, and medical economic burden. Hip fractures are among the most serious osteoporotic fractures, and national surveys have been conducted in many countries around the world. In Japan, a nationwide survey of Japanese Orthopaedic Association (JOA)-related hospitals is conducted every year by the JOA,¹ and a survey on the incidence of hip fractures is conducted every 5 years.² Based on the results of these surveys we have come to a good understanding of the annual trends in frequency, number of occurrences, cause, treatment regimen, and prognosis for hip fractures.³

There have been no similar surveys in Japan on spine fractures in the elderly, however, which occur with the highest incidence among all osteoporotic fractures. As a result, the current status of the diagnosis and treatment for spine fractures in the elderly remains unclear. We therefore conducted a nationwide survey of the treatment of spine fracture patients ≥ 65 years of age in Japan. However, because of the technical difficulty of accessing information on outpatients with spine fractures, this survey was limited to hospitalized patients with spine fractures, and we looked at the current medical practices for treating them in Japan. This study will contribute to our understanding of the current treatment of elderly patients hospitalized for spine fractures and provide suggestions for improving and standardizing treatment.

Offprint requests to: A. Harada

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Table 1. Questionnaire items

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1. Trends in medical care for spine fractures in the elderly
 - (1) Mean percentage of spine fractures patients who were hospitalized
 - (2) Use of critical paths for the treatment of spine fractures
 - (3) Imaging tests used regularly (*multiple responses are allowed*)
Which test is most trusted in determining a diagnosis of fracture?
 - (4) Open surgery and vertebroplasty performed
 - (5) External fixation used regularly (*multiple responses are allowed*)
Which method is used most often? Which method is never used?
 - (6) Analgesic treatment used regularly (*multiple responses are allowed*)
Which method is used most often? Which method is used when pain is strongest?
 - (7) Rehabilitation practices used regularly (*multiple responses are allowed*)
 2. Number of patients under hospitalization on the day of the response
 - (1) Number of patients hospitalized for orthopedic diseases
 - (2) Number of hospitalized spine fracture patients 65 years or older
 - (3) Number among them receiving conservative treatment
 3. Number of surgeries for patients with spinal fractures in 2005
 - (1) Number of vertebroplasties using bone cement, materials other than bone cement, or other methods
 - (2) Number of open surgeries using a posterior procedure, anterior procedure, or combined anterior and posterior procedure
-

This survey was limited to spine fracture patients ≥ 65 years of age who had acute pain or other clinical symptoms. Patients with asymptomatic morphological fractures were excluded

Materials and methods

A questionnaire survey of medical institutions was conducted by mail. In Japan, nearly all doctors who perform orthopedic treatment belong to the JOA, and the hospitals where these doctors work are broadly classified as JOA-authorized hospitals and Japanese Clinical Orthopaedic Association (JCOA) hospitals. The former are relatively large hospitals certified as postgraduate clinical training hospitals, and the latter are small hospitals with up to 19 beds. As of 2006, there were 2229 JOA-authorized hospitals and 1279 JCOA hospitals. All these hospitals have been targeted for annual surveys of the incidence of hip fractures by the JOA since 1997. From among these 3509 institutions, 1200 hospitals were randomly selected for the current survey with consideration of type of hospital and region. In this survey, the regions were the 47 prefectures of Japan. Before selecting the subject institutions, a letter was sent to the president of the JOA requesting permission to use the directory of the JOA and digital data from the list of printed address labels; the permission was granted. In addition, we obtained agreement from our institutional review board to publish this article.

Questionnaires were mailed to the chiefs of the departments of orthopedic surgery in the selected hospitals by the end of July 2006; and responses received by the end of September 2006 were analyzed. Spine fractures included in the survey were limited to those accompanied by acute pain in elderly (defined here as ≥ 65 years of age) hospitalized patients. The questionnaire items are shown in Table 1.

The trends in medical care were summarized by the chief of surgery based on the regular treatment pat-

terns. Responses for the number of hospitalized patients and surgeries were based on actual patient numbers.

