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Original Article

Survey of hip fractures in Japan: Recent trends in prevalence and treatment

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ABSTRACT

Background: A nationwide survey of hip fractures by the Japanese Orthopaedic Association (JOA) from 1998 to 2008 found a drastic increase in incidence. The aims of this study were to elucidate the status of hip fractures from 2009 to 2014 and to survey the causes for delayed surgery.

Methods: A tally of all hip fractures that occurred in patients from 2009 to 2014 was conducted in hospitals authorized by the JOA or in clinics with inpatient facilities of the Japanese Clinical Orthopaedic Association (JCOA). A survey of the causes for delay in surgery was conducted at 849 sites and 526 sites participated.

Results: A total of 488,759 hip fractures were registered. Increases in incidence from 2009 to 2014 were prominent in the 90–94-year-old age group among women and the 85–89-year-old age group among men. More trochanteric fractures than neck fractures occurred; however, the neck/trochanter ratio increased over time. The mean duration of preoperative hospital stay was 4.8 and 4.5 days, and the mean duration of hospitalization was 40.5 and 36.8 days in 2009 and 2014, respectively. There were significant differences between patients who waited for surgery up to 3 days and those who waited longer than 3 days in date of hospitalization, fracture type, comorbidities, anticoagulant use, surgical procedure, type of physician who administered anesthesia, type of anesthesia, and operating room schedule. Physicians in charge of each patient who waited for surgery for more than 3 days most frequently cited difficulties in securing operating rooms as the cause for delayed surgery.

Conclusion: A drastic increase occurred in the number of patients with hip fractures with time in Japan. One problem in the treatment of hip fractures is the long waiting time from hospitalization to surgery resulting from difficulties in securing operating rooms.

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1. Introduction

A hip fracture is a serious complication of osteoporosis. The burden of osteoporosis in patients with hip fracture, which involves economic costs as well as morbidity and premature mortality, is

now well recognized. The incidence of hip fracture increases as the population of elderly individuals increases, since hip fracture incidence rates increase exponentially with age. The total number of hip fractures in men and women in 1990 world-wide was estimated to be 338,000 and 917,000 respectively and is expected to approximately double from 1.26 million to 2.6 by the year 2025, and increase to 4.5 million by the year 2050 [1]. In 1990, 26% of all hip fractures occurred in Asia; by the year 2050, more than 50% of all hip fractures are projected to occur in Asia [2].

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The total population of Japan is projected to decrease until 2050, but a substantial increase in the proportion aged 85 years and over is expected. Therefore, the annual number of patients with new hip fractures in Japan was estimated to be approximately 190,000 in 2012 and 320,000 in 2040 based on the incidence previously reported [3]. The Japanese Orthopaedic Association (JOA) performed a nationwide survey of hip fractures annually from 1998 to 2014 to elucidate the current status of hip fractures in Japan. A survey from 1998 to 2008 found a drastic increase in the number of patients as well as a decrease in the length of hospital stay and preoperative hospital stay. However, the mean duration of preoperative hospital stay was 4.9 days longer than recommended [4–6]. The current study has two aims: to elucidate the status of hip fractures from 2009 to 2014 and to survey the causes for delayed surgery.

2. Patients and methods

2.1. Ethical approval

Approval was obtained from the JOA ethics committee.

2.2. Survey of all hip fractures

2.2.1. Patients

A tally of all hip fractures that occurred between 2009 and 2014 that were treated in hospitals authorized by JOA or in clinics with inpatient facilities of the Japanese Clinical Orthopaedic Association (JCOA) was conducted. Femoral neck and trochanteric fractures in patients aged 35 years or over were included. Pathological fractures due to neoplasm or infection and removal of implants were excluded. Cases of re-fracture were included but cases of re-operation due to delayed union or non-union were excluded.

