Complications and institutionalization are almost doubled after second hip fracture surgery in the elderly patient.

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Abstract

Purpose

To determine patient and hip fracture characteristics, early postoperative complication rate and need for institutionalization at time of discharge from the hospital in patients treated for a second, contralateral hip fracture.

Methods

During a six-year period (2003-2009) seventy-one patients (60 women and 11 men; age range 54 – 94 years) underwent first hip fracture surgery and subsequent contralateral hip fracture surgery at our hospital. Variables including age, gender, American Society of Anesthesiologists Classification (ASA), AO fracture classification, time between both hip fractures, rate and severity of early postoperative complications and destination of discharge were obtained from the electronic medical records. Data from both hospitalization periods were compared.

Results

Forty-six percent of second hip fractures occurred within two years after the first hip fracture. Following first hip fracture surgery 13 patients had one or multiple complications compared to 23 patients after second hip fracture surgery (P= 0.02). The mean time (± SD) between first and second hip fracture in patients without complications after the second injury was 4.3 (± 4.2) years, compared to 2.6 (± 2.1) years in patients with complications after the second injury (P= 0.03). The mean ASA classification of patients without complications after second hip fracture surgery was 2.6 (± 0.6) versus 3.0 (± 0.6) in patients with complications (P= 0.04). After first hip fracture surgery 27 patients (38%) were discharged to an institutional care facility, whereas 72% of patients resided at an institutional care facility after a second hip fracture.

Conclusions

Early complication rate in patients sustaining a second, contralateral hip fracture was almost twice that documented after the first hip fracture. Following second hip fracture surgery, most patients resided in an institutional care facility.

INTRODUCTION

Hip fracture is a public health burden in elderly patients with repercussions that extend beyond the orthopedic injury into the domain of medicine, rehabilitation, psychiatry, social work, and health care economics[1]. There are over 300,000 hip fracture patients in the United States each year. Patients with mental illness, coexisting medical conditions and postoperative complications have a permanent reduction in activities of daily living and require postoperative discharge to an institutional care facility [2, 3]. After hip fracture, mortality risk is increased during the first three months 5 to 8 fold [4]. This excess risk also persists for several years thereafter [5, 6]. Of those who survive the first fracture, up to 16 percent subsequently sustains a fracture on the contralateral side [7, 8]. Assumed risk factors for such second, contralateral fracture include older age [7, 9, 10], weakened motor skills [11], weakened cognitive function [7, 12, 13], respiratory disease [12] and solitary life [14].

In contrast to the extensive documentation of the impact of a first hip fracture, the consequences of a second, contralateral hip fracture on the disability of these frail patients remain largely unknown. Limited data suggest that patients with a second hip fracture might have worse mobility shortly after the surgery compared with patients with a first fracture [15, 16]. In a recent study of 473 patients with a sequential hip fracture, the second injury was associated with greater loss of independent mobility and changes in residential status compared with single fractures at one-year follow-up [17]. However, Sawalha and Parker in their study of 633 patients who sustained a second, contralateral hip fracture, could not corroborate the decreased level of mobility at one-year follow-up [18]. The mortality rate in their cohort, on the other hand, was significantly higher after a second hip fracture at one year than after a first fracture. No data are available on the immediate postoperative outcome of patients after second hip fracture.

The specific aims of this study were to compare (1) patient and fracture characteristics of first and second, contralateral hip fractures, (2) the early postoperative complication rate in both groups, and (3) the need for institutionalization at time of discharge from the hospital of patients after surgery for a second, contralateral hip fracture with those of the same patients after their first hip surgery.

METHODS

Patient selection

The electronic medical records and X-ray images of all patients with hip fractures (ICD-10 code S72.0 or S72.1) operated between 2003 and 2009 in the St. Elisabeth Hospital (Tilburg, The Netherlands) were reviewed to identify patients who were treated for both a first and second, contralateral hip fracture. Patients under the age of 50 years at the time of injury, second, ipsilateral fractures and fractures following high-energy trauma were excluded from the study. 920 eligible patients underwent hip fracture surgery in the study period. Of these, 71 patients (prevalence 8%), 60 women and 11 men; age range 54 – 94 years, were treated for a second, contralateral hip fracture at our institute and were included in this study.