Data handling and statistical analysis were performed using Dr.SPSS II (SPSS, Chicago, IL, USA). Associations between categorical variables were tested with chi-squared distribution, and differences between means for continuous variables were analyzed using the *t*-test. A *P* value of 0.05 (two-tailed) was used to define statistical significance.

Results

Responses were received from 473 hospitals in all regions, for an overall response rate of 39.4%. The number of responses and response rate by hospital were 308 hospitals (40.5%) among JOA-authorized hospitals and 155 hospitals (35.2%) among JCOA hospitals. The classification of 10 hospitals was unclear. Among the 473 hospitals from which responses were received, 22 no longer accepted inpatients, and 2 were pediatric hospitals. The analysis was thus conducted with the responses from the remaining 449 hospitals (valid response rate 37.4%).

First, the results with regard to trends in medical care for spine fractures were as follows. Hospitalization of patients diagnosed with spine fractures was done in 39.5% [standard deviation (SD) 32.3%] of cases. In a comparison of the two types of hospital, the percentage at JOA-authorized hospitals, at 42.0% (SD 33.2%), was higher than that at JCOA hospitals, which was 33.1% (SD 29.3%) ($P = 0.0108$).

In all, 449 hospitals responded concerning imaging tests, and the most common response for test regularly

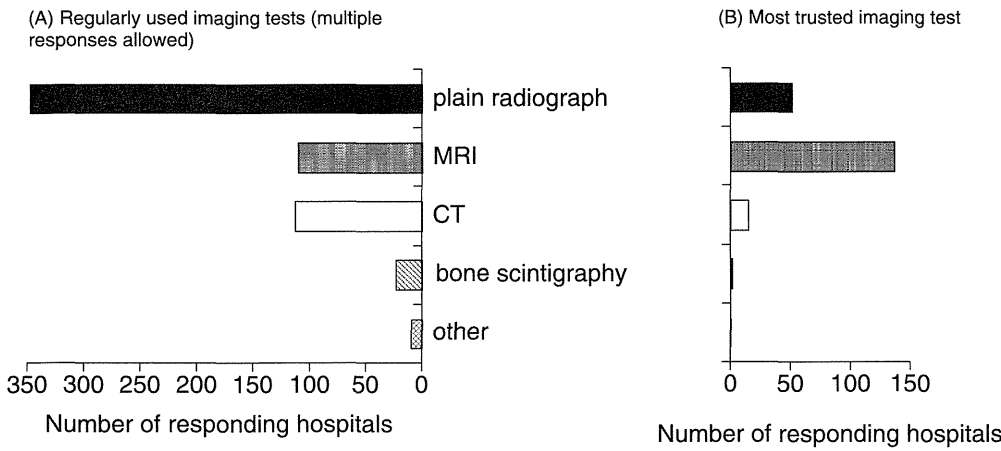


Fig. 1. Imaging tests for spine fractures. **A** Plain radiography was the imaging test most commonly used for diagnosing spine fractures in the elderly. **B** Among all imaging tests, magnetic resonance imaging (MRI) was the most trusted test in making a diagnosis

