



## Short-term complications in hip fracture surgery using spinal versus general anaesthesia



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### ARTICLE INFO

Article history:  
Accepted 1 February 2015

Keywords:  
Hip fracture  
Anaesthesia  
General anaesthesia  
Local anaesthesia  
Complications

### ABSTRACT

**Background:** Spinal anaesthesia when compared to general anaesthesia has been shown to decrease postoperative morbidity in orthopaedic surgery. The aim of the present study was to assess the differences in thirty-day morbidity and mortality for patients undergoing hip fracture surgery with spinal versus general anaesthesia.

**Methods:** The American College of Surgeons National Surgical Quality and Improvement Program (NSQIP) database was used to identify patients who underwent hip fracture surgery with general or spinal anaesthesia between 2010 and 2012 using CPT codes 27245 and 27244. Patient characteristics, complications, and mortality rates were compared. Univariate analysis and multivariate logistic regression were used to identify predictors of thirty-day complications. Stratified propensity scores were employed to adjust for potential selection bias between cohorts.

**Results:** 6133 patients underwent hip fracture surgery with spinal or general anaesthesia; 4318 (72.6%) patients underwent fracture repair with general anaesthesia and 1815 (27.4%) underwent fracture repair with spinal anaesthesia. The spinal anaesthesia group had a lower unadjusted frequency of blood transfusions (39.34% versus 45.49%;  $p < 0.0001$ ), deep vein thrombosis (0.72% versus 1.64%;  $p = 0.004$ ), urinary tract infection (8.87% versus 5.76%;  $p < 0.0001$ ), and overall complications (45.75% versus 48.97%;  $p = 0.001$ ). The length of surgery was shorter in the spinal anaesthesia group (55.81 versus 65.36 min;  $p < 0.0001$ ). After multivariate logistic regression was used to adjust for confounders, general anaesthesia (odds ratio, 1.29; 95% confidence interval, 1.14–1.47;  $p = 0.0002$ ) was significantly associated with increased risk for complication after hip fracture surgery. Age, female sex, body mass index, hypertension, transfusion, emergency procedure, operation time, and ASA score were risk factors for complications after hip fracture repair (all  $p < 0.05$ ).

**Conclusions:** Patients who underwent hip fracture surgery with general anaesthesia had a higher risk of thirty-day complications as compared to patients who underwent hip fracture repair with spinal anaesthesia. Surgeons should consider using spinal anaesthesia for hip fracture surgery.

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### Introduction

Hip fractures occur in more than 1.6 million people worldwide each year, and this incidence will increase in the future due to the world's ageing population [1,2]. Given that hip fractures usually occur in elderly patients with multiple medical comorbidities, hip fracture surgery is generally a high-risk procedure, with high

morbidity and mortality rates reported [3–5]. Therefore, it is important to understand how to reduce the postoperative risk in these patients. Anaesthesia choice may be an important variable to help decrease morbidity in this patient population. Although hip fracture repair by orthopaedic surgeons is commonly performed, the optimal anaesthetic modality for this procedure remains to be determined. Due to this lack of consensus, choice of anaesthesia in hip fracture repair is to a large degree influenced by individual surgeon preference and hospital anaesthesia team capabilities [6].

Regional anaesthesia as compared to general anaesthesia in orthopaedic procedures has been shown to reduce rates of thromboembolism, blood loss, need for transfusion, operative time, and superficial wound infection [7–11]. Some studies examining regional anaesthesia for hip fracture surgery have

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shown a decrease in mortality and postoperative complications [12] while other studies have shown no difference in postoperative morbidity between the two anaesthesia modalities [13]. It has been hypothesized that regional anaesthesia can reduce postoperative complications in hip fracture patients by eliminating the need for mechanical ventilation and reducing blood loss [14].

Spinal anaesthesia is a specific type of regional anaesthesia. Few studies have assessed complication rates in hip fracture repair surgery with spinal compared to general anaesthesia. Some of these studies had small sample sizes or only assessed mortality [6,15,16]. To the author's knowledge, there has been no national multicenter, prospective comparison between general and spinal anaesthesia assessing morbidity and mortality after hip fracture repair.

The aim of the present study was to assess the differences in thirty-day morbidity and mortality in patients undergoing hip fracture repair with general and spinal anaesthesia. We used the American College of Surgeons National Surgical Quality and Improvement Program (NSQIP) to identify patients who underwent hip fracture repair in the years 2010, 2011, and 2012. We hypothesized that patients undergoing hip fracture repair with spinal anaesthesia would have lower thirty-day morbidity than patients undergoing the same procedure with general anaesthesia.

