

Anesthesia management in laparoscopic bariatric surgery: Perioperative complications and outcomes in the third year of practice

Laparoskopik bariatrik cerrahide anestezi yönetimi: 3 yıllık uygulamada perioperatif komplikasyonlar ve sonuçlar

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ABSTRACT

Objective: In this study, we aimed to assess the perioperative and postoperative results of the patients who underwent bariatric surgery.

Methods: After obtaining approval, a retrospectively designed observational study was conducted. All adult patients who underwent laparoscopic gastric plication, sleeve gastrectomy, or roux-en-Y anastomosis between January 2011 and May 2013 were included.

Results: A total of 104 patients were included in the study period: 49 (47.1%) underwent laparoscopic roux-en-Y anastomosis, 44 (42.3%) underwent laparoscopic sleeve gastrectomy, and 11 (10.6%) underwent laparoscopic gastric plication. The present study showed a mortality rate of 1.9% (n = 2, one after Roux-en-Y anastomosis operation, and the other one after gastric plication).

Conclusion: The anesthesia methods and approaches have no association with morbidity and mortality in such procedures of bariatric surgery indicated in the present study. *J Clin Exp Invest* 2014; 5 (2): 200-205

Key words: Obesity, bariatric surgery, anesthesia, laparoscopy.

ÖZET

Amaç: Bu çalışmada, bariatrik cerrahi operasyonu geçiren hastaların perioperatif ve postoperatif sonuçlarının değerlendirilmesi amaçlanmıştır.

Yöntemler: Onam alındıktan sonra, retrospektif tasarlanan gözlemsel çalışma yapıldı. Ocak 2011 ve Mayıs 2013 yılları arasında laparoskopik gastrik plikasyon, sleeve gastrektomi ve roux-en-Y anastomoz operasyonları geçiren tüm yetişkin hastalar çalışmaya dâhil edildi.

Bulgular: Çalışma süresince toplam 104 hasta dâhil edildi ve bunların; 49 (%47.1)'u laparoskopik roux-en-Y anastomoz, 44 (%42.3)'ü laparoskopik gastrik plikasyon, ve 11 (%10.6)'i laparoskopik gastrik plikasyon idi. Yapılan çalışmada %1.9 mortalite oranı (n = 2, roux-en-Y anastomoz operasyonundan sonra bir vaka, ve gastrik plikasyon operasyonundan sonra bir vaka) saptanmıştır.

Sonuç: Çalışmada belirtilen bariatrik cerrahi prosedürlerinde, morbidite ve mortalite ile anestezi metodu ve yaklaşımı arasında bir ilişki yoktur.

Anahtar kelimeler: Obezite, obezite cerrahisi, anestezi, laparoskopi

INTRODUCTION

Obesity has become one of the greatest public health problems, and it affects millions of people around the world [1,2]. The World Health Organization reported that nearly 1.5 billion individuals are overweight (body mass index (BMI) >25 kg/m²), and of these, >200 million men and approximately 300 million women are obese (BMI >30 kg/m²) [3-8].

Bariatric surgery, which is continuously in development, is an acceptable alternative treatment option for obese individuals [9]. It has been per-

formed to provide weight loss and improved quality of life, as well as to decrease the risk of obesity-related disorders [3]. A wide range of available surgical techniques, including intragastric balloon, biliopancreatic diversion, gastric plication, sleeve gastrectomy, and roux-en-Y anastomosis, have been performed on patients with morbid obesity (BMI >40 kg/m²) or severe obesity (BMI >35 kg/m²). While invasive approaches have been associated with better clinical results, such as consistent weight loss and comorbidity resolution, their disadvantage is an increased risk of perioperative mortality [10].

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Various previous studies have involved heterogeneous populations and different techniques, performed by several surgical teams. Therefore, the present study was aimed to assess the perioperative and postoperative complications and anesthesia techniques in bariatric surgery.

METHODS

After obtaining approval from the Gaziosmanpaşa University ethics committee, a retrospectively designed observational study was conducted. All adult patients who underwent laparoscopic gastric plication, sleeve gastrectomy, or roux-en-Y anastomosis between January 2011 and May 2013 were included. Patients 18-70 years of age with a BMI >40 kg/m² or BMI >35 kg/m² with a morbid obesity-related substantial comorbidity, such as type 2 diabetes, hypertension, obstructive sleep apnea, or dyslipidemia, were included in the study. Age, gender, BMI and American Society of Anesthesiologists score (ASA) were recorded. The exclusion criteria included presence of psychiatric disorder, alcohol or substance abuse, presence of active gastric ulcer, gastroesophageal reflux disease with a large hiatal hernia, and history of previous bariatric surgery.

Statistical analysis

Normality and variance were tested using the one-sample Kolmogorov-Smirnov test, skewness, kurtosis, and histograms for each variable. Quantitative data are presented as means and standard deviation, and qualitative data as frequency and percentage. Depending on those results, a non-parametric analysis was undertaken for each variable. Body mass index, duration of anesthesia, surgery, and recovery room and hospital stay differences among groups were analyzed using the Mann-Whitney U-test. Difficult intubation, ICU admission, and mortality rate differences between groups were analyzed using the Fisher's exