

General or Spinal Anesthesia for Hip and Femoral Fractures and Subsequent Risk of Mortality and Morbidity

Jalal Saem¹, MD;
Hajar Haghshenas², PhD
candidate; Fateme Zare
Qashlaghi³, BSc; Fatemeh
Mohseni⁴, PhD candidate;
Rouhollah Rouhandeh⁵, MSc;
MohammadRafi Bazrafshan⁶,
PhD; Amirhossein Saem⁷, MD
candidate

¹Department of Anesthesiology,
School of Medicine, Shiraz University
of Medical Sciences, Shiraz, Iran

²Department of Nursing, School of
Nursing, Gerash University of Medical
Sciences, Gerash, Iran

³Gerash Amir-al-Momenin Medical and
Educational Center, Gerash University
of Medical Sciences, Gerash, Iran

⁴Department of Anesthesiology, School
of Nursing, Gerash University of
Medical Sciences, Gerash, Iran

⁵Department of Biostatistics, School
of Paramedical, Gerash University of
Medical Sciences, Gerash, Iran

⁶Department of Nursing, School of
Nursing, Larestan University of Medical
Sciences, Larestan, Iran

⁷Medical Student, School of Medicine,
Shiraz University of Medical Sciences,
Shiraz, Iran

Correspondence:

Hajar Haghshenas, PhD candidate;
Nursing Department, School of
Nursing, Gerash University of Medical
Sciences, Daneshjoo Blvd., Postal
code: 74417-58666, Gerash, Iran

Tel: +98 71 52448101-9

Email: haghshenah@gmail.com

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Abstract

Background: There are still conflicting results on the postoperative consequences of patients with hip and femoral fractures based on the type of anesthesia. The aim of this study was to compare mortality and morbidity of general and spinal anesthesia in patients undergoing hip and femoral fractures.

Methods: In this analytical cross-sectional study, the information of 93 patients who had undergone hip and femoral surgery with general and spinal anesthesia was studied during 2011-2019 in the medical records by census method. Data were analyzed using SPSS 23 software and descriptive and analytical statistics.

Results: The general anesthesia group consisted of 29 patients and the spinal anesthesia group included 64 patients. The two groups were the same in terms of demographic information, preoperative hemodynamic variables, and previous medical history. The results of the independent t-test with a significance level of 5% did not show a significant difference between the two groups in the following variables: mean duration of surgery and duration of anesthesia, mean arterial pressure and heart rate after surgery, changes in blood pressure, and heart rate during surgery, bleeding, intravenous fluids and blood products intake, postoperative hemoglobin, number of days hospitalized in the Intensive Care Unit and surgical ward. The mean post-operative mean arterial pressure score in the general anesthesia group was significantly higher than the spinal group ($P=0.004$). Complications and mortality after surgery did not differ between the two types of anesthesia.

Conclusion: In general, these two methods of anesthesia do not differ from each other in terms of postoperative complications and mortality, and physicians can choose the appropriate anesthesia method according to the specific conditions of the patients.

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Introduction

Hip and femoral fractures are the most common orthopedic fractures, especially in the elderly population.¹ It is estimated that the number of annual pelvic fractures will have reached 6.26 million worldwide by 2050.²

The rate of hip fracture is increasing in Iran due to the ageing trend of the Iranian population.^{3,4} About 50000 hip fractures occur in Iran in the year 2010, and it is estimated that this number will increase to 62000 by 2020.³ Pelvic fractures are caused by falls, accidents with vehicles, or injuries with crushing.⁵ Complications

after hip fracture surgery⁶ and one year mortality rate of hip fracture patients⁷ are relatively high. Almost all of these fractures require surgical treatment.⁸ Results of a systematic review study showed that the early hip surgery within 48 hours was associated with a lower mortality risk and decreased the rate of perioperative complications.⁹ A systematic review study showed that the cost of hip fractures management in Asia was from US\$774 to US\$14,198.90 (median S\$2943), representing an average of 18.95% of the 2014 GDP/capita of the countries.¹⁰ Femoral neck fractures are the cause of more than 300,000 annual hospitalizations in adults over 65 years of age.⁵ The risk of death after femoral neck fractures is high due to impaired cardiovascular and respiratory function.¹¹ Different anesthesia methods are used for surgical treatment of fractures,⁸ and the two general and spinal anesthesia approaches are the most widely used ones.¹²

General anesthesia begins with the administration of intravenous anesthetics or inhaled anesthetics with or without nitro oxide. Ventilation is then done through a face mask or laryngeal airway mask, and a venous muscle relaxant may be needed to facilitate direct laryngoscopy before tube insertion. In general anesthesia, the dose of the drug is higher, so the patient is more exposed to the side effects of drugs. Spinal anesthesia involves the injection of a local anesthetic into the subarachnoid space, which preserves the patient's consciousness during surgery.^{13, 14}

Researches showed that compared with general anesthesia, regional anesthesia is associated with shorter length of stay.^{8, 15} Regional anesthesia is associated with a reduction in surgical site infection, and a reduction in cardiovascular and pulmonary complications compared to general anesthesia, but the mortality rate in regional anesthesia is not significantly reduced.¹⁵

