KASTAMONU MEDICAL JOURNAL

Original Article

DOI: 10.51271/KMJ-0132

Kastamonu Med J. 2024;4(1):5-9

A retrospective analysis of postoperative geriatric patients with hip fracture; the reasons for admission to ICU

Münire Babayiğit[1], Mehtap Honca[2], Merve Bayraktaroğlu[3], Mustafa Caner Okkaoğlu[4], Hakan Şeşen[4], Mustafa Alparslan Babayiğit[3], Eyüp Horasanlı [6]

[1]Department of Anesthesiology and Reanimation, Ankara Atatürk Sanatorium Training and Research Hospital, University of Health Science, Ankara, Turkiye
[2]Department of Anesthesiology and Reanimation, Ankara Bilkent City Hospital, Ankara, Turkiye
[3]Department of Anesthesiology and Reanimation, Ankara Etlik City Hospital, Ankara, Turkiye
[4]Department of Orthopedics and Traumatology, Ankara Atatürk Sanatorium Training and Research Hospital, University of Health Science, Ankara, Turkiye
[5]Private Occupational Physician, Public Health Specialist, Ankara, Turkiye
[6]Department of Anesthesiology and Reanimation, Faculty of Medicine, AnkaraYıldırım Beyazıt University, Ankara, Turkiye

Received: 02/11/2023 ◆ **Accepted**: 11/12/2023 ◆ **Published**: 01/03/2024

ABSTRACT

Aims: Geriatric patients with hip fracture experience high rates of mortality and morbidity. The purpose of this study was to analyse the epidemiology, complications and reasons for admission to ICU of the postoperative geriatric patients undergoing hip fracture surgery.

Methods: Patients aged 60 years and over who were operated on for hip fractures were retrospectively examined. Demographic characteristics, type of anesthesia (general/regional), operation time, and complications were recorded from the patients' files.

Results: The median age of the patients included in the study was 78.9±8.39 (min 60-max 100). It was observed that 71.6% of the patients were women, 13 patients received general anesthesia, and the rest received regional anesthesia. It was determined that 56.2% of the patients were admitted to intensive care. It was found that the surgery duration of patients admitted to intensive care was longer, and their average age and ASA scores were higher.

Conclusion: In our study, besides to the development of perioperative complications, age >80 years, ASA score 3 and 4, and long operation time were found to be the most important factors that required patients to be admitted to intensive care.

Keywords: Geriatric, hip fracture, critical care, general anaesthesia, spinal anaesthesia

INTRODUCTION

With the increase in the elderly population, the number of operations performed for femoral fractures is also increasing. The surgical plan of these patients should be meticulously planned starting from the admission to the emergency department. The medical treatment process should be planned and followed by a multidisciplinary team including an emergency medicine specialist, orthopedist, anesthesiologist, intensive care specialist, nurse, physiotherapist, social worker and dietician. In this way, it is possible to achieve fewer complications and shorter hospitalisations.[1,2] In people with hip fracture, mortality in the first year is higher in older men than in women compared to the normal population. In female patients, mortality increases with advancing age and increasing number of systemic diseases. Scientific studies are generally aimed at analysing the factors affecting mortality and morbidity. The predictive roles of preoperative laboratory data and demographic data of the patient in terms of postoperative mortality have been investigated.[3-6] Timely planning of measures that can be taken by identifying postoperative mortality markers and effective intervention can prevent possible complications in these patients and reduce morbidity and mortality. Anesthesiologists have an important role in planning the necessary preparations by looking at these parameters in the preoperative evaluation of patients. Postoperative follow-up of patients in intensive care is an important issue that should be evaluated by anesthesiologists in the preoperative period. However, intensive care units should be used with caution because of their high costs, limited capacity and risk of infection.[6-8] In this study, we aimed to contribute to the literature by analysing the effect of anesthesia method on the perioperative process and possible risk factors for intensive care unit admission.

Corresponding Author: Münire Babayiğit, mnroksuz@hotmail.com

Cite this article as: Babayiğit M, Honca M, Bayraktaroğlu M, et al. A retrospective analysis of postoperative geriatric patients with hip fracture; the reasons for admission to ICU. *Kastamonu Med J.* 2024;4(1):5-9.