Data collection

The characteristics and outcome after the first and second fractures in the included patients were obtained from (1) the electronic medical record system and (2) a prospective complication database.

Data were collected prospectively in the electronic medical record system including patient age, gender, medical history, AO classification of the fracture and the appropriate ICD-10 and billing code recorded upon each admission to the emergency department, time of hospital admission, American Society of Anesthesiologists (ASA) classification [19] and time of surgery. Finally, the electronic medical record was reviewed for the complete postoperative course, including in-hospital complications and mortality, date of discharge and destination of discharge.

As for the prospective complication database, the standard definition of a complication as formulated by the Association of Surgeons of The Netherlands was used: 'A complication is any condition or event, unfavorable to the patient's health, causing irreversible damage or requiring a change in therapeutic policy'. Complications were coded prospectively according to the Trauma Registry of the American College of Surgeons Committee on Trauma (TRACS) [20]. In addition, a free-text description of the complication was also recorded. As prospective registration of complications is known to be often incomplete and inconsistent, in this study all patient records were fully reviewed for non-registered complications and all entries were checked. Early post-operative complications were defined as those occurring within 30 days of surgery. Complications were ranked according to the Clavien-Dindo classification based on a therapy-oriented, four-level severity grading (ranging from Grade I –

minor risk event not requiring therapy – to Grade IV – death due to a complication) [21]. In-hospital mortality and mortality within 30 days of surgery were scored separately. As this was a retrospective review, no actual patient follow-up visit for the specific purpose of this study took place.

Statistical analysis.

Statistical analysis was done using Statistical Package for the Social Sciences Statistics 18 (SPSS Inc., Chicago, Illinois). To compare complications in the 71 patients after their first and second hip fracture surgery with continuous data and a normal distribution, a paired Student's t-test was used. For nominal data following hip fracture surgery we used McNemar's test, a non-parametric test. ASA classification during first and second hip fracture surgery was compared using Wilcoxon's test. *P* values less than 0.05 were considered significant.

RESULTS

Patient and fracture characteristics (Table 1 and 2)

The mean time between first and second hip fracture was 3.4 ± 2.9 years (range 0.25 - 12.6 years). Forty-six percent of the second hip fractures occurred within 2 years after the first hip fracture. The percentage of intracapsular hip fractures was 63% for the first fracture and 59% for the second fracture (*P*=0.50). According to AO fracture classification no significant difference between the first and second hip fractures was found. The fracture-types were similar with respect to intra- or extra-capsular location in 52 patients (73%). The mean time from arrival at the hospital to surgery and the duration of hospital stay were similar after first and second hip fracture surgery.

The ASA classification prior to first hip fracture surgery was 2.4 (± 0.6) versus 2.7 (± 0.7) prior to second hip fracture surgery (*P*= 0.001). The mean ASA classification of patients without complications after second hip fracture surgery was 2.6 (± 0.6) versus 3.0 (± 0.6) in patients with complications (*P*= 0.04).

Table 1. Patient and fracture characteristics (n = 71 patients).

	First hip fracture	Second hip fracture	*P* value*
Gender (n (%))			
Female	60 (85%)	*Same patients*	-
Male	11 (15%)	*Same patients*	-
Age (years)			
Mean ± S.D.	80.0 ± 8.1	83.4 ± 7.7	<0.0001
Range	54 – 94	56 – 95	
Mean time between hospital admission and surgery (days)	0.9 ± 1.5	0.8 ± 1.0	0.56
Mean duration of hospitalization (days)	15.7 ± 15.4	13.4 ± 12.0	0.35
Type of fracture (n (%))			0.50§
Intracapsular	45 (63%)	42 (59%)	
Extracapsular	26 (37%)	29 (41%)	

Plus-minus values are means ± SD. *Student's t-test, §McNemar's test

Table 2. American Society of Anesthesiologists (ASA) classification of physical health (n = 71 patients).

