

## Gender differences in the clinical characteristics of traumatic spinal fractures among the elderly



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### ABSTRACT

In order to illustrate the epidemiology of traumatic spinal fractures among the elderly, with an emphasis on exploring gender differences in clinical characteristics, we retrospectively reviewed hospital records on all elderly patients with traumatic spinal fractures who were 60 years of age or older at two university-affiliated hospitals between January 2001 and December 2010. A total of 642 elderly patients with traumatic spinal fractures were identified, of whom 249 were male and 393 were female. Accidental falls from low heights were the most common cause of traumatic spinal fractures among the elderly (50.8%). Frequencies of falls from high heights and direct collisions with a blunt object were significantly higher in male than in female elderly patients ( $P < 0.05$ ). Frequencies of falls from low heights, daily life injuries and jolt injuries in female patients were significantly higher than in male patients ( $P < 0.05$ ). There were 984 vertebral body fractures, with the thoracolumbar segment involved in 60.3% of cases (227/984). Frequencies of cervical spinal fractures, spinal cord injuries, associated non-spinal injuries (ASOIs) and mean injury severity scores (ISSs) were significantly higher in males than in females ( $P < 0.05$ ). Frequencies of thoracic and thoracolumbar spinal fractures in females were significantly higher than in males ( $P < 0.05$ ). Clinicians should make their diagnoses and direct their injury prevention strategies according to gender differences in the clinical characteristics of traumatic spinal fractures among the elderly.

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### 1. Introduction

Aging, along with age-related changes in the biomechanical characteristics of the vertebral column, has resulted in an increased incidence of spinal fractures among the elderly (Ehara & Shimamura, 2001; Kannus, Niemi, Palvanen, & Parkkari, 2000). Injuries in elderly patients are associated with higher mortalities and increased frequencies of life-threatening complications. This is particularly true for spinal fractures associated with spinal cord injuries (Dai, 2001; Gulati, Yeo, & Cooney, 2011; Hagen, Aarli, & Gronning, 2005). In recent years, there were many studies about the epidemiological features of traumatic spinal fractures (Jansson et al., 2010; Leucht, Fischer, Muhr, & Mueller, 2009; Lieutaud, Ndiaye, & Frost, 2010; Wang et al., 2012), but only a few articles about spinal fractures among the elderly were published, and there was no study that systematically illustrated the gender differences

in traumatic spinal fractures among the elderly (Ehara & Shimamura, 2001; Kannus et al., 2000). An understanding of gender differences in the clinical characteristics of traumatic spinal fractures among the elderly is essential for public resource allocation and primary prevention strategies. The purpose of this study was to investigate the demographic and injury characteristics of patients 60 years of age and older with traumatic spinal fractures, with an emphasis on comparing the clinical characteristics of male and female elderly patients.

We have undertaken a descriptive population study of elderly men and women. In order to improve our understanding of the gender differences in clinical characteristics, we attempted to answer three key questions: (i) what are the most common causes of spinal fractures among the elderly, and how do they differ between men and women; (ii) what is the most common location of spinal fractures among the elderly, and how does that differ between men and women; and (iii) is the mechanism of a spinal fracture associated with the location of the fracture, and is this phenomenon the same in men vs women. Within the limitations of a cross-sectional study, we have investigated these questions.

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## 2. Materials and methods

### 2.1. Study population

This study was a retrospective cross-sectional study using the data from the Military Hospital Information Registry Database gathered from January 2001 to December 2010. Data were collected from 2 hospitals affiliated with the Third Military Medical University in Chongqing, China, the 2 largest public tertiary hospitals located in the Shapingba district, which is a core district located in the northwest of Chongqing city. The research ethics board of the University Health Network approved the protocol for this study.

The data extracted from the original database for this study included general patient characteristics, mechanisms of trauma, anatomic distribution, neurologic deficit, multiple spinal fracture and ASOIs. ISSs (Osier, Baker, & Long, 1997) were used to classify injury severity and were assigned to all injuries noted in the diagnostic record of hospitalized patients with spinal fractures. The analysis focused on patient-related data (age at trauma incident, sex), cause of accident (fall from the high height  $\geq 2$  m or fall from the low height  $< 2$  m; traffic accident involving car, motorcycle, bicycle, or pedestrian; direct collision with a blunt object; daily life injury; farm work related injury; jolt injury and miscellaneous), fracture location, the number of fractured vertebral segments, spinal cord injury (SCI) according to American Spinal Injury Association (ASIA) classification, and ASOIs. The anteroposterior and lateral X-ray examination and CT scans were routinely performed to diagnose and classify the spinal fractures, CT three dimensional reconstruction and/or MRI examination will be performed when the spinal fracture presented with neurological deficit.

