RESEARCH ARTICLE

Is Spinal Anesthesia with Low Dose Lidocaine Better than Sevoflorane Anesthesia in Patients Undergoing Hip Fracture Surgery

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Abstract

Background: To evaluate general anesthesia with sevoflurane vs spinal anesthesia with low dose lidocaine 5% on hemodynamics changes in patients undergoing hip fracture surgery.

Methods: In this randomized double blind trial 100 patients (50 patients in each group) older than 60 years under hip surgery were randomized in general anesthesia with sevoflurane and spinal anesthesia with lidocaine 5%. Hemodynamic changes including mean arterial pressure (MAP) and heart rate, blood loss, pain severity, nausea and vomiting and opioids consumption were compared in two groups.

Results: During surgery, difference between two groups regarding changes in mean arterial pressure was not significant, but the changes in heart rate were significantly different. Mean arterial pressure changes during recovery between two groups were significantly different. But there was no significant difference in heart rate changes. Bleeding in the sevoflurane group was significantly more than spinal group (513.ml vs. 365 ml). Moreover, AS Score, opioid consumption, and the nausea and vomiting in spinal anesthesia group was significantly lower than the sevoflurane group.

Conclusion: We showed that general anesthesia with sevoflurane and spinal anesthesia with low dose lidocaine 5% have comparable effects on hemodynamics changes in patients undergoing hip fracture surgery. However postoperative pain score, vomiting and morphine consumption in patients with spinal anesthesia were lower than general anesthesia.

Keywords: General anesthesia, Hip surgery, Regional, Sevoflurane

Introduction

Hip fractures are most important fractures that occurs in 1.5 million of patients around the world (1). Hip fractures are considered as age related diseases. It is supposed that more than six million of people in 2050 may suffer from one type of hip fractures (2). Surgery is the main management method in patients with hip fracture. Hip fractures are more prevalent in patients older than 65 years. Thus, the incidence of cardiovascular and pulmonary comorbidities in these patients is frequent with increased mortality and morbidity and complications associated with surgery (2-6). It has been hypothesized that the type of anesthesia impact on surgery outcomes. Previous experiences reported some advantages related to each types of anesthesia. These reports indicated that regional anesthesia has some advantages such as no intubation requirement, blood loss avoidance and better analgesia, with more stable hemodynamic conditions in general anesthesia than regional anesthesia (7, 8). Moreover, regional anesthesia leads to avoidance of airway management, decreases blood loss, potentially reduces risk of deep venous thrombosis, and improved postoperative analgesia (7,

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9). Conversely, general anesthesia may be associated with a more stable hemodynamic state than regional anesthesia (3, 10, 11). However, the results of previous practice remain conflicting and it is not clear which of these techniques are preferred. A meta analysis revealed regional anesthesia decreased the rate of mortality (11). Moreover, another experience indicated that epidural anesthesia (EA) reduces the incidence of side effects and postoperative pain (12). Therefore, in this study we compared general anesthesia with sevoflurane vs. spinal anesthesia with low dose lidocaine 5% on hemodynamics changes like blood pressure and heart rate as the primary outcome and intraoperative bleeding and recovery discharge time as secondary outcome in patients undergoing hip fracture surgery.

Materials and Methods

In this clinical trial, 100 patients (50 patients in each group) aged > 60 years, ASA class I-III candidate for hip fractures fixation referring to Poursina hospital in Rasht in north of Iran were recruited. The study protocol was approved by the ethical committee of Rasht University of Medical sciences (IRCT registration code 201308316280N4). Exclusion criteria were coagulopathies, neurologic disease, inability to give accurate responses to questions, cognitive disorders, dementia, opioid consumption history, hepatorenal diseases, pulmonary diseases and sensitivity to anesthetics agents. Moreover, spinal group exclusion criteria were high intra cerebral pressure and infection in site of injection .The exclusion criteria during surgery were massive hemorrhage and low blood pressure The enrolled participants were counseled, and informed consents were obtained before randomization, as per the institution's protocol. For randomization, we used sequential numbers, in which the first number was given to the first patient and received general anesthesia (GA group n=50). The next number was given to next patient and received spinal anesthesia with low dose lidocaine 5% (SA group, n=50). Both participants and study staff (site investigators and trial coordinating center staff) were masked to treatment allocation. Arriving in the operating room (OR), intravenous (IV) infusion of lactated Ringer's solution was started and standard monitoring was applied. Mean arterial blood pressure (MAP), heart rate (HR), were recorded at 10-minute intervals during operation using pulse oximeter, NIBP, ECG (Saadat CO.). Before induction of anesthesia in GA group 10 cc/kg ringer lactate were injected and systolic and diastolic blood pressure and mean blood pressure were recorded. In GA group anesthesia was induced with fentanyl 2µg/kg, propofol 2mg/kg and then 0.5 mg/kg atracurium was injected during 30 seconds and patients were intubated. Then sevoflurane with Minimum Alveolar Concentration, MAC (1.3-1.5%), oxygen 50% and N_2O 50% were used. Mechanical ventilation with tidal volume (TV=10 cc kg) and respiratory rate (RR=10-12) for continuing PCO_2 at 36-46 mmHg were established. At the end of the operation sevoflurane and N_2O were discontinued and neuromuscular block was revers using neostigmine 0.04 mg/kg and atropine 0.02 mg/kg.