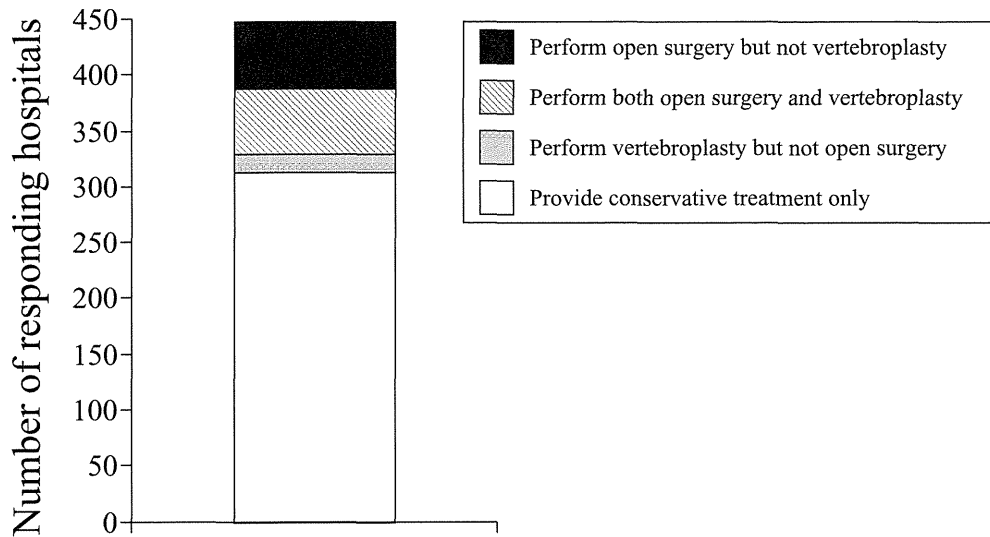


Fig. 2. Treatment for elderly spine fracture patients. In all, 69.7% of hospitals provided conservative treatment only, 3.8% performed vertebraloplasty but not open surgery, 12.9% performed both open surgery and vertebraloplasty, and 13.6% performed open surgery but not vertebraloplasty

used was plain radiography. Next most common were computed tomography (CT) and magnetic resonance imaging (MRI), at 110 hospitals (24.5%) and 112 hospitals (24.9%), respectively. Bone scintigraphy was used at a fairly small number of hospitals ($n = 23$, 5.1%). In contrast, responses were received from 291 hospitals on the imaging test that was most trusted in determining a diagnosis of fracture, and the largest number, 211 hospitals (72.5%), responded that MRI was the most reliable. This was more than three times higher than plain radiography and far above CT and bone scintigraphy (Fig. 1).

Second, responses related to surgery were received from 449 hospitals. Open surgery was performed at 119 hospitals (26.5%) and not performed at 328 hospitals (73.1%). Vertebraloplasty was conducted in orthopedic units of 73 hospitals (16.3%) and in a department other than orthopedics in 2 hospitals (0.4%). Vertebraloplasty was not conducted in 372 hospitals (82.9%). A total of 136 hospitals (30.3%) con-

ducted surgical treatment — either open surgery or vertebraloplasty — and 313 hospitals (69.7%) did not. In all 58 hospitals responded that they performed both open surgery and vertebraloplasty, 61 hospitals (13.6%) conducted open surgery but not vertebraloplasty, and 17 hospitals (3.8%) did vertebraloplasty but not open surgery (Fig. 2).

Responses were received from 449 hospitals with regard to treatment with a cast or brace, of which 430 hospitals (95.8%) used them and 18 hospitals (4.0%) did not. The most common responses were soft corsets and hard corsets at 202 hospitals (45.0%) and 189 hospitals (42.1%), respectively. These choices were followed by casts at 151 hospitals (33.6%) and lumbar support belts at 133 hospitals (29.6%). According to responses from 260 hospitals on the method that was used most often, 150 (57.7%) used soft corsets, and 51 (19.6%) used hard corsets. Casts were the most common method in only 30 (11.5%) cases and never used in 56 (12.5%).

Table 2. Number of hospitalized patients on the day of response

Parameter	All hospitals	JOA-authorized hospitals	JCOA hospitals	Hospitals of undetermined affiliation
Total hospitalized orthopedic patients ^a	14372 (32.8)	12658 (42.8)	1529 (11.6)	185 (18.5)
Hospitalized spine fracture patients age ≥ 65 years ^a	1403 (3.1)	1100 (3.7)	285 (1.9)	18 (1.8)
Hospitalized spine fracture patients who underwent conservative treatment ^a	1294 (3.1)	995 (3.4)	282 (1.8)	17 (1.7)
Spine fracture patients ≥ 65 years among all hospitalized orthopedic patients	13.5% \pm 16.6%	19.6% \pm 20.7% ^b	11.0% \pm 14.1%	13.0% \pm 13.1%
Spine fracture patients who received conservative treatment	91.9% \pm 24.5%	89.2% \pm 27.7% ^c	98.6% \pm 10.7%	97.6% \pm 5.8%

