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Research Article

Depth of Anesthesia in Sleeve Surgery is Associated with Surgical Rating Score: A Cross Sectional Study

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ABSTRACT

Background: The depth of anesthesia is an important consideration during sleeve surgery, as it can impact patient safety and surgical outcomes. Proper depth of anesthesia can help to ensure patient comfort and reduce the risk of complications such as respiratory depression and hemodynamic instability. This study aimed to determine the association between the depth of anesthesia and the Surgical Rating Score in sleeve surgery.

Methods: This study was conducted as a cross-sectional study. Twenty patients who were candidates for sleeve surgery by the laparoscopic method and were referred to Dr. Shariati Hospital from 1394 to 1395 were recruited in this study. Informed consent was obtained before the start of the study. Surgical rating scale (SRS) used to assess surgeon satisfaction. Bispectral Index (BIS) monitoring used to assess the depth of anesthesia. Patients demographics along with hemodynamic, medications, and depth of anesthesia were recorded

Results: Twenty patients, including four men (20%) and sixteen women (80%), were examined in two groups of 10 people who underwent laparoscopic sleeve surgery (Mean age 40.20 ±8.87). The depth of anesthesia has a direct relationship with the improvement of the patient's condition and the SRS during the operation. As the observations showed, in the first group, the surgeon's satisfaction decreased as a result of the decrease in the depth of anesthesia, but this decrease was not statistically significant (P = 0.064), but in the second group, with the change of conditions and the increase in the depth of anesthesia from 60–65 to 40–45, the surgeon's satisfaction increased significantly (P = 0.018).There was no significant difference between the two groups in terms of age, sex, drugs (fentanyl, etc.), PEEP, TV, BMI, and fluid intake.

Conclusion: In conclusion, the findings of this study suggest that the depth of anesthesia has a significant impact on the improvement of the patient's condition and surgeon's satisfaction (SRS) during surgery.

Introduction

A lack of consciousness caused by the administration of drugs is called general anesthesia [1]. One of the basic characteristics of a successful anesthesia is the reversible loss of consciousness with lack of movement, lack of awareness, lack of response to painful stimulation, and lack of recall of surgical interventions [2]. Important signs of insufficient depth of anesthesia are symptoms that appear in response to stress or a painful stimulus in the form of movement, increased breathing, an increased heart rate, and an increase in blood pressure. These symptoms are warning signs, but they are often suppressed and influenced by the administration of neuromuscular relaxants and other drugs during the operation [3].

On the other hand, individual differences in patients' needs for medicine can lead to poisoning caused by

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excessive use of medicine or complications caused by insufficient use and less than the therapeutic dose of medicine. Failure to adjust anesthesia needs and stimulus intensity during a specific surgical process due to the individual differences of patients will lead to overuse or underuse of the patient's needs in both intravenous and inhalation anesthesia methods [3-4]. The usual method in assessing the depth of anesthesia is to measure hemodynamic indicators and autonomic changes [5] and mental symptoms such as movement and mobility, sweating, and tears, which are not sensitive and specific enough [5-6].

The first reports from Berger in 1929 on the use of electroencephalograms (EEG) in imaging the electrical activity of the brain followed advances in the technical development of this field and led to the successful use of this method in the diagnosis of neurological diseases and the evaluation of the effect of drugs on the system. central nervous system [7]. Based on the approval of the Food and Drug Administration, the bispectral index has sufficient sensitivity to evaluate the depth of anesthesia, and it is believed that processing the electrical activity of the patient's brain is useful in diagnosing the depth of anesthesia [8-9]. The bispectral index is a direct method of measuring the electrical activity of the cerebral cortex and is inversely related to the degree of drowsiness of the drug. It uses a special algorithm to convert individual EEG channels into a sleep-inducing level index, which ranges from 100 (awake) to zero (isoelectric EEG) and varies [10]. Specific ranges of 40 to 60 are recommended to reduce the risk of consciousness during general anesthesia [5].

Laparoscopic surgery is increasingly used in many surgeries, diagnoses, and treatment methods. Laparoscopic surgery reduces the complications of mortality and hospital stay [1]. The advantages of laparoscopic surgery compared to open abdominal surgeries include the following: reduction of surgical trauma, reduction of pain, reduction of pulmonary complications after surgery, reduction of the recovery period after surgery, etc. Also, its disadvantages include its longer time (10 years) and higher cost. Laparoscopy is routinely performed under general anesthesia. And it is facilitated through GI decompression and the use of muscle relaxants, pneumoperitoneum, and the Trendelenburg position. These conditions improve access to abdominal organs and reduce the risk of abdominal injuries. The goal of the surgeon is to have safe and effective surgery, and the goal of anesthesia is to improve the surgical conditions and reduce side effects while maintaining the vital functions of the organs.

