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ORIGINAL ARTICLE

Surgical Versus Nonsurgical Treatment of Femur Fractures in People With Spinal Cord Injury: An Administrative Analysis of Risks

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Abstract

Objective: To assess the risks associated with surgical and nonsurgical care of femur fractures in people with spinal cord injury (SCI).

Design: Retrospective cohort study; an analysis of Veterans Affairs (VA) data from the National Patient Care Database.

Setting: Administrative data from database.

Participants: The cohort was identified by searching the administrative data from fiscal years 2001 to 2006 for veterans with a femur fracture diagnosis using the *International Classification of Diseases, 9th Revision, Clinical Modification* codes. This group was subdivided into those with (n=396) and without (n=13,350) SCI and those treated with and without surgical intervention.

Interventions: Not applicable.

Main Outcome Measures: Rates of mortality and adverse events.

Results: The SCI group was younger with more distal fractures than the non-SCI group. In the non-SCI population, 78% of patients had associated surgical codes compared with 37% in the SCI population. There was higher mortality in the non-SCI group treated nonoperatively. In the SCI population, there was no difference in mortality between patients treated nonoperatively and operatively. Overall adverse events were similar between groups except for pressure sores in the SCI population, of which the nonoperative group had 20% and the operative had 7%. Rates of surgical interventions for those with SCI varied greatly among VA institutions.

Conclusions: We found lower rates of surgical intervention in the SCI population. Those with SCI who had surgery did not have increased mortality or adverse events. Surgical treatment minimizes the risks of immobilization and should be considered in appropriate SCI patients.

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There are approximately 300,000 people in the United States living with spinal cord injury (SCI).[1] Improved medical care and higher life expectancy have changed the goals of medical care for this population beyond lifesaving measures to improving quality of life.

People with SCI are frequently osteoporotic, and this increases the risk of lower extremity fractures, commonly affecting the femur.[2-7] When a fracture occurs, the goals of treatment include restoration of preinjury function and avoidance of complications. The provider must also consider characteristics unique to people with SCI, including activities of daily living, mobility limitations, poor bone quality, impaired skin integrity, and potentially altered pulmonary mechanics. Historically, surgical treatment of lower extremity fractures has been associated with high complication rates in the SCI population, which has led many to advocate for nonoperative treatment.[3,4,8] However, nonoperative treatment is

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also associated with complications, including pressure ulcers, nonunions, increased spasticity, infection, and even loss of limb.[9-14] Additionally, nonoperative intervention may require a longer time with restrictions while awaiting the fracture to heal. These limitations impact key activities of daily living, such as transfers and driving, and some patients even require temporary institutionalization to accommodate their increased needs. These problems with nonoperative techniques have led to ongoing interest in surgical treatment, and several contemporary case series have demonstrated acceptable surgical results.[13,15,16] However, uncertainty persists, and there is a need for additional clinical evidence to guide practitioners in their treatment.

The overarching goal was to compare morbidity and mortality after operative and nonoperative treatment of femur fractures in a large cohort of patients from the Veterans Affairs (VA) hospital system. Our first objective was to determine if operative intervention results in higher rates of adverse events than nonoperative treatment in the SCI population. We hypothesized that surgical treatment would not be associated with an unacceptably high complication rate. Our second goal was to compare risks/mortality of femur fracture treatments between SCI and non-SCI veterans. We hypothesized that after femur fractures, the non-SCI population would have higher rates of adverse events and mortality than the SCI population. This is because femur fractures in the non-SCI population often occur in older adults and people who are frail. Our final goal was to assess the use of treatment modalities for femur fractures in the SCI population. Given the lack of clarity in the appropriate treatment for femur fractures in people with SCI, we think that variability will exist in the use of operative techniques across facilities.

Methods

Data source

Data were extracted from the National Patient Care Database from fiscal years 2001 to 2006. The database contains VA administrative data of clinical information on all outpatient and inpatient care in the VA system.

Study sample

The sample included any patient who had an inpatient stay with a primary diagnosis of femur fractures. The *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) diagnosis codes used to identify femur fractures were 820.x, 821.x, 733.15, and 733.14. Within this femur fracture group we evaluated 2 distinct cohorts. The first was SCI patients who had a femur fracture. We have already identified veterans with SCI in a previous work.[17] This group was identified using diagnosis codes consistent with SCI (344.0x, 344.1, 806x, 907.2, 952.x). To be considered an SCI patient, the SCI diagnosis had to be recorded in at least 1 face-to-face clinician visit (ie, not a telephone, laboratory, or pharmacy encounter). Sensitivity analysis showed that by increasing the requirement to at least 2 documented SCI encounters there would be a loss of <5% of the patients; thus, we did not impose stricter inclusion criteria. Patients with neurologic diagnoses such as multiple sclerosis, which could result in paralysis (335.24, 335.2, 340, 341.x), were excluded. The second group was patients without SCI who had a femur fracture.

Demographic variables included age, sex, and race. Veterans Health Administration administrative data are known to have a high proportion of individual records that are missing race values. To minimize unknown values for race, we checked if patients with unknown values have a known race value in other fiscal years and replaced them. Although we were able to replace some unknown values, the percentage of unknowns was still substantial.

Medical comorbidities for the cohort were assessed using the Charlson comorbidity index, which was dichotomized to a score of <2 for low comorbidity versus ≥ 2 for high comorbidity.[18]

List of abbreviations:

ICD-9-CM	***International Classification of Diseases, 9th Revision, Clinical Modification***
PSI	**patient safety indicator**
SCI	**spinal cord injury**
VA	**Veterans Affairs**

Exposure variables

Femur fractures were subgrouped into (1) proximal hip fractures, fracture of the neck of the femur (820.x), including intertrochanteric and pathologic fracture of the neck of the femur (733.14), and (2) other distal fractures, fracture of other unspecified parts of the femur (821.x) and pathologic fracture of other specified parts of the femur (733.15). Procedure ICD-9 codes 79.15, 79.25, 79.35, 78.55, 81.51, and 81.52 were used to identify those patients who underwent surgical intervention.

Outcome variables

Geographic variability in care for the SCI patients was assessed. We identified hospitals that performed surgeries and the facilities that had the first inpatient stay associated with a femur fracture diagnosis. A high volume surgery center was designated as a facility that performed >5 procedures, and a high volume treatment center had >5 femur fracture inpatient stays within the study period.

Mortality information was obtained from the Beneficiary Identification Records Locator Subsystem death file, which is the Veterans Benefits Administration database containing records of veterans known to be deceased. The database is updated on a monthly basis. Death dates come from multiple sources, including reports from family members applying for death benefits, Veterans Health Administration hospitals, and the VA National Cemetery Administration. Mortality after the diagnosis of femur fracture and any subsequent surgery (using the latest discharge, if patient had multiple stays) were calculated at different time periods.

We identified adverse event data by adapting the Agency for Healthcare Research indicators and the quality patient safety indicators (PSIs).[19] The PSIs were designed to identify postoperative complications in administrative data. For example, respiratory failure is identified if diagnosis codes for acute respiratory failure are present (eg, 518.81) or procedure codes, such as intubation, are present (9604). We chose the PSIs clinically relevant to our femur fracture cohort and the codes that would also be applicable for those who received nonoperative treatment. For the descriptive analysis we counted the presence of