JOA, Japanese Orthopaedic Association; JCOA, Japanese Clinical Orthopaedic Association

^aNumbers in parentheses represent the number of patients per hospital \pm SD

^b $P < 0.0001$ for JCOA hospitals

^c $P = 0.0014$ for JCOA hospitals

Responses were received from 449 hospitals about pain relief. Methods normally used to relieve pain were, in order of frequency: antiinflammatory analgesic plaster in 308 (68.6%), calcitonin in 264 (58.8%), oral NSAIDs in 224 (49.9%), NSAID suppositories in 169 (37.6%), local injections in 129 (28.7%), liniments in 96 (21.4%), nerve blocks in 35 (7.8%), and pentazocine in 19 (4.2%). No hospitals used narcotics. Responses regarding the pain relief method that was used most often were received from 345 hospitals. The choice here was oral NSAIDs in 191 (55.4%) followed by NSAID suppositories in 105 (30.4%), and calcitonin in 20 (5.8%). Responses were also received from 215 hospitals on the method used when pain was strongest. The most common response was overwhelmingly NSAID suppositories, in 162 (75.3%), followed by local injection in 17 (5.6%) and use of pentazocine in 13 (6.0%).

With regard to rehabilitation, responses were received from 449 hospitals. Normal practices were, in order of frequency, activities of daily living (ADL) training by a physical therapist in 301 (67.0%), physical therapy in 226 (50.3%), ADL training by someone other than a physical therapist in 94 (20.9%), no rehabilitation in 32 (7.1%), and "other" in 10 (2.2%).

The numbers of hospitalized patients on the day of the response (from 446 hospitals) were as follows. On the day of response, the total number of inpatients at orthopedic surgery hospitals was 14 372, for an average of 32.8 (SD 27.6) per hospital. The number of hospitalized spine fracture patients ≥ 65 years of age was 1403 on the day of response; this was an average of 3.1 (SD 3.3) per hospital, accounting for 13.5% of all orthopedic surgery patients. The number of these patients receiving conservative treatment was 1294, which accounted for 91.9% of hospitalized spine fracture patients. The remaining 109 (8.1%) were thought to be patients hospitalized for surgical treatment. A comparison between

the two types of hospital regarding the number of inpatients on the day of response showed that the percentage of elderly spine fracture patients among all orthopedic surgery patients and the percentage of patients receiving conservative treatment were both higher at JCOA hospitals (Table 2).

Third, with regard to the surgeries performed in 2005, the number of open surgeries was reported to be 624 at 119 hospitals. They included 471 (75.7%) posterior surgeries, 100 (16.0%) anterior surgeries, 51 (8.2%) combined anterior and posterior surgeries, and 2 (0.3%) others. The respective average per hospital for hospitals that conducted open surgery was, in order, 4.0 (SD 9.0), 0.8 (SD 3.9), 0.4 (SD 1.3), and 0.0 (SD 0.2). The number of vertebroplasties performed was reported to be 257 at 75 hospitals. Bone cement was used in 88 surgeries (34.2%), materials other than bone cement were used in 155 (60.3%), and 14 vertebroplasties (5.4%) were listed as "other." The average per hospital performing vertebroplasty was 1.2 (SD 2.7), 2.1 (SD 2.8), and 0.2 (SD 0.8), respectively (Fig. 3).

Discussion

This study was the first nationwide survey to clarify the status of treatment for elderly patients with spine fractures in Japan. The percentage of spine fractures that are clinical fractures accompanied by pain is reported to be 23%–34%.^{4,5} Moreover, not all patients with clinical fractures are hospitalized. Therefore, it is difficult to gain an overall understanding of the treatment status of spine fractures. For that reason, there have not been any rigorous national surveys.