The type of anesthesia has no effect on postoperative cardiopulmonary complications in the elderly with pelvic fractures, but neurovascular excision and neural block can reduce the hospital costs.¹⁶ Researches have also shown that regional anesthesia shortens the duration of surgery, but the type of anesthesia has no effect on the outcome of surgery.¹⁷ Spinal anesthesia does not reduce the 30-day mortality rate compared to general anesthesia.⁸ General anesthesia affects the mortality rate of patients with pelvic fractures in the hospital.¹⁸ A study by Van Waesberghe et al. showed that neurovascular anesthesia reduced mortality and hospital stay compared to general anesthesia, but the type of anesthesia did not affect mortality 30 days after surgery.¹⁹ Regional anesthesia improves the outcomes and precision of the surgery, but larger clinical trials are needed to draw the final conclusions about the optimal method for anesthesia in the elderly patients with pelvic fractures.²⁰ A systematic review showed that the quality of evidence available for the results

of studies was "very poor" to compare general with spinal anesthesia in pelvic fracture surgery between 1977 and 2012.²¹

This study aimed to compare mortality and morbidity of general and spinal anesthesia in patients who had undergone hip and femoral fractures since observational studies have shown that there are conflicting results on the postoperative consequences of hip fractures based on the type of anesthesia.^{19, 22-24}

Methods

This is a cross-sectional study. 93 patients who had undergone hip and femoral fractures surgery with general and spinal anesthesia in the operating room ward of Amir Al-Momenin Educational-Medical Center of Gerash city (in Fars province) during the years 2011-2019 were enrolled in the study. Those who had the criteria were selected using census method. After the approval of the research project by the Ethics Committee of Gerash University of Medical Sciences, the researchers referred to the hospital's medical records unit and examined the patients' files. The required data were collected by a questionnaire or a form that was provided by the research team's members and approved by 5 faculty members who were specialized in this field. Some variables (such as death during one month and one year after surgery) were also collected by telephone contact with patients or their families. In all stages of data collection, the principle of confidentiality was observed, and the questionnaires were coded. Inclusion criteria were patients in the age group of 40-90 years who had hip and femoral fractures and had undergone surgery; those with cardiac ejection fraction less than 30%, positive history of stroke over the past year, myocardial infarction in the past six months, chronic obstructive airways disease, coronary artery stent placement in the past two months, and the use of anticoagulants were excluded. Patients were divided into two groups under general anesthesia (29 patients) and spinal anesthesia (64 patients). The two groups of patients were compared in terms of the following criteria: the mean duration of surgery, mean duration of anesthesia, mean score of mean arterial pressure and heart rate after surgery, changes in blood pressure and heart rate during surgery, amount of bleeding, volume of intravenous fluid and blood products intake, amount of hemoglobin after surgery, hospitalization or non-hospitalization in Intensive Care Unit (ICU) and duration of hospitalization in the ICU and surgery ward, rate of complications (such as infection, respiratory disorder, anemia, pain, restlessness, delirium, thromboembolism, nausea and vomiting), and mortality rate in the operating room, in the hospital, during one month and one year after surgery. Independent t-test, accurate Fisher test, Chi-square test, and SPSS software version 23 were used to analyze the data. Significance level was considered as $P < 0.05$.

Results

In this study, 93 patients who had undergone hip and femoral fractures surgery with two methods of general and spinal anesthesia (during the years 2011-2019) were examined in Gerash Educational and Medical Center. General anesthesia was used for 29 patients and spinal anesthesia for 64 patients for surgical treatment. The two study groups were similar in terms of demographic information (age and sex) and variables such as mean arterial pressure, pulse rate and amount of hemoglobin before surgery, history of diabetes mellitus, hyperlipidemia, history of smoking, and type and location of fracture.

Table 1 shows the independent t-test results and a significant level of 5% related to the mean duration of surgery, duration of anesthesia, mean arterial pressure and heart rate after surgery, changes in blood pressure, and heart rate during surgery. It also shows the mean volume of bleeding, volume of fluid and blood products intake, amount of hemoglobin after surgery, and the number of days hospitalized in the ICU and the surgical ward in the two groups. There was a significant difference between the postoperative mean arterial pressure in the two groups, so that the mean postoperative arterial pressure in the general anesthesia group (Mean=97.91±14.39) was significantly higher than the spinal anesthesia group (Mean=89.64±11.44) (P<0.05). Comparison of postoperative complications is shown in Table 2. The mortality rate for both groups was zero in the operating room. The results of Fisher's accurate test showed no difference between hospital mortality, mortality during one month after surgery, and one-year survival in two types of anesthesia (P>0.05).

Table 1 shows that there was a significant difference only between postoperative mean arterial pressure in patients who had undergone hip and femoral fractures surgery in both general and regional anesthesia groups based on sample observations and at a significance level of %5 (P<0.05).

Chi-Square test was used to investigate the relationship between the complications and type of anesthesia. Based on the observations of the sample and at the significance level of 5%, there was no significant difference between the two groups. The most common complications were anemia, pain, and delirium. Nausea and vomiting were reported in one patient with general anesthesia. Both respiratory and pulmonary thromboembolism were observed in only one patient with spinal anesthesia and were not present in the general anesthesia group.

