

# The clinical characteristics of hip fracture: during the novel coronavirus disease (COVID-19) epidemic

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## Research Article

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# Abstract

**Background** The aim of this study was to assess the characteristics of hip fracture during the novel coronavirus (COVID-19) epidemic.

**Method** Hip-fracture patients undergoing surgery from January 26 to March 31, 2020 (group A) and from January 26 to March 31, 2019 (group B) were retrospectively included. The durations from injury onset to hospital discharge, hospitalization cost, comorbidity, and complications of patients in the two groups were collected. The daily activity and light exposure time, and medical treatment interruption of patients in group A before and during their self-quarantine were also collected. In addition, the reasons for those with hospital admission delay were inquired.

**Results** During the COVID-19 epidemic, patients with hip fracture was increased by 9 cases (69.23%). Patients in group A underwent an over 20-hour longer duration from the injury onset to hospital, an over 3-day longer hospitalization stay, and more hospitalization cost of over 4-thousand yuan compared with those for patients in group B ( $P < 0.05$ ). The self-quarantine led to reduced daily activities ( $P < 0.001$ ), reduced light exposure time ( $P < 0.001$ ) and more medical interruption for hip-fracture patients. There were also slight more comorbidity number and perioperative complications for patients in group A compared with patients in group B. For those with a pre-hospital time more than 24 h, 58.33% feared go out for medical treatment because of the COVID-19 epidemic.

**Conclusion** During the COVID-19 epidemic period, the prevention and management of hip-fracture for the elderly require more attention for the public and medical care personnel.

## Background

The epidemic of novel coronavirus disease 2019 (COVID-19) has become a major public health challenge not only in China but also in countries around the world [1]. COVID-19 is characterized by insidious onset, high contagiousness, rapid and wide spread. As of April 19, 2020, COVID-19 has been recognized in 213 countries, with a total of 2,203,927 laboratory-confirmed cases and 148,749 deaths [2]. During the epidemic prevention and control period, all provinces and cities over China implemented strict population movement management to prevent the spread of the novel coronavirus. On January 24, 2020, the author's province launched the highest level response to major public health emergencies and strictly restricted the flow of people. As a result, the number of fracture patients with high-energy injuries such as traffic injury was less than that in the past. The number of low-energy fractures caused by fall down at home activities, however, was found to be increased. Hip fractures are mostly caused by fall down prone to the elderly [3], which is a major risk factor for disability, morbidity and mortality among older adults [4]. The aim of this study was therefore to analyze the characteristics of hip fracture during the COVID-19 epidemic, so as to improve the prevention and management of hip-fracture patients under the pandemic incident all over the world.

# Methods

## Subjects

This study protocol was in line with the ethical guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of our institution. Written informed consent from the enrolled patients had been acquired previously. We retrospectively collected all hip-fracture patients undergoing surgery from January 26, 2020 to March 31, 2020 and defined them as group A. Patients with hip fracture undergoing surgery from January 26, 2019 to March 31, 2019 were also collected and defined as the control group B. All patients' data were from our institution. The inclusion criteria were 1) confirmed diagnosis of hip (femoral neck, intertrochanteric, subtrochanteric) fractures; 2) patient age  $\geq 60$  years; 3) patients with independent daily activities before injury. Exclusion criteria included 1) pathological fracture; 2) hip fractures caused by high-energy mechanisms, such as falls from the height or traffic accident.

## Data collection

The clinicopathological parameters were collected to compare the differences between groups A and B, including age, sex, durations from injury onset to hospital and from admission to surgery, duration of hospitalization stay, hospitalization cost, laboratory examination results (hemoglobin, albumin, potassium ion, sodium ion) on admission, type of fracture and operation, combined internal diseases, and perioperative complications. At the same time, the daily activity time, light exposure time and medical treatment interruption of patients in group A were collected before and during the self-quarantine. In addition, for those with hospital admission delay, the reasons were also inquired.

## Diagnosis and treatment

The diagnosis of hip fracture was confirmed by the pelvic X-ray examination. Before the operation, all patients underwent laboratory and imaging routine examinations. Those presenting with medical comorbidity or complication received active conservative treatment before or after surgery. Blood test and chest CT scan were also used as routine examinations for patients requiring admission. In addition, patients in group A were screened for the epidemiological history and common symptoms of COVID-19 such as fever, dry cough, and dyspnea. Those without infection of the novel coronavirus will be treated in the general orthopedics ward.