## Patients and methods

The American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) collects data from over two hundred hospitals from across the United States and tracks patients for thirty days postoperatively. A surgical clinical reviewer present at each participating hospital collects the data for the

NSQIP database. A random sampling of cases is input from each hospital and ACS NSQIP continuously audits their data to ensure high interrater reliability. To date, there have been numerous studies utilizing NSQIP to examine short-term surgical complications following a variety of procedures [17–21]. More information on NSQIP data collection is available for the reader in a paper by Khuri [22].

The current study selected all patients undergoing surgery for hip fractures in the years 2010, 2011, and 2012 that received either a plate/screw or intramedullary implant. The database was searched with the Current Procedural Terminology (CPT) codes of 27244 (treatment of intertrochanteric, peritrochanteric, or subtrochanteric femoral fracture; with plate/screw type implant, with or without cerclage), and 27245 (treatment of intertrochanteric, peritrochanteric, or subtrochanteric femoral fracture; with intramedullary implant, with or without interlocking screws and/or cerclage). Only patients undergoing either general anaesthesia (4318) or spinal anaesthesia (1815) were selected for a total of 6133 patients. Patients receiving unknown or another anaesthesia type were excluded.

Patient characteristics as listed in the NSQIP database can be found in Table 1. Specifics on the definition of each NSQIP variable definition can be found in the NSQIP User Guide [23]. For this study, preoperative characteristics are divided into demographics, preoperative comorbidities, preoperative laboratory values, and operative categories. Demographics consisted of age, sex, and race. Preoperative comorbidities included body mass index (BMI), functional status, outpatient procedure, smoker within one year, alcohol use (more than two drinks per day), steroid use, weight loss (>10% in last six months), diabetes, dyspnoea, hypertension,

**Table 1**  
Demographics of hip fracture patients.

	General anaesthesia (N=4813)	Spinal anaesthesia (N=1815)	p-values	
			Unadjusted	Propensity score adjusted
<b>Demographic</b>				
Age (y)	78.6 ± 12.51	81.81 ± 9.57	<0.0001	0.70
Female sex (%)	69.63	73.17	0.05	0.82
Race (%)			<0.0001	0.34
White	81.15	51.79		
Black	3.41	1.43		
Other	12.78	43.58		
<b>Preoperative comorbidities</b>				
BMI (kg/m <sup>2</sup> )	24.93 ± 6.53	23.58 ± 6.29	<0.0001	0.76
Functional status (dependent) (%)	31.26	28.95	0.07	0.24
Outpatient (%)	0.44	0.55	0.54	0.08
Smoker within 1 year (%)	13.78	12.67	0.24	0.05
Alcohol use (%)	1.77	1.32	0.21	0.26
Steroid use (%)	5.67	6.06	0.55	0.39
Weight loss (%)	1.83	1.87	0.90	0.56
Diabetes (%)	18.99	16.14	0.07	0.81
Dyspnoea (%)	8.68	8.87	0.81	0.67
Hypertension (%)	69.35	66.06	0.01	0.88
COPD (%)	11.18	15.54	<0.0001	0.81
Dialysis (%)	1.93	1.98	0.89	0.85
Bleeding disorder (%)	20.94	9.59	<0.0001	0.09
Open wound/wound infection (%)	7.52	6.61	0.20	0.48
Preoperative blood transfusion (%)	8.79	7.05	0.02	0.78
<b>Preoperative lab values</b>				
White blood cell count	9.79 ± 3.87	10 ± 3.60	0.05	0.92
Hematocrit	33.53 ± 6.63	33.35 ± 6.97	0.33	0.39
Creatinine	1.65 ± 0.83	1.15 ± 0.77	0.73	0.76
<b>Operative variables</b>				
ASA 1 or 2 (%)	20.26	19.28	0.39	0.53
Wound class 1 or 2 (%)	99.71	100	0.02	1.00
Mean operative time (min)	65.36 ± 45.99	55.81 ± 37.68	<0.0001	0.58
Emergency (%)	29.27	38.95	<0.0001	0.99

Continuous variables given as mean ± SD; BMI, body mass index; ASA, American Society of Anesthesia; COPD, chronic obstructive pulmonary disease

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