	First hip fracture	Second hip fracture	*P* value*
ASA classification (n (%))			**0.001**
1	2 (3)	1 (1)	
2	42 (59)	24 (34)	
3	24 (34)	39 (55)	
4	3 (4)	7 (10)	
Total	71 (100%)	71 (100%)	

***** Wilcoxon's test

Postoperative complication rate (Table 3)

Following first hip fracture surgery 13 patients had one or multiple complications compared to 23 patients after second hip fracture surgery (*P*= 0.02). There was one patient with two complications after first hip fracture surgery (a urinary tract infection and wound infection) compared to four patients with two complications after second hip fracture surgery (technical failure and urinary tract infection; cardiac and technical failure; cardiac and deep wound infection; pneumonia and urinary tract infection). Out of the 13 patients with complications after first hip fracture surgery, only 5 had complications after the second fracture. Four of these 5 patients had complications after the second hip fracture surgery that were similar to the complication after first fracture (pulmonary, cardiac and two wound infections).

Six patients with second hip fracture died in the hospital, and one additional patient died within 30 days of the second fracture, thus the mortality within 30 days of surgery of the second hip fracture was 10%. According to the Clavien-Dindo classification, 1 grade III complication occurred after first hip fracture, compared to 7 severe complications, grade III and IV, after second hip fracture. The mean duration between first and second hip fracture in patients without complications after the second injury was 4.3 (± 4.2) years, and 2.6 (± 2.1) years in patients with complications after the second injury (*P*= 0.03).

Table 3. The 30-day postoperative complication rate comparing first hip fracture and second, contralateral hip fracture (n= 71 patients).

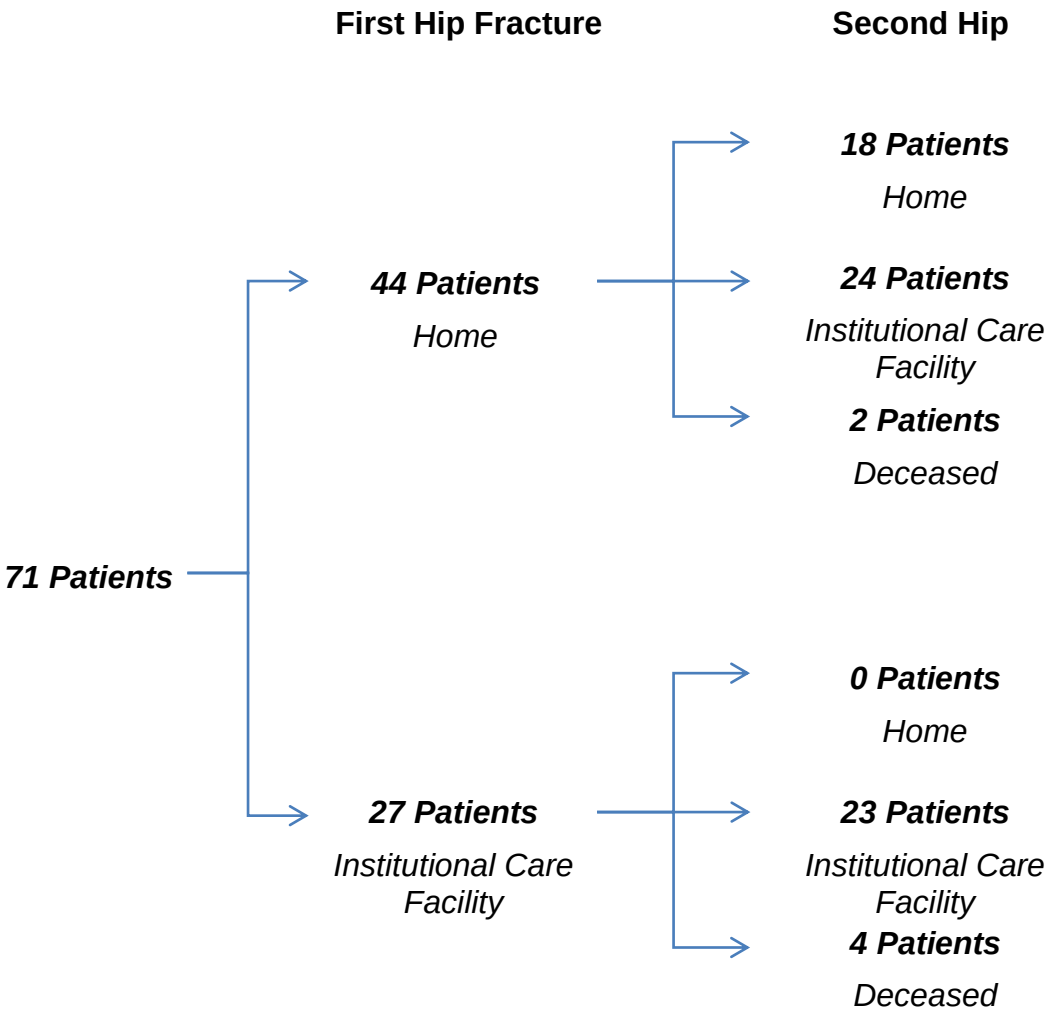
	First hip fracture (n=71)	**Second hip fracture (n=71)**	***P* value[§]**
Complications (n)	14	26	0.02
Patients with complications (n)	13	23	0.02
Type of complication (n)			
Cardiac	4	6	
Pneumonia	1	4	
Wound infection	4	5	
Urinary tract infection	4	2	
Dislocation – technical complication	1	2	
Severe complication leading to death (Type IV)		7	