All patients underwent spinal anesthesia. Surgical methods including fixation of proximal femoral nail antirotation (PFNA), artificial femoral head replacement and total hip replacement were selected according to the patient's fracture type, age, and ability to move before injury. After operation, routine nursing, antibiotic treatment, analgesia, prevention of thrombus, and functional exercise were performed. Patients with perioperative complications should be treated accordingly.

## Statistical analyses

All the statistical analyses were performed using the SPSS Version 21.0 software (IBM Corporation, Armonk, New York, USA). Measurement data with normal distribution were presented as mean  $\pm$  standard deviation and analyzed by the independent- or paired-sample Student's t test. Measurement data with abnormal distribution were presented as median (first quartile, third quartile) and analyzed by the Mann-Whitney U test. Counting data were analyzed by the Fisher's exact test or the Mann-Whitney U test. P value  $<0.05$  was regarded as statistically significant.

## Results

### Baseline characteristics of hip-fracture patients during the COVID-19 epidemic

There were a total of 22 patients (group A) in January 26, 2020 to March 31, 2020 and 13 patients (group B) during the same period a year ago undergoing surgery for hip fracture. An increase of 9 cases of hip fracture during the COVID-19 was observed, with an increase rate of 69.23%. The detection results of the patients for the novel coronavirus were all negative. Patients in group A included 12 females (54.5%) and 10 males (45.5%) with an average age of 78.82 years. Patients in group B included 9 females (69.2%) and 4 males (30.8%) with an average age of 83.54 years. There was a statistically significant difference ( $P < 0.05$ ) regarding age between patients in the two groups. Patients in group A underwent an over 20-hour longer duration from the injury onset to hospital in average compared with that for group B patients, the difference of which was significant ( $P < 0.05$ ). There was also a longer duration from the admission to surgery for patients in group A, though without a significant difference ( $P > 0.05$ ) compared with that for patients in group B. Moreover, the hospitalization stay for group A patients was also significantly prolonged by over 3 days compared with that for patients in group B ( $P < 0.05$ ). As a result, the hospitalization cost for group A patients was significantly increased by over 4-thousand yuan compared with that for patients in group B ( $P < 0.05$ ). Blood test results revealed that the patients in group A had significantly lower albumin level than that in group B patients ( $P < 0.05$ ). In group A, 63.64% patients suffered femoral neck fracture, followed by 31.82% patients of intertrochanteric fracture and 4.55% patients of subtrochanteric fracture. In group B, there were less patients with femoral neck fractures, and relatively more with intertrochanteric fracture or subtrochanteric fracture. The difference of fracture types between the two groups was not significant ( $P > 0.05$ ). There were 12 patients in group A and 9 patients in group B with at least one comorbidities, including cardiovascular disease, diabetes mellitus, cerebrovascular disease, renal disease and Parkinson's disease. However, there was no statistically significant difference regarding the comorbidity number between the two groups (Table 1).

### Surgery and complications

In group A, 8 patients underwent PFNA, 11 artificial femoral head replacement and 3 total hip replacement. In group B, 7 patients underwent PFNA, 5 patients femoral head replacement, and 1 patient total hip replacement (Table 1). There was no significant difference regarding the operation type between the two groups. Perioperative complications occurred in 8 patients in group A, including 3 cases of pulmonary infection, 2 cases of urinary infection, 2 cases of deep vein thrombosis, and 1 case of

pressure sore. In group B, there was only 1 case with the complication of urinary infection. All complications were cured before discharge. The complication rate of group A (36.36%) is higher than that of the group B (7.69%), though without a significant difference (Table 1).

### **Daily routine of hip-fracture patients before and during self-quarantine**

The daily activity time, light exposure time and medical treatment situation of the patients in group A before and during the self-quarantine were shown in Table 2. Before the self-quarantine, the patients had daily activities for  $4.90 \pm 1.72$  hours/day, including daily household and physical activities. They had  $4.05 \pm 1.21$  hours sunshine exposure time per week and received regular medical consultations. During the self-quarantine period, however, the daily activity and light exposure time were significantly reduced by over 2 hours in average ( $P < 0.001$ ). At the same time, because of the fear of contact infection of novel coronavirus and insufficient medicines in hospitals, 7 of the 23 (30.43%) patients stopped their regular medical treatment.