In SA group lumbar puncture was performed in sitting position using a 25-gauge needle (Dr. Japan Co.) positioned midline at the L2-3 or L3-4 vertebral interspaces. All patients in spinal group received supplemental oxygen via a facemask at a rate of 6 L per minute during the procedure. Then 1.5 ml lidocaine 5% (75 mg lidocaine) with 0.1 mg epinephrine were injected. During surgery the heart rate, systolic and diastolic blood pressure and mean arterial blood pressure were checked every 10 minutes. Intraoperative hypotension (MAP that exceeds 20% of baseline MAP) and bradycardia (HR < 50 beats/minute or decrease > 20% from baseline HR) were treated. In the presence of hypotension in GA group, the sevoflurane was decreased until BIS was maintained between 60-40 and in SA group ringer 10 cc/kg was injected during 10 minutes. If the hypotension persisted, 5-10 mg ephedrine, intravenous was injected and if hypotension persisted after 5 minutes 5-10 mg ephedrine injection was repeated. Blood loss was measured based on consumed gauze (small gauze = 20 ml, large gauze = 50 ml). At the end of operation the patients were transferred to the recovery room and vital signs were checked every 10 minutes, moreover the severity of pain based on VAS and nausea and vomiting were recorded. If vomiting occurs ondansetron 4 mg IV was injected and if VAS was more than 3, morphine 0.05 mg/kg was administered. The patients were transferred to the orthopedic ward based on recovery discharge criteria (Aldrete score more than 9). The Aldrete scoring system has been developed to ensure the absence of clinically significant complication in the post anesthesia care unit.

Statistical Analyses

The number of samples in this study with power %90 and α=0.05 were calculated 50 patients in each group. Data were analyzed using SPSS version 20. Categorical data are presented as numbers (%), and continuous data as mean ± SD. We used the Chai_2 or Fisher's exact test to compare categorical variables and the Student's *t* test or the Mann-Whitney's rank sum *U* test to compare continuous variables. Repeated measure was used to compare hemodynamic changes in two groups. α< 0.05 was consider significant.

Results

In this study 100 patients (ASA I-III) mean age 66.10±4.95 and mean BMI 24.74±2.80 were evaluated. The difference between two groups regarding sex, age, ASA class and BMI was not significant [Table 1]. During operation, the MAP in GA group was more than SA but the difference between two groups was not significant (*P=0.10*). Moreover the mean of HR during operation in GA group was slightly more than SA but the difference between two groups was not significant (*P=0.54*). During recovery, the MAP in GA group was significantly more than SA group [Table-2] (*P=0.004*). Additionally, the mean of heart rate in GA group was more than SA but the difference between two groups was not significant (*P=0.32*). Four patients in SA and 2 patients in GA group needed to ephedrine, however, the difference between two groups was not significant (*P=0.39*). The frequency of vomiting, morphine consumption, bleeding, VAS in SA group was significantly lower than GA. Time to

Table 1. The base line characteristics of patients

		SA	GA	*P*
Sex	Male	42 (84%)	38 (76%)	0.31
	Female	8 (16%)	12 (24%)	
Age		66.22±5.17	65.98±4.76	0.81
BMI		24.73±2.87	24.75±2.75	0.97
ASA	1	6 (12%)	8 (16%)	0.84
	2	33 (66%)	31 (62%)	
	3	11 (22%)	11 (22%)	

Aldrerte score > 9 in SA was significantly more than GA group [Table 3].

Discussion

In this study, we revealed that during surgery difference between two groups regarding changes in mean arterial pressure was not significant, but the changes in heart rate were significantly different. Mean arterial pressure variations during recovery between two groups were significantly different. But there was no significant difference in heart rate changes. On the other hand, frequency of vomiting, morphine consumption and bleeding in spinal group was lower