2.2.2. Methods

There were 1983, 2007, 1994, 1993, 1996, and 1953 JOA-authorized hospitals and 1033, 1004, 940, 933, 912, and 853 clinics with JCOA inpatient facilities in 2009, 2010, 2011, 2012, 2013, and 2014, respectively. Registration forms were sent to these hospitals by mail each year and registration was performed by staff at each hospital (including orthopedic surgeons) based on their hospital records. Registration information included gender, age, date of fracture, date of first hospital visit, fracture site, fracture type, fracture location (indoors or outdoors), cause of injury, treatment, and duration of hospitalization. To avoid duplication, cases where patients were admitted and transferred to another hospital to receive surgical treatment or transferred to the hospital for rehabilitation from another hospital where surgical treatment was performed were checked.

Causes of injury were divided into six categories: in bed, simple fall, fall on stairs, traffic accident, unrecalled, and unknown. “In bed” refers to fractures that occurred while lying in bed. Simple fall describes falling from standing height or from a bed. Unrecalled indicates that the patient did not remember the injury. Unknown denotes that the information could not be obtained from the patient as a result of some difficulty, such as dementia. We defined care fractures as fractures that occurred during activities involving the care of bed-ridden patients, for example, diaper changing and bed baths, which were included in the “in bed” category.

The duration of hospitalization was calculated for the hospital at which the patient was treated just after the injury. The date of surgery was used to calculate the length of hospitalization before surgery.

2.3. Survey of the causes for delay in surgery

2.3.1. Patients

The survey was conducted at 849 sites where at least 20 patients with hip fractures were surgically treated in 2007. First, the sites were asked whether they would participate in this study in a preliminary survey. A total of 694 sites (81.7%) responded and 526 sites (77.2%) agreed to participate.

Patients with hip fractures that were surgically treated at participating sites from July 1, 2008 to December 31, 2008 were included. Patients who were admitted to hospitals at least three days after the occurrence of the fracture, patients who experienced re-fracture on the same side (trochanteric fracture after neck fracture, re-operation for reasons including non-union) and patients with pathological fractures caused by tumors were excluded. From the sites where 20 to 49 patients with hip fractures were surgically (the 20 group) treated in 2007, five patients were prospectively registered. For sites that treated 50 or more patients (the 50 group), 10 were prospectively registered.

2.3.2. Methods

The following variables were surveyed: age, gender, date of fracture, date of hospitalization, date of surgery, comorbidities, surgical procedure (osteosynthesis, hemiarthroplasty, or joint replacement), anticoagulant use, type of physician who administered anesthesia (anesthesiologist, orthopedic surgeon, or surgeon), anesthesia type (spinal, epidural, general, or other), use of operating rooms (whether surgeries were performed during normal operating room hours or not), waiting time (from hospitalization to entering the operating room), major reasons for a long waiting time in patients who waited for ≥ 72 h (up to three of the following reasons can be selected: anesthesiologist availability, surgeon availability, difficulty in securing an operating room, comorbidities, anticoagulation therapy, and other).

2.4. Statistical methods

Significant differences between the two groups were tested using the Wilcoxon test for paired values, such as the number of patients with fractures on the right or left side each year, and the Mann–Whitney U test for unpaired values. The proportion of patients in the two groups was compared using the chi-square test. In the analysis of factors associated with extended surgery wait time, multiple logistic regression analysis was performed for the variables identified in the univariate analysis. Statistical analysis was performed using SPSS (SPSS II for Windows, version 11.0.1J; SPSS Japan Inc., Tokyo, Japan) and $p < 0.05$ was considered statistically significant. Patient data obtained between 1998 and 2008, included in our previous report [4], were included in this analysis.

3. Results

3.1. Survey of all hip fractures

3.1.1. Response rates and number of patients

A total of 488,759 fractures were registered. Response rates from 2009 to 2014 ranged from 53.9% to 63.3%, and the total number of patients aged 35 years or over with hip fractures registered each year is summarized in Table 1. Left-sided fractures were more common than right-sided fractures during the observation period. There were 3.6 times more women than men with fractures.

3.1.2. Age- and gender-specific patient totals

The total number of patients registered each year was calculated and divided into age groups for each gender. The number of

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