Further investigations on the duration from injury onset to hospital of hip-fracture patients during the COVID-19 epidemic revealed that there were 10 cases within 24 hours, with an average of  $9.8 \pm 4.4$  hours, and 12 cases with more than 24 hours, with an average of  $144.92 \pm 187.78$  hours. For those with a pre-hospital time more than 24 hours, 58.33% feared go out for medical treatment because of the COVID-19 epidemic. 16.67% refused to be admitted to the hospital because of the slight symptoms. Another 16.67% was delayed to be known of the injury by their families because they lived alone. There was also one patient (8.33%) delayed because of the inconvenient transportation (Figure 1).

## **Discussion**

During the COVID-19 period, almost all people in China were ordered to be under self-quarantine at home. It was noted that the incidence of senile hip fracture was found to be increased by 9 cases compared with the same period last year, with an increase rate of 69.23%. Hip fracture in the elderly not only increases the patient's suffering, disability and mortality, but also puts a huge financial burden on their families, the health care system and the society [5, 6], especially during the COVID-19 period, when many hospitals' medical resources are in a tight situation. Therefore, the risk prevention and patient management of hip fracture require more attention during the COVID-19 epidemic.

The majority of hip fractures are caused by fall down among older people, as was the investigation results in this study. The coexisting chronic disease, which is increasing in prevalence with the age, may prone the elderly to falls or reduced bone strength, leading to higher risks for hip fractures [7]. In our study, 72.7% of hip-fracture patients during the COVID-19 period had at least one chronic disease. Since the outbreak of novel coronavirus, the regular medications affecting the central nervous or cardiovascular systems may be unavailable, leading to increased risks of fall down and hip fracture via slowing their cognitive, reflex reaction alertness and orthostatic hypotension.

In clinical trials, physical activity has been found to reduce falls and fractures through greater muscular strength and improved balance [8-10]. Light exposure is also beneficial to reduce the incidence of hip fractures, via increasing the source of vitamin D, promoting calcium absorption which are all crucial for bone health and muscle performance [11, 12]. Before the novel coronavirus epidemic, the patients in group A had outdoor activities for almost 5 hours and exposed them under sunshine for over 4 hours. During the epidemic, the reduced outdoor activities and light exposure time weakened their musculoskeletal conditions, increasing the risk of fall down and the occurrence of fractures.

In our study, the pre-hospital time of hip fracture from injury to admission in the elderly during the COVID-19 epidemic period was over 20-hour longer than that in the normal period. One considerable reason was that people were afraid of the COVID-19 infection especially when exposed to the hospital. Another reason was that the elderly living alone during the COVID-19 period were less visited by their children, delaying the time to the hospital. The isolation caused inconvenient transportation could not also be neglected. In addition, the duration from admission to surgery and the hospitalization stay were also prolonged. That was attributed on one hand to the management of progressed underlying disease, on the other hand to delayed admission induced complications of hip fractures, including pulmonary and urinary infections, deep vein thrombosis and pressure sore. The hospitalization cost as a result was increased. Previous studies have also found that long surgical delay increases the time of hospital stay and the risk for mortality and some medical complications [13]. A recent meta-analysis on the other hand concluded that early surgery was associated with a lower risk for death and lower rates of postoperative pneumonia and pressure sore [14]. Therefore, enhanced management of the underlying diseases and fall-prevention publicity for the elderly, and improved efficiency of pre-hospital and emergency medical care for patients with hip fracture are required during the COVID-19 epidemic.

Our study has limitations. Firstly, it was a single center research with relatively small sample size. Secondly, the effect of surgical delay on long-term clinical outcomes need to be further investigated.

## Conclusions

In conclusion, during the COVID-19 epidemic period, it is necessary for the elderly to maintain appropriate activities at home under security protection. Network consultation is recommended for people requiring for regular management with chronic diseases. For the cases with persistent pain and restricted mobility after falling down, the family members should help the elderly to go to the hospital in time under the premise of good protection.