METHODS

The study was carried out with the permission of Keçiören Training and Research Hospital Clinical Researches Ethics Committee (Date: 08.04.2015, Decision No: 784). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Statistical Analysis

Continuous variables were expressed as mean±standard deviation, categorical variables as number and percentage. In the intergroup analysis of continuous variables, normality analysis of the variables was performed with the Kolmogorov-Smirnov goodness of fit test. In paired group comparisons, the T-test was used when the data were compatible with normal distribution, and the Mann Whitney U test was used when the data were not. Within-group comparisons were made with Wilcoxon signed ranks test. Chi-square test (Fisher's exact test where necessary) was used for the comparison of categorical data. Analyses were performed with IBM SPSS Package Program version 24.0 (IBM Corporation, Armonk, NY, USA). Statistical significance level was considered as $p<0.05$.

RESULTS

When compared according to the type of anesthesia [general and regional anesthesia(spinal/ spinal-epidural combined anesthesia)], it was found that there was no significant difference between patients in terms of ASA score, peroperative complication, peroperative hypotension and respiratory depression rates ($p>0.05$). During surgery bradycardia developed in 30.8% of patients who had general anesthesia and in 10.1% of patients had regional anesthesia ($p=0.046$) (**Table 1**).

Table 1. Comparison of some preoperative and intraoperative clinical characteristics of the patients according to anesthesia type

	Anesthesia Type				Total		p
	Spinal-epidural combined		General anesthesia				
	n	%	n	%	n	%	
ASA							0.515*
2	22	12.3	3	3.1	25	13.0	
3	136	76.0	9	69.2	145	75.5	
4	21	11.7	1	7.7	22	11.5	
Peroperative complication							0.263*
No	99	55.3	5	38.5	104	54.2	
Yes	80	44.7	8	61.5	88	45.8	
Peroperative hypotension							0.919*
No	99	55.3	7	53.8	106	55.2	
Yes	80	44.7	6	46.2	86	44.8	
Peroperative bradycardia							0.046**
No	161	89.9	9	69.2	180	93.8	
Yes	18	10.1	4	30.8	6	3.1	
Respiratory depression							0.869**
No	177	98.9	13	100.0	190	99.0	
Yes	2	1.2	0	0.0	2	1.0	
Total	179	100.0	13	100.0	192	100.0	

* Chi-square Test, **Fisher's Exact Test

When some clinical characteristics of a total of 108 patients hospitalised in the intensive care unit were compared according to the type of anesthesia, no significant difference was found between who had general anesthesia and had regional anesthesia (spinal/ combined spinal-epidural anesthesia) in terms of blood transfussion, noradrenaline use, mechanical ventilator use, duration of intensive care unit stay and outcome (discharge or exitus) (**Table 2**). The mean age of fracture patients hospitalised in the intensive care unit (ICU group) (80.38±7.84 years) was statistically significantly higher than that of patients hospitalised in the orthopedic ward (Ward group) (77.13±8.77 years) ($p=0.012$). The proportion of patients aged 80 years and over hospitalised in the intensive care unit was 58.3%, whereas it was 47.7% in the ward. It was found that the rate of hospitalisation in the intensive care unit increased with increasing age ($p=0.020$). ASA 3 and 4 rates were significantly higher in ICU group (93.6%) compared to Ward group (78.5%) ($p=0.009$). There was a statistically significant difference between ICU group and Ward group according to the type of surgery and type of anesthesia ($p=0.017$ and $p=0.042$, respectively). While 10.2% of those transferred to the intensive care unit received general anesthesia, this rate was only 2.4% in those admitted to the ward. The rates of peroperative complications and peroperative hypotension were statistically significantly higher in ICU group ($p<0.001$). No significant difference was found in terms of gender, fracture mechanism, operated side and the rates of peroperative bradycardia (**Table 3**).