### 2.2. Statistical analysis

The results were expressed as means  $\pm$  SD. The 95% confidence interval (CI) was indicated with the frequency data. The results of time interval were presented as median [upper quartile, lower quartile]. All statistical analyses of data were performed using SPSS 15.0 and statistical analyses were conducted using the Student *t*-test and nonparametric tests to compare the means. Chi-square testing of frequency data was also performed where appropriate. A value of  $p < 0.05$  was taken to indicate a statistically significant difference.

## 3. Results

### 3.1. Demographics and epidemiology

A total of 642 elderly patients with traumatic spinal fractures were identified, of whom 249 patients (38.8%, 95% CI 35.0–42.1%) were males. One hundred and forty-five male patients (58.2% of the male patients) and 332 female patients (84.5% of the female patients) were diagnosed with osteoporosis when they were admitted. One hundred and forty male patients (96.5%) and 295 female patients (88.9%) presented with osteoporosis but did not take osteoporosis medication at the time of their injuries. The highest rate of spinal fractures was observed in patients from 60 to 69 years old with a rate of 53.0% (95% CI 49.1–56.9%), followed by patients 70–79 years old (36.8%, 95% CI 33.1–40.5%), patients 80–89 years old (9.7%, 95% CI 7.4–12.0%) and patients over 90 years old (0.6%, 95% CI 0.02–1.18%). The mean age of patients with traumatic spinal fractures was 69.7 years (range 60–92 years). The annual mean age of the patients rose gradually with their year of admission, from 65.4 years in 2001 to 70.0 years in 2010. For male elderly patients, the mean age rose from 65.8 years in 2001 to 70.1 years in 2010, and for female elderly patients, the mean age rose from 65.0 years in 2001 to 69.9 years in 2010.

The overall annual incidence of spinal fractures was  $(23.1 \pm 8.0)$  cases per 1,000,000 hospital admissions for elderly male patients and  $(34.8 \pm 16.0)$  cases per 1,000,000 hospital admissions for elderly female patients. The annual incidence rates rose gradually with the year of admission from 11.2 cases in 2001 to 36.0 cases per 1,000,000 hospital admissions in 2010 for elderly males and from 11.2 cases per 1,000,000 hospital admissions in 2001 to 55.4 cases per 1,000,000 hospital admissions in 2010 for elderly females (Fig. 1). Risk factors included smoking in 24 male patients, diabetes in 13 patients (5 male, 8 female), hypertension in 13 patients (4 male, 9 female), alcohol abuse in 7 male patients, a history of tuberculosis in 6 patients (4 male, 2 female), a history of tumors in 4 female patients and a history of hyperparathyroidism in 1 male patient.

### 3.2. Anatomical distribution

The study group (642 patients) consisted of 249 male and 393 female patients with 984 vertebral fractures. Spinal fractures were categorized into five anatomical regions: cervical (C1–C7), thoracic (T1–T10), thoracolumbar (T11–L2) and lumbar (L3–L5). The thoracolumbar segment was the most common region for

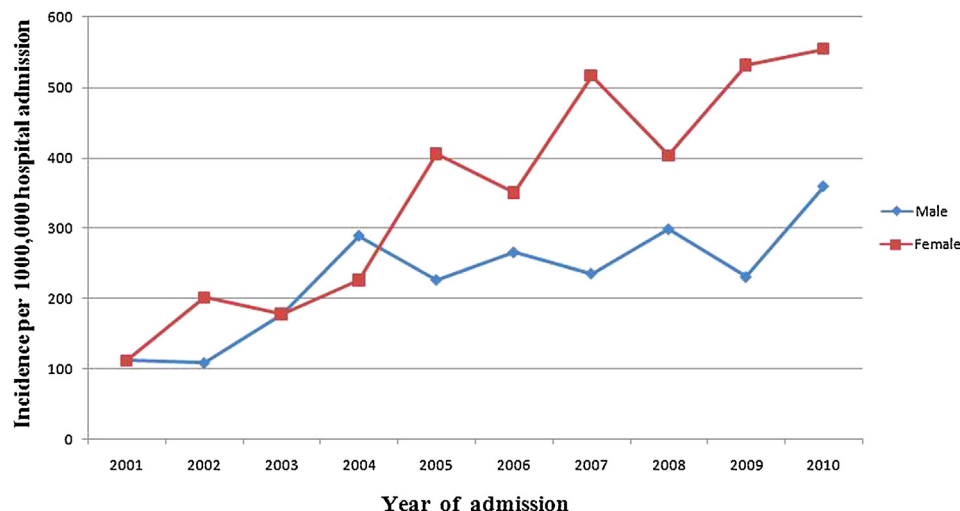


Fig. 1. Annual incidence of traumatic spinal fractures among the elderly according to gender from 2001 to 2010.

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