Table 2. The characteristics of patients during surgery and recovery

		SA	GA	*P*
Duration of operation		87.24±4.33	95.68±3.27	0.001
SBP (during surgery)	10 (min)	121.44±19.12	120.18±20.50	0.75
	20	118.56±15.03	119.74±19.31	0.73
	30	116.84±13.95	121.76±17.76	0.13
DBP (during surgery)	10 (min)	72.82±13.88	70.56±12.60	0.4
	20	70.98±13.13	70.64±13.07	0.9
	30	69.10±12.34	72.44±13.01	0.19
HR (during surgery)	10 (min)	85.80±16.04	83±13.55	0.40
	20	81.94±13.21	78.90±12.48	
	30	79.04±11.59	80.38±13.18	
MAP (during surgery)	10 (min)	87.80±14.54	87.31±14.07	0.10
	20	85.78±13.87	86.63±14.84	
	30	84.24±12.30	88.14±14.01	
	40	84.22±11.34	89.84±12.22	
	50	85.14±11.75	88.80±10.60	
	60	84.56±11.43	89.7310.79	
	70	85.65±10.61	89.71±9.80	
	80	86.65±10.62	91.13±10.34	
SBP (during recovery)	10 (min)	117.26±12.26	131.62±19.52	0.000
	20	115.82±11.96	13.24±18.30	0.000
	30	115.64±12	127.22±16.40	0.000
DBP (during recovery)	10 (min)	72.22±10.53	78.92±11.44	0.003
	20	72.26±10.89	78.48±10.82	0.005
	30	71.68±11.612	75.28±10.62	0.109
HR (during recovery)	10 (min)	77.75±12.76	84.44±14.37	0.32
	20	76.85±12.38	83.33±13.28	
	30	75.55±12.002	81.20±13.79	
MAP (during recovery)	10 (min)	86.89±10.08	95.83±12.84	0.004
	20	86.06±10.43	94.87±12.23	
	30	85.84±11.09	92.14±11.53	
	40	86.5±10.53	94.710.19	

Table 3. The characteristics of patients in recovery

Group	SA(%)	GA	*P*
Vomiting in recovery	1 (2%)	9 (18%)	0.006
Ephedrine (during operation)	4 (8%)	2 (4%)	0.39
Morphine (mg)	0.89±1.52	2.66±1.63	0.001
Bleeding (ml) (during operation)	365.00±62.99	513.70±151.19	0.001
VAS	2.36±1.85	4.86±1.75	0.001
Time to discharge (min) Alderte score>9	41.26±8.37	35.04±3.39	0.001

than general anesthesia group. In a study, Nishikawa et al. in 2007 indicated that both spinal anesthesia with small-dose lidocaine and general anesthesia are favorable techniques but hypotension in GA group was significantly more than regional anesthesia, but the time for discharge after operation in GA group was significantly shorter than regional group (13). In general our trial indicated that hemodynamic instability did not occur in two groups. Given to these results Gonano in 2006 emphasized that spinal and epidural anesthesia are not related to hemodynamic instability (14). Current practice revealed shorter duration of operation in general anesthesia group than spinal, however, in contrast to our results a review by Hu et al. in 2009 compared regional and general anesthesia for total replacement of the hip or knee and indicated shorter duration of surgery in regional anesthesia (15). Moreover, this study in tune with our results revealed lower blood loss and blood transfusion in regional than general anesthesia (15). In consistent with this results, Guay in 2006 and Richman in 2006 also indicated lower blood loss in spinal anesthesia (15, 16), Moreover, Macfarlane in 2009 and Mauermann in 2006 reported similar results (17, 18). Additionally the risk of thromboembolic events in regional was lower than general anesthesia (15). The ephedrine consumption in present experience in spinal group was more than general anesthesia group, however, difference between two groups was not significant. In agreement with our findings, Minville et al. in 2008 in a study on old patients under femur fracture surgery revealed that ephedrine consumption in spinal and general anesthesia was in similar range (19). In consistent with our results showing low pain (VAS 2.36 in SA vs. 4.86 in GA) and morphine consumption (0.89 in SA vs. 2.66 in GA) in spinal group than general, Gonano showed that the severity of pain in spinal group was lower than general anesthesia group, harmoniously Liu et al. in 2005 et al. signified that the pain score in regional group was less than general (14, 20). We detected that the postoperative nausea and vomiting was significantly lower in the regional compared to the general group (14). Block et al. have indicated that this is due to regional anesthesia delivers expressively better post-operative analgesia, and decreases opioids consumption (21). In current survey, the frequency of vomiting in SA group was significantly lower than GA, conversely, Nishikawa et al. signified that both regional and general techniques had no major postoperative adverse effects (13). In most studies, the majority of hip fracture patients (65-80%) belong to old women, but since this study was conducted on elderly trauma, men constitute the majority of patients, can be used in future studies. Relatively small sample size was one of the most important limitations of current practice. Also, in this study we did not assess the blood transfusion and serum requirements in patients in two groups. Furthermore, the duration of postoperative evaluation in recovery was very short (80 minutes). Thus, we could not evaluate the long-term effect of two methods on patients. Larger studies with longer postoperative monitoring are required to validate the results reported here.

We confirmed that general anesthesia with sevoflurane and spinal anesthesia with low dose lidocaine 5% have comparable effects on hemodynamic changes in patients undergoing hip fracture surgery. However, postoperative vomiting and morphine consumption in patients with spinal anesthesia was lower than general anesthesia.

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