Table 2. Comparison of some clinical characteristics of patients admitted to intensive care unit according to anesthesia type

	Anesthesia Type				Total		p
	Spinal-epidural combined		General anesthesia				
	n	%	n	%	n	%	
Blood replacement							0.803*
No	67	69.1	8	72.7	75	69.4	
Yes	30	30.9	3	27.3	33	30.6	
Use of inotropes							0.722**
No	94	96.9	11	100.0	105	97.2	
Yes	3	3.1	0	0.0	3	2.8	
Use of mechanical ventilation							0.806**
No	95	97.9	11	100.0	106	98.1	
Yes	2	2.1	0	0.0	2	1.9	
Duration of ICU stay (days)							0.813*
1	76	78.4	15	15.5	85	78.7	
2	15	15.5	1	9.1	16	14.8	
≥3	6	6.2	1	9.1	7	6.5	
Sonuç							0.898**
Referral	96	99.0	11	100.0	107	99.1	
Exitus	1	1.0	0	0.0	1	0.9	
Total	97	100.0	11	100.0	108	100.0	

* Chi-square Test, **Fisher's Exact Test

There was no significant difference between ICU group and Ward group in terms of time to operation and hospitalization ($p>0.05$). The operation times were significantly higher in ICU group (92.40±35.09 min.) compared to Ward group (79.94±31.81 min.). On the contrary, preoperative and postoperative hemoglobin levels were found to be significantly lower in ICU group. The operation times were significantly higher in ICU group. Postoperative hemoglobin levels were found to be statistically significantly lower than basal preoperative levels in both groups ($p<0.001$) (**Table 4**).

Table 3. Comparison of sociodemographic and some clinical data of patients according to hospitalization in intensive care unit

	Admission to intensive care unit				Total		p
	No		Yes				
	n	%	n	%	n	%	
Age							0.020*
60-69	18	21.4	10	9.3	28	14.6	
70-79	26	31.0	35	32.4	61	31.8	
80-89	36	42.9	52	48.1	88	45.8	
90 ≤	4	4.8	11	10.2	15	7.8	
Sex							0.413*
Female	48	57.1	68	63.0	116	60.4	
Male	36	42.9	40	37.0	76	39.6	
ASA							0.009*
2	18	21.4	7	6.5	25	13.0	
3	58	69.0	87	80.6	145	75.5	
4	8	9.5	14	13.0	22	11.5	
Fracture mechanism							0.903*
Falling down	78	92.9	102	94.4	180	93.8	
Traffic accident	3	3.6	3	2.8	6	3.1	
Pathological fracture	3	3.6	3	2.8	6	3.1	
Operated side of the body							0.114*
Left leg	47	56.0	48	44.4	95	49.5	
Right leg	37	44.0	60	55.6	97	50.5	
Type of surgery							0.017*
PFNA	31	36.9	30	27.8	61	31.8	
PTN	34	40.5	31	28.7	65	33.9	
PFN	8	9.5	27	25.0	35	18.2	
Other	11	13.1	20	18.5	31	16.1	
Anesthesia type							0.042**
Spinal-epidural-combined	82	97.6	97	89.8	179	93.2	
General anesthesia	2	2.4	11	10.2	13	6.8	
Peroperative complication							<0.001*
Yes	58	69.0	46	42.6	104	54.2	
No	26	31.0	62	57.4	88	45.8	
Peroperative hypotension							<0.001*
Yes	60	71.4	46	42.6	106	55.2	
No	24	28.6	62	57.4	86	44.8	
Peroperative bradycardia							0.231*
Yes	77	91.7	93	86.1	170	88.5	
No	7	8.3	15	13.9	22	11.5	
Total	84	100.0	108	100.0	192	100.0	

* Chi-square Test, **Fisher's Exact Test

DISCUSSION

As a result of our study, it was observed that there were many factors determining intensive care unit hospitalisation in patients operated for femoral fracture. The presence of perioperative complications, advanced age, ASA >3, and long duration of surgery were determined as factors that increased the risk of ICU hospitalisation.