§ McNemar's test, * 6 patients died during hospitalization, one patient died after discharge within 30 days.

Discharge institutionalization (Figure 1)

After first hip fracture surgery 27 patients (38%) were discharged to an institutional care facility, 44 patients (62%) returned to their original residence. After second hip fracture 24 patients who originally resided home were discharged to an institutional care facility and 23 of the 27 patients who already resided at an institutional care facility returned to the same residence. Eventually, 47 patients (72%) resided at an institutional care facility after the second hip fracture.

Figure 1. Destination outcome at discharge after first and second hip fracture



DISCUSSION

In the present study, we compared patient and fracture characteristics, early postoperative complication rate, and the need for institutionalization at the time of discharge from the hospital in seventy-one patients treated at our hospital from a consecutive series of 920 first hip fractures. It is well known that a major operation in elderly individuals results in functional decline [22, 23]. It could be postulated that the first hip fracture and its treatment in elderly might result in a persistent reduction in performance and physiological reserve as well. Such impairment of function in the older surgical patient is consistently identified as a predictor of subsequent poor postoperative outcome and the need for discharge to an institutional care facility [23-25]. Thus an optimal treatment to insure a mobile independent patient is of importance. Other factors for higher complication and mortality risks are advanced age, absence of a partner, dementia, a lower pre-fracture level of ADL independency or mobility problems [25-27]. Also ASA-classification due to diseases affecting generic health might be increased. It is unknown whether a second, contralateral hip fracture is associated with an additional risk of postoperative complications and institutionalization after discharge from hospital. Some use a discharge score at admission in these, often frail, fracture patients, to facilitate an optimal postoperative rehabilitation and expectation course for both patients and their family as well for the treating physicians [28]. We found that the characteristics of our cohort were similar to those reported in the literature so far: the majority of patients with hip fracture were female (85%); almost half of the second, contralateral hip fractures occurred within two years of the first hip fracture; and the anatomical classification of contralateral fractures was identical to the primary fracture in more than two thirds of patients [10, 29, 30] [12, 18] [18, 30, 31]. Approximately 8% of all hip fracture patients in our study sustained a second hip fracture, this is comparable to incidence rates found in the literature [7, 8, 10]. It could be possible that patients were brought to another institution for their second hip fracture. If so, the 8% could be an underestimate of the true incidence of second hip fractures. However, our hospital has a regional trauma function, therefore patients would have to relocate outside our region to be admitted to another hospital for their second fracture.

The 30-day mortality rate after second hip fracture in our study is comparable to previously determined mortality rate from a single hip fracture at our institute. In this previous study published in 2010 the hospital mortality of a similar cohort of patients operated for a single pertrochanteric femoral fracture in our hospital was 11% [32].