The present survey also was limited to elderly hospitalized patients with spine fractures. To make the present survey as similar as possible to the hip fracture

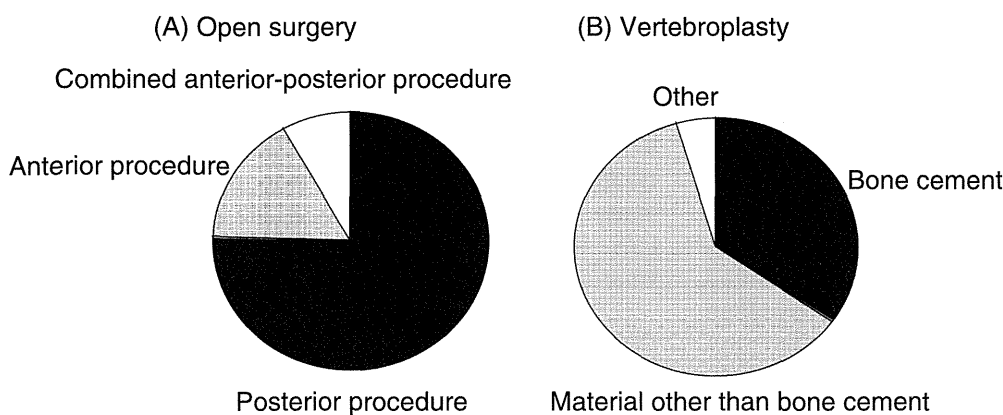


Fig. 3. Number of surgeries performed in elderly spine fracture patients in 2005. **A** The number of open surgeries was reported to be 624. **B** The number of vertebroplasties was reported to be 257

surveys, 1200 hospitals were selected randomly with consideration of type of hospital and the 47 prefectures in Japan, accounting for about one-third of the hospitals in the 2006 register. The response rates in the hip fracture surveys from JOA-authorized hospitals were 53.7%, 55.6%, and 46.0%, in 1998, 1999, and 2000, respectively; and those from JCOA hospitals were 40.5%, 54.5%, and 48.5%, respectively.¹ The response rates in the current investigation were slightly lower than those for hip fractures stated above. Possible reasons for this are the short survey period of 2 months, and the effect from not sending up a follow-up reminder. However, the difference was not large, and the results of the analysis from the present responses are considered to have reliability comparable to that of the hip fracture surveys.

The period of hospitalization for spine fracture patients is long. In Canada, of 18 health conditions, spine fractures were among the top three in accounting for length of hospital stay, along with hip fractures and mental disorders.⁶ However, the percentage of spine fracture patients with symptoms who are hospitalized for treatment may vary considerably according to age, sex, or differences in medical practices or circumstances by country; for example, the difference in medical insurance systems must affect the treatment of the spine fractures, although much remains unclear.

According to the present survey, Japanese orthopedic surgeons hospitalize 39.5% of the elderly spine fracture patients who they examine. In a national survey in Spain, which was the only nationwide survey in America and European countries, it was found from the 2002 National Hospital Discharge Register that identified cases with spine fractures attributable to osteoporosis amounted to a hospitalization rate of 2.76 cases per 10 000 population aged >30 years, and these cases represented 0.15% of all hospital admissions nationwide.⁷ However, it is difficult to compare this rate with our results.

It is not easy to diagnose accurately, using plain radiography, new spine fractures that occur with osteoporosis. According to our earlier study, in which we examined the diagnostic rate with plain radiography for new fractures in the elderly spine, the correct diagnosis rate by five orthopedic surgeons and two radiologists, with MRI diagnosis as the standard, was only 25%.⁸ The same trend was observed in the present survey, in which 72.5% of hospitals said MRI was the most reliable for making diagnoses.