There is little evidence to support the use of either method of anesthesia for hip fracture. One meta-analysis found no significant difference in complications between regional and general anesthesia except for acute renal failure.[9] Recent meta-analyses have also reported no statistically significant difference in 30-day mortality between the two methods of anesthesia.[10-15] In one of these studies, 30-day mortality and the incidence of deep vein thrombosis were lower in the regional anesthesia group, although not statistically significant, and the incidence of myocardial infarction, confusion and postoperative hypoxia was also lower. Although the operation time was shorter in operations performed under general anesthesia, there was a tendency towards cerebrovascular events and intraoperative hypotension in these patients. The incidence of postoperative hypoxia was 35.7% in patients under regional anesthesia and 48.3% in general anesthesia.[11] In a study by Neuman et al.[16] 666 patients under spinal anesthesia and 769 patients under general anesthesia were compared. When 60-day mortality in older adults undergoing hip fracture surgery was examined, it was found to be 3.9% in the spinal anesthesia group and 4.1% in the general anesthesia group. Both types of anesthesia were found to be similar in terms of mortality and ambulation. Among the patients we followed within the scope of our study, no deaths occurred in patients who received general anesthesia, while only one patient died in patients who received regional anesthesia. When we looked at the perioperative complications, we found that the incidence of complications was higher in the general anesthesia group. The incidence of hypotension during the operation was similar in both groups, while bradycardia was more common in the general anesthesia group. While all patients under general anesthesia were extubated, 2 patients under regional anesthesia were intubated due to respiratory depression and required mechanical ventilator support. While our study was compatible with the literature in terms of mortality, hemodynamic complication findings were not compatible with the literature. This may be due to the small number of patients who had general anesthesia among the patients included in the study. During the period included in the study, regional anesthesia was administered to the majority of the patients, while general anesthesia was administered much less frequently, and regional anesthesia was preferred by anesthesiologists in our clinic. This may be considered as a limitation of our study.

Rashiq et al.[17] reported that the need for blood transfusion was associated with female gender, preoperative low Hb level, presence of comorbidities and long surgical duration, and that blood loss and the need for transfusion were less in regional anesthesia. Morgan et al.[15] found that less blood transfusion was performed in patients who had spinal anesthesia in their analysis of 11 years of records registered in the UK database. However, in two large-scale meta-analyses, the need for postoperative blood transfusion was found to be similar in both types of anesthesia.[11,16] In our study, similar to the meta-analyses, the need for blood transfusion was similar in both groups. There seems to be no consensus on the effect of anesthesia method on blood transfusion.

Table 4. Comparison of the mean values of some clinical data of the patients according to the status of hospitalization in the intensive care unit

	Hospitalized in service		Hospitalized in intensive care unit		p
	Min-max	Mean±Sd	Min-max	Mean±Sd	
Time until the operation (day)	1-9	3.50±1.89	1-11	3.29±2.11	0.406**
Surgery time (minutes)	30-180	79.94±31.81	40-180	92.40±35.09	0.012**
Duration of hospital stay (days)	3-17	8.45±4.05	3-25	7.86±3.93	0.587**
Preoperative hemogram (mg/dl)	9.3-17	12.32±1.81	8.6-15.7	11.79±1.66	0.039*
Postoperative hemogram (mg/dl)	1-9	10.50±1.84	1-9	9.90±1.68	0.024**
	p<0.001***		p<0.001***		

* T Test, **Mann Whitney U Test, *** Wilcoxon signed ranks test (comparison of preoperative and postoperative hemogram values within each group)

Morgan et al.[15] in their retrospective study of 8144 patients, 24.6% of the patients were in the 84- 89 age range. In the study of Neuman et al.[16] the mean age was 78 years and found to be similar in terms of additional systemic diseases, and when the ASA scores of the patients in both groups were analysed, it was observed that 60% of the patients were ASA 3. In the study of Kanar et al.[18] the mean age was found to be 80 years. In our study, 45.8% of the patients were between the ages of 80-89 years and 31.8% were between the ages of 70-79 years, 75% were ASA 3 and 11.5% were ASA 4, and in this respect, our study was compatible with the literature. Patients who were operated for hip fracture were elderly, had additional systemic diseases and had high risk ASA scores.