Bispectral (BIS) monitoring is a type of monitoring used to evaluate the level of anesthesia in patients under general anesthesia, which is divided by this index of level of consciousness between 0 and 100. 100 is the time when the patient is fully conscious, and zero is the condition when the depth of anesthesia is at the level of coma, and in this condition we have a flat EEG. When the patient has enough depth of anesthesia that BIS is between 40 and 60. BIS is used as a way to prevent surgical awareness. Our hypothesis in this study is that by increasing the depth of anesthesia through BIS in two groups that received the same dose of muscle relaxant, the level of surgeon satisfaction increases. Therefore, the purpose of this study is to determine the relationship between depth of anesthesia and the Surgical Rating Score.

Methods

This Study was approved by the institutional review board of the Tehran University of Medical Sciences. This study was conducted as a cross-sectional study. Twenty patients who were candidates for sleeve surgery by the laparoscopic method and were referred to Dr. Shariati Hospital from 1394 to 1395 were recruited in this study. Informed consent was obtained before the start of the study.

Inclusion criteria included age 50–18, a BMI of 35–41, ASA classes 1 and 2, the absence of neuromuscular disease, and drug abuse. Exclusion criteria: bleeding during surgery, opening of sleeve surgery, drug sensitivity.

At first, the surgical rating scale table (supplement table 1) was explained to the surgeon to express his satisfaction with the operation's conditions during the operation and at the desired times. After visiting the operating room, the patients underwent standard monitoring (ECG, HR, SPO2, ETCO2, NIBP). Bispectral Index (BIS) monitoring used to assess the depth of anesthesia.

For sleeve surgery, patients were first put under general anesthesia with propofol 2 mg/kg, atracurium 0.5 mg/kg, and fentanyl 200 mcg for intubation. Anesthesia maintenance was propofol 100–200 mcg/kg/min.

In this study, the depth of anesthesia was reached once at 60–65, and the satisfaction of the surgeon was determined by asking him and by the SRS table. Then, the depth of anesthesia was increased, and the patient reached the depth of anesthesia at 40–45, and again, the satisfaction of the surgeon was determined by asking him and by the SRS table. Patients were assigned to two groups based on a random table. The first group reached the depth of anesthesia 60–65, then the depth increased and reached 40–45, and the second group, on the contrary, first reached the depth of anesthesia 40–45. Then, by decreasing the depth, they reached 60–65, and finally, the satisfaction level of the surgeon was recorded in each of the above cases.

In all patients, age, sex, length of operation, amount of medication (atracurium, propofol, fentanyl), ventilator setting, and BMI were recorded. Also, in all patients, TOF was checked during the procedure, and muscle relaxation was maintained at the level of no response to TOF.

In the current study, the results are presented with the mean and standard deviation. At first, the Kolmogorov-Smirnov test was performed for all variables in order to check the normality of the data. If the data were normal, parametric tests were used; otherwise, non-parametric tests were used. The results are stated with the mean and standard deviation, and the paired t test was used to compare the quantitative variables in the two groups before and after the operation, and the Wilcoxon signed-rank test was used for the SRS (qualitative rank) variable. Also, the first error level of less than 5% was considered a significant level.

Results

Twenty patients, including four men (20%) and sixteen women (80%), were examined in two groups of 10 people who underwent laparoscopic sleeve surgery (Mean age 40.20 ±8.87). All patients were operated by one surgeon (Table 1). Therefore, the confounding variables were controlled to a large extent and it can be expected that the changes made are only influenced by the type of intervention. The mean difference of SRS was 4.15 ±.78 before intervention and 4.50±.57 (p=.044).

According to the results obtained in this study, the depth of anesthesia has a direct relationship with the improvement of the patient's condition and the SRS during the operation. As the observations showed, in the first group, the surgeon's satisfaction decreased as a result of the decrease in the depth of anesthesia, but this decrease was not statistically significant (P=0.064), but in the second group, with the change of conditions and the increase in the depth of anesthesia from 60-65 to 40-45, the surgeon's satisfaction increased significantly (P=0.018) (Table 2).

Also, based on the obtained information, there was no significant difference between the two groups in terms of age, sex, drugs (fentanyl, etc.), PEEP, TV, BMI, and fluid intake. However, the two groups had a significant difference in terms of operation time, so the average operation in the first group was 114 minutes, and in the second group it was 147 minutes (P=0.023).

Based on the findings of this study, the surgeon's satisfaction rate (SRS) has increased considerably and significantly (P=0.044). The two groups did not differ significantly in terms of the studied variables (P>0.05), only in terms of operation time did the two groups have a significant difference (P=0.033). So that in the patients of the second group, the operation time was significantly longer than that of the first group.