In our study, significantly more patients had postoperative complications after the second hip fracture than after the first hip fracture, with close to twice the number of complications per patient after second hip fracture surgery (table 3). In addition, complications were more severe, according to the Clavien-Dindo classification, after second hip fracture compared to those documented after first hip fracture. One explanation for this increased complication rate might be that patients were inevitably older at the time of the repeat injury and were hence more susceptible to medical complications. In our study, patients were on average 3.4 years older at the time of second hip fracture. Older age has been linked to increased mortality rate after second hip fractures [7, 10, 18, 25, 33]. The question raises whether age itself is an independent risk factor for postoperative complications, eventually resulting in death, or that more chronic comorbidity and reduced physiological reserves are the true independent risk factors. This last argument is supported by a significantly higher ASA-classification in patients with complications after a second fracture. However, the question whether age or ASA-classification contribute to a worse outcome after a second fracture, cannot be answered from the current data. In addition, no rigid method such as the Charlson Comorbidity Index which classifies comorbid conditions that might alter the risk of mortality has been used in the present study [34]. A logistic regression that corrects for all potential independent risk factors and confounders would be required, but is unreliable using the current data set. Although this is a limitation of our study, the mean age of patients with postoperative complications after second hip injury did not differ significantly from those without postoperative complications (83.3 ± 7.1 years versus 83.6 ± 8.1 years, respectively). More importantly, the time interval between both hip fractures was shorter in patients with postoperative complications after second hip fracture as compared to those without. It has been shown that fewer than half of ageing patients recover to their pre-illness levels of functioning one year following hospitalization for acute illness [35-37]. Therefore, the finding that those patients who required a second intervention sooner had more complications suggests that these patients were likely in a state of lingering reduced physiologic reserve after the first fracture, as suggested by the higher ASA classification in these patients. Such accumulated frailty in geriatric patients has been associated with increased susceptibility to postoperative complications and the need for institutionalization after discharge [24].

Another limitation of the present study is that reliable information on pharmacy usage was not available at the time of hospital admission. This is due to the retrospective nature of our study; therefore we performed no analysis of this presence of drugs-at-admission effect on

complications. Patients who are admitted with a second hip fracture often use five or more drugs daily [38]. Polypharmacy, combined with repeat immobility [39], indwelling devices such as urinary catheters [40] and a nutritional status that deteriorates during hospitalization [41] have been shown to put frail older patients at risk of hospitalization-associated disability with resultant loss of ability to live independently [37]. This phenomenon is supported by the observation in our study that only approximately one third of the patients was able to return to their own home after treatment for second hip fracture.

The finding that postoperative complications and institutionalization after discharge from the hospital are increased in patients sustaining a second, contralateral hip fracture has implications for clinical care. Patients that are admitted with a second hip fracture, especially those with a relatively short period between the two hip fractures, might be good candidates for targeted interventions such as acute care of elders units (ACE) or geriatric evaluation and management (GEM) units. In such units a multidisciplinary team takes primary role in patient care to reduce the incidence of complications. Such units have been shown to increase the likelihood of functional improvement by the time of discharge and lower the need for nursing home care [42]. The integration of individual consulting services such as physical therapy, occupational therapy and geriatrics into a multidisciplinary team has been particularly promising following hip fracture [37].

Given the detrimental impact of second hip fracture on elderly patients, secondary fracture prevention efforts are clinically justified. Randomized trials have shown that available osteoporosis therapies are effective in preventing secondary fractures [43, 44]. However, a considerable amount of patients who have sustained one hip fracture do not receive adequate pharmaceutical treatment for osteoporosis [45]. Poor compliance with oral bisphosphonate therapy and the short time between first and second fracture have been shown to diminish the efficacy of this treatment for secondary fracture reduction [46]. Therefore, in frail patients at particular risk of second, contralateral hip fracture (i.e. older age with weakened motor skills, visual impairment, dementia, respiratory disease, or solitary life after first hip fracture) alternative medical approaches such as an external mechanical protection with hip protectors might be considered [47] as well as balance training for patients [48]. A surgical option, although still in the experimental phase, is internal stabilization with bone cement or elastomer through femoroplasty of the contralateral hip during surgery of the first hip fracture is promising because of its instant protection potential and inherent compliance [49, 50].

In conclusion, the need for discharge institutionalization was increased and the early postoperative complications were almost doubled in patients sustaining a second, contralateral hip fracture compared to the first hip fracture. Prevention of these second hip fractures is urgently needed.

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