The elderly are special patient group and anesthesia management should be meticulously planned. In these patients, cardiopulmonary reserve, nutrition, anticoagulation, polypharmacy should be taken into consideration in preoperative evaluation and necessary tests and consultations should be planned.[19] Early intervention, early mobilisation and physiotherapy are the primary goals for possible adverse outcomes. Therefore, optimum conditions should be prepared for the patient with a multidisciplinary approach and the surgical process should be managed by providing effective analgesia from the preoperative period.[20,21]

The need for follow-up and treatment in the intensive care unit in the postoperative period should be discussed and planned in the preoperative period. However, sometimes complications that develop during the operation may cause unexpected intensive care unit requirement. Kanar et al.[18] compared 118 patients over 65 years of age who were operated on for proximal femur fracture, divided into two groups: those followed up in the ward and in the intensive care unit, and evaluated the possible risk factors. There was no difference between the two groups in terms of gender and type of operation. Although no statistically significant difference was found in terms of blood transfusion in patients hospitalised in the ICU, it was reported that more blood transfusions were performed in patients referred to the ICU. Similarly, in our study, no significant difference was found between patients hospitalised in the intensive care unit and patients followed in the ward in terms of gender and type of surgery. However, we found that the preoperative and postoperative control Hb values of patients hospitalised in the ICU were statistically significantly lower.

Early surgical intervention and early mobilization are preferred by orthopedists. Delay in surgery may increase complications such as pain, myocardial infarction due to increased sympathetic activity, embolism, atelectasis, and infection.[20,21] In our study, when the time from fracture to surgery was analysed, no statistically significant difference was found between patients hospitalised in the intensive care unit and in the ward. The length of surgical time has been reported as a risk factor that increases the risk of complications and blood transfusion.[17] Consistent with the literature, we found that the mean surgical time was statistically significantly higher in our patients hospitalised in the intensive care unit compared to patients transferred to the ward.

The presence of comorbidity is an important risk factor for postoperative morbidity and mortality. In our study, 48.1% of the patients hospitalised in the intensive care unit were 80-89 years old and 10.2% were over 90 years old, which was significantly higher compared to patients who did not require intensive care unit hospitalisation. The risk of comorbidity increases with age. When the ASA scores of the patients were examined, it was found that 80.6% of the patients hospitalised in the intensive care unit were ASA 3 and 13% were ASA 4, which were significantly higher. In addition, the percentage of patients receiving general anesthesia was found to be higher in patients hospitalised in the intensive care unit. In a study, patients who were planned for postoperative ICU hospitalization as a result of preoperative evaluation and patients who required ICU hospitalisation due to peroperative complications were retrospectively analysed. As a result of this study, it was determined that patients hospitalised in the postoperative ICU were older, ASA3 and above, male patients, and were mostly admitted to the ICU for monitoring and close follow-up in terms of hemodynamic instability.[22] In our study, 78.7% of the patients were hospitalised in the ICU for only 1 day, 14.8% for 2 days, and 6.5% for 3 days or more. It was observed that 57.4% of these patients developed peroperative hypotension. In this respect, our study was found to be compatible with the literature and it was thought that ICU hospitalisation was performed for hemodynamic monitoring and treatment in elderly patients with high ASA scores.[22] Within the framework of the ERAS protocol, it is recommended that elderly patients should be operated under regional anesthesia with opioid-limited anesthesia.[23] In our clinic, regional anesthesia is chosen as much as possible in accordance with this protocol and opioids are not preferred for sedation in elderly patients.

CONCLUSION

As a result of our study, it was observed that ASA 3-4 patients over 80 years of age who received general anesthesia were more risky group in terms of intensive care requirement.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Keçiören Training and Researches Hospital Clinical Research Ethics Committee (Date: 08.04.2015, Decision No: 784).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Financial Disclosure

The authors received no financial support for the research and/or authorship of this article.

Author Contributions

All of the authors declare that they have all participated in the design, execution and analysis of the paper and that they have approved the final version.

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