Discussion

Because hip and femoral fractures are common in the elderly,⁵ the choice of anesthesia for surgical treatment depends largely on the patient's situation and contextual condition;²⁵ in this regard, choosing the appropriate method of anesthesia is a vital issue. This observational study aimed to investigate the postoperative outcomes in patients with hip and femoral fractures. There was no significant difference between the mean duration of surgery and anesthesia between general and spinal anesthesia groups. In our study, the duration of surgery was the same in both groups, but the results of the study carried out by Urwin et al. stated that general anesthesia compared to regional anesthesia reduced the duration of the operation;²⁶ also, other studies concluded that

Table 1: Comparison of the mean and standard deviation of quantitative variables between the two groups of general and spinal Anesthesia

Variables	General anesthesia n=26	Spinal anesthesia n=64	P value*
	Mean±SD	Mean±SD	
Surgery duration (min)	119.48± 57.04	102.89± 37.97	>0.05
Anesthesia duration (min)	147.93± 57.63	129.76± 40.28	>0.05
Bleeding volume (ml)	366.66±288.67	356.25± 176.14	>0.05
Fluid volume intake (ml)	2051.72± 892.67	2173.43± 777.10	>0.05
Blood products volume intake (ml)	187.93± 268.81	140.62± 219.64	>0.05
postoperative Mean arterial pressure (mmHg)	97.91±14.39	89.64±11.44	<0.05
Postoperative heart rate (beats per minute)	80.48±11.93	79.78±12.52	>0.05
Postoperative Hgb. (mg/dl)	10.48±2.13	10.84±2.14	>0.05
Number of hospitalized days in the ICU	0.20±.81	.48±1.02	>0.05
Number of hospitalized days in the surgical ward	2.93±1.27	2.96±2.28	>0.05

*Independent t-test

Table 2: Comparison of postoperative complications between the two groups of general and spinal Anesthesia

Anesthesia type Complication	Anemia		Pain		Delirium		Without complication		More than one complication		Total	P value*	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.		%
General	7	24.1	3	10.3	0	0	11	37.9	8	27.6	29	100	>0.05
Spinal	13	20.6	6	9.5	2	3.2	36	57.1	6	9.5	63	100	

*Chi-square test

in regional anesthesia the duration of the operation was shorter.^{17, 27} The bleeding volume was the same in both groups. In the study of Rashid et al., there was no difference between the volume of bleeding during surgery in both general and regional anesthesia groups.¹⁷

In the present study, there was no significant difference between the average intake of intravenous fluids and blood products, heart rate after surgery, changes in blood pressure and heart rate during surgery, and amount of hemoglobin after surgery in patients under general and spinal anesthesia. The average volume of blood product intake in the Basques' study was higher in general anesthesia.²⁷ The systolic blood pressure in the general anesthesia group was significantly lower than of the spinal group in Wood et al.'s study.²⁸

The average number of hospital days (both in the surgical ward and in the ICU), like the Rashid's¹⁷ and Seitz's study,²⁹ were similar in the two groups. In a study, the average number of hospitalization days in the regional anesthesia group was 0.6 days less than general anesthesia in patients after hip fracture surgery;⁸ in contrast, in another research the number of hospitalization days in the general anesthesia patients was less than regional anesthesia. There was no significant difference between postoperative complications such as anemia, pain, and delirium in the two groups. Both respiratory and pulmonary thromboembolism were observed in only one patient with spinal anesthesia, and there was no case in general anesthesia. In Desai et al.'s study, complications such as heart attack, venous or pulmonary thrombosis, and pneumonia in general and spinal anesthesia did not differ.³⁰ Another research study showed that the rate of cardiovascular complications was the same in the two groups, and respiratory complications in regional anesthesia were lower than in the general anesthesia.²² The incidence of pneumonia, urinary tract infection, and venous or pulmonary thrombosis was higher in general anesthesia in the Basques et al.'s study.²⁷

The mortality rate in the operating room was zero for both groups. There was no difference between mortality rate in the hospital, 30 days and one year after surgery in both general and spinal anesthesia groups. In the study of White et al., there was no difference in mortality in the first 24 hours, 5 and 30 days after the surgery;²⁴ in other studies, there was no difference between mortality rate during 30 days after surgery in both groups.^{22, 29} Postoperative mortality after hip fracture is not associated with the anesthetic technique.³¹ Other studies have shown an increased mortality rate in the general anesthesia group at the hospital¹⁸ as well as 90 days after surgery.³⁰

Conclusion

In some studies, comparisons between general and

spinal anesthesia have shown that spinal anesthesia has fewer side effects such as cardiovascular problems and deep vein thrombosis; in some, there has been no difference between the two methods in terms of patient's outcome and mortality. In the present study, there was no difference between the two methods of anesthesia in terms of complications during and after the surgery, as well as mortality. However, the main limitation of this study, which is the low sample size, especially in the general anesthesia group, should also be considered. It is recommended that more clinical trials with high sample size should be performed to obtain a better and more accurate results.

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