## Abbreviations

COVID-19:the novel coronavirus; PFNA: proximal femoral nail antirotation

## Declarations

## **Ethics approval and consent to participate**

This study protocol was in line with the ethical guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Fujian Provincial 2nd People's Hospital, China. Written informed consent from the enrolled patients had been acquired previously.

## **Consent for publication**

Written informed consent was obtained from the patients for publication of this research and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

## **Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## **Competing interests**

All authors declare that they have no competing interests.

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## **Authors' contributions**

Each of the authors has participated in the research for this paper. HJZ processed data, participated in the study design, and drafted the manuscript. ZPL, HMS and WH collected the data. DRN, SG and JPZ designed the study. JFZ supervised the whole study process, and helped to review the manuscript. All authors read and approved the final manuscript. The manuscript has not been submitted elsewhere for publication.

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## Tables

Due to technical limitations, Tables 1-2 are only available as a download in the supplemental files section

## Figures

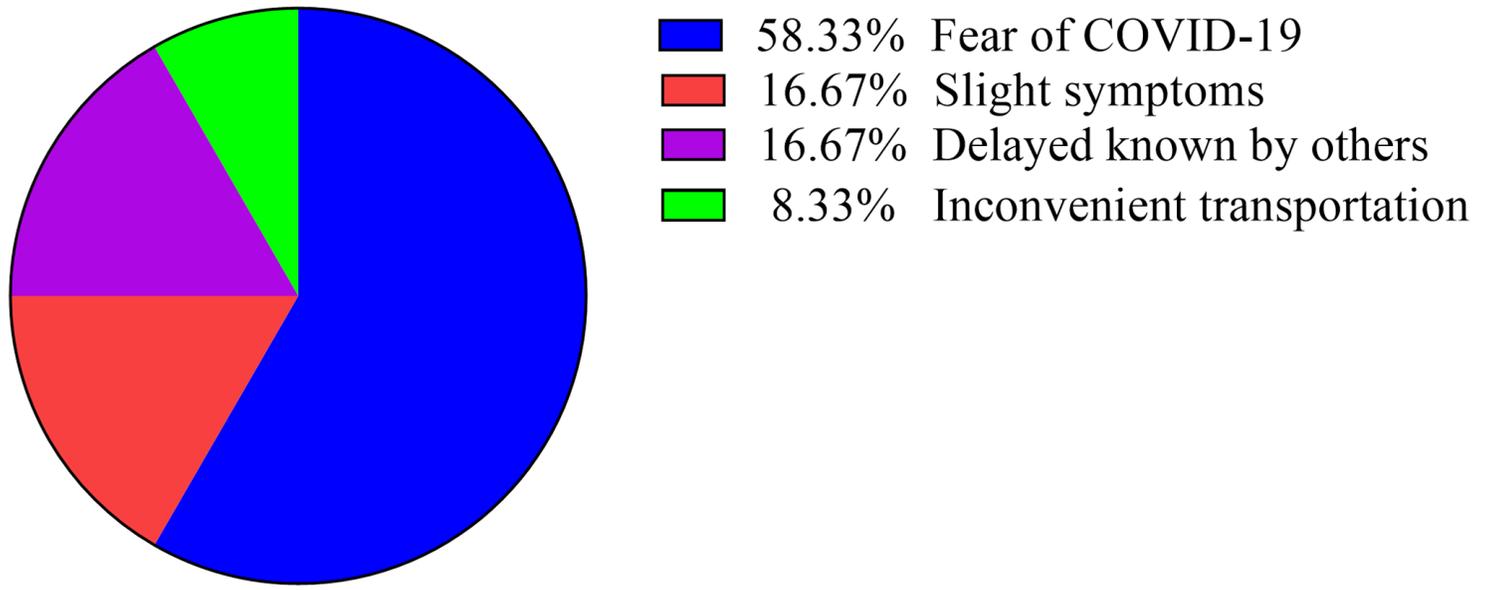


Figure 1

The reasons for hospital-admission delay of hip-fracture patients during the COVID-19 epidemic

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Table1.xlsx](#)
- [Table2.xlsx](#)