Table 1- Baseline and demographic data

Variables	Group1* (n=10)	Group2 (n=10)	P value
Age	38.40 (8.80)	42.00 (9.03)	0.379
BMI	41.40 (9.02)	43.20 (3.42)	0.567
Duration of Surgery (min)	114.00 (18.97)	147.00 (41.11)	0.033
Dose of propofol (mg)	227.00 (75.72)	223.00 (56.57)	0.317
Dose of Atracurium	45.00 (10.80)	48.00 (13.98)	0.562
Dose of fentanyl (ug)	250.00 (78.17)	265.00 (33.74)	0.584
PEEP	5.90 (1.44)	9.50 (14.23)	0.074
TV	626.00 (113.94)	700.00 (81.65)	0.095
IV fluid infused (lit)	2.70 (.48)	2.40 (.69)	0.279

BMI: body mass index, PEEP: positive end expiratory pressure, IV: intravenous, TV: tidal volume. * Mean (±SD)

Table 2- Comparison SRS before and after intervention

	Poor condition	Acceptable	Good	Optimal conditions	P value
Before					
Group 1	0	0	4	6	.064
Group 2	1	1	6	2	
After					
Group 1	0	1	8	1	.018
Group 2	0	0	4	6	

Discussion

Obese patients are at high risk of complications from general anesthesia in surgery. This is due to the presence of more fat tissue in obese people than in non-obese people, which can be a major source of storage for inhaled gases and relaxants. This high fat content prolongs the recovery time from anesthesia and thus increases the possibility of airway obstruction or other respiratory complications. Our hypothesis in this study was that by increasing the depth of anesthesia through BIS in two groups that received the same dose of muscle relaxant, the level of surgeon satisfaction would increase.

The results obtained in this study showed that the depth of anesthesia has a direct relationship with the improvement of the patient's condition and the surgeon's satisfaction (SRS) during the operation. In the first group,

the surgeon's satisfaction decreased because of decreasing the depth of anesthesia (P = 0.064), but this decrease was not statistically significant. The reason for this could be due to the small sample size. Also, in the second group, by changing the conditions and increasing the depth of anesthesia from 60–65 to 40–45, the surgeon's satisfaction increased significantly (P = 0.018). Also, in the present study, the findings showed that, in general, regardless of the considered groups, with the increase in the depth of anesthesia, the SRS increased considerably and significantly (P=0.044).

Based on the analysis, it was shown that there are no significant differences between the two groups in terms of the investigated variables, including age, sex, drugs, fluid intake, and hemodynamic factors that were evaluated based on BIS (P>0.05), but the surgery time was significantly longer in the two groups (P=0.033). So that in the patients of the second group, the operation time was significantly longer than that of the first group. In the study of Myles et al. in Australia, which investigated the relationship between BIS monitoring and intraoperative awakening, it was shown that anesthesia with BIS monitoring reduces the risk of intraoperative awakening by 82% compared to the control group [11].

Although the rate of awakening during surgery was not evaluated in the present study, considering that the depth of anesthesia was low for 50% of the operation time and the patients experienced light anesthesia during surgery, it is possible that a percentage of these patients experienced awakening during surgery. have been It may be possible to lead patients to the appropriate depth of anesthesia by using BIS. Many researchers believe that the use of BIS to estimate the depth of anesthesia leads to better maintenance of hemodynamic stability, increased satisfaction of patients and surgeons, and quick recovery in obese and non-obese patients who receive general anesthesia.

According to a study by Melinde King et al. [12], isoflurane and fentanyl alone provide good to excellent conditions for two-thirds of patients undergoing radical retropubic prostatectomy, so the routine use of muscle relaxants in patients who are sufficiently fit They have reached the required depth of anesthesia; there is no indication. In agreement with the results obtained in the present study, Roar Medici showed in a study that deeper anesthesia improves surgical conditions for laparoscopy by improving the field of view and reducing involuntary movements. Therefore, according to the risks that anesthesia creates for people with high BMI, we believe that it is very important to discuss and investigate the quick exit from anesthesia with minimal respiratory and cardiovascular complications in patients, and in this regard, the use of monitoring such as BIS during anesthesia, which makes it easier to achieve this goal, as well as increasing the depth of anesthesia in order to improve the general condition of patients during surgery, is suggested.

Conclusion

In conclusion, the findings of this study suggest that the depth of anesthesia has a significant impact on the improvement of the patient's condition and surgeon's satisfaction (SRS) during surgery. Overall, the results highlight the importance of considering the depth of anesthesia in improving patient outcomes and surgeon satisfaction during surgery.

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