With regard to surgery, 30.3% of hospitals responded that they performed surgery for elderly spine fracture patients. Of the 1403 elderly spine fracture patients who were under hospitalization on the day of response, 109 (7.8%) were surgical patients, but this rate was clearly higher than the low rate of 1.5% reported in the other surveys.^{6,7} In Japan, the material used for vertebroplasty is bone cement in a small number of cases, with the mainstream choice still being other materials (e.g., calcium phosphate paste, hydroxyapatite granules). Although surgery for elderly spine fracture patients should be as minimally invasive as possible,^{9,10} the number of hospitals that perform vertebroplasty and the actual number of cases is still rather low, with a background reason being that the Japanese Ministry of Health, Labor, and Welfare has not yet approved this procedure, kyphoplasty, or the use of bone cement in vertebrae.

A prospective, randomized study for spine fracture patients without neurological deficit found that open surgery provided no major long-term advantage compared with nonoperative treatment.¹¹ Therefore, the current consensus regarding the indication for open surgery includes progressive neurological loss, severe unrelenting pain, and significant deformity.¹² It is unclear what percentage of elderly patients fit these indications. In a retrospective study of 497 osteoporotic spine fracture patients, 10 with spinal cord compression underwent anterior decompression and stabilization

procedures.¹³ Obviously, the use of open surgery is greatly restricted in frail elderly patients because of its significant invasiveness.

With regard to bracing, a retrospective study of patients with thoracolumbar fractures suggested that braces might be important for pain control but probably did not change the long-term result.¹⁴ However, a systematic review to assess the effects of lumbar supports for treatment of nonspecific low back pain found limited evidence that lumbar supports were more effective than no treatment, so it is still unclear whether lumbar supports are more effective than other interventions.¹⁵ In the present survey, however, we found that 95.8% of hospitals use casting or bracing, showing that this technique retains a major role in conservative treatment in Japan.

Concerning pharmacological therapies, antiinflammatory analgesic plasters are a popular traditional treatment among Japanese, although they may not be a standard medicinal agent internationally. With regard to calcitonin, several randomized trials have demonstrated that calcitonin has a rapid analgesic effect; and they recommended that calcitonin be given for pain due to spine fractures.¹⁶ With the expectation of a similar effect, it also seems to be used at a high rate in Japan. With respect to NSAIDs, one meta-analysis found that they are effective for short-term symptomatic relief in patients with acute low back pain of all causes.¹⁷ NSAIDs are frequently used in Japan, either orally or in suppositories. However, an overwhelming 75.3% of hospitals selected NSAIDs in suppository form for analgesic treatment when pain was strongest, revealing a high level of trust in these drugs.

This study has several limitations. First, the response rate was about 40%. Second, the survey was conducted among hospitals authorized by the JOA and JCOA. Inpatient treatment for elderly patients with spine fractures, however, is done not only at those hospitals but also at nonaffiliated hospitals. Therefore, it was not possible to make an accurate estimate of the number of inpatients with spine fractures in Japan. Although these limitations could cause some bias, the large number of patients and hospitals in this study may in some measure compensate for any such bias.

Conclusion

We conducted the first nationwide survey in Japan on trends in the treatment of spine fracture patients ≥ 65 years of age. The results showed that there were 3.1 spinal fracture patients per hospital at the time of the survey, which accounted for 13.5% of all orthopedic surgery inpatients. Of this number, 91.9% underwent conservative treatment. Surgical treatment was mainly

done with a posterior method at one-fourth of hospitals. Vertebroplasty was conducted at 16.7% of hospitals. MRI was far and away the most trusted diagnostic imaging technique, and it was found that bracing, mainly with corsets, was in general use. The status of pain relief treatment and rehabilitation was also revealed. This study provides basic data that will contribute to the current thinking about how to improve spine fracture treatment and make it more efficient.

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Original article

Nationwide one-decade survey of hip fractures in Japan

HIROSHI HAGINO¹, KEIZO SAKAMOTO², ATSUSHI HARADA³, TOSHITAKA NAKAMURA⁴, YOSHITERU MUTOH⁵, SATOSHI MORI⁶, NAOTO ENDO⁷, TETSUO NAKANO⁸, EIJI ITOI⁹, KIYOSHI KITA¹⁰, NORIAKI YAMAMOTO¹¹, KIYOSHI AOYAGI¹², and KAORU YAMAZAKI¹³ for the Committee on Osteoporosis of The Japanese Orthopaedic Association

¹School of Health Science, Tottori University, 86 Nishi-Cho, Yonago, Tottori 683-8503, Japan

²Department of Orthopaedic Surgery, Showa University School of Medicine, Tokyo, Japan

³Department of Advanced and Restorative Medicine, National Center for Geriatrics and Gerontology, Aichi, Japan

⁴Department of Orthopaedic Surgery, School of Medicine, University of Occupational and Environmental Health, Fukuoka, Japan

⁵Department of Physical and Health Education, Graduate School of Education, The University of Tokyo, Tokyo, Japan

⁶Department of Bone and Joint Surgery, Seirei Hamamatsu General Hospital, Hamamatsu, Japan

⁷Division of Orthopedic Surgery, Department of Regenerative and Transplant Medicine, Niigata University Graduate School of Medical and Dental Sciences, Niigata, Japan

⁸Department of Orthopaedic Surgery, Tamana Central Hospital, Tamana, Kumamoto, Japan

⁹Department of Orthopaedic Surgery, Tohoku University Graduate School of Medicine, Sendai, Japan

¹⁰Kita Orthopaedic Clinic, Kobe, Japan

¹¹Department of Orthopaedic Surgery, Niigata Rehabilitation Hospital, Niigata, Japan

¹²Department of Public Health, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan

¹³Department of Orthopedic Surgery, Iwata City Hospital, Iwata, Japan

Abstract

Background. To elucidate the characteristics of hip fractures and the current status of their treatment in Japan, the Japanese Orthopaedic Association (JOA) conducted a nationwide hip fracture survey from 1998 to the present. The aim of the current report was to present the changes in patient distribution by age and fracture type, cause of fracture, treatment selection, and duration of hospitalization for a study period of one decade.

Methods. A tally of all hip fractures that occurred in patients between 2001 and 2008 was conducted in JOA-authorized hospitals and in Japanese Clinical Orthopaedic Association (JCOA) hospitals. Registration forms were sent to these hospitals each year, and registration was performed based on their hospital records.

Results. The mean response rate was 51.8%, and the total number of patients aged ≥ 35 with new hip fractures between 2001 and 2008 was 402 760. A drastic increase in the number of patients, especially those aged ≥ 90 was observed over the course of the decade. More trochanteric fractures occurred than neck fractures during the observational period; however, the neck/trochanter ratio increased over time. Simple falls were the most common cause of fracture. About 94% patients were treated surgically with about a 5-day presurgical hospital stay, and the mean hospitalization period was 40.7 days in 2008.

Conclusions. This one-decade survey demonstrated a drastic increase in the number of patients over the course of the decade in Japan. Appropriate treatment and prevention of hip frac-

tures, including the treatment of osteoporosis and more effective interventions for preventing falls, are important issues to address to reduce the burden of this fracture.

Introduction

Hip fractures are not only the most significant osteoporotic fracture in terms of health outcome or quality of life, they also account for a substantial proportion of health service expenses. As a result of the aging population in most industrialized countries, the burden of this fracture type on our health care systems is increasing, and the absolute number of hip fractures is expected to rise significantly over the next few decades.

A growing number of epidemiological surveys have shown a recent exponential increase in the number of hip fractures among various ethnic groups. It is well known that the incidence of hip fractures in northern Europe or North America is substantially higher than that in Asian counties; however, whereas this incidence was once increasing in Europe and America, it has now plateaued or is decreasing.^{1,2} On the contrary, it has been reported that hip fracture incidence increased steadily from 1986 to 2006 in Japan,³ which agreed with most other studies from Asia. It is estimated that the annual number of hip fractures worldwide will be 2.6 million by the year 2025, and the number of hip fractures could range between 7.3 and 21.3 million by 2050.⁴ Although Europe and North America account for about one-half of all hip fractures among elderly people today, this proportion will fall to around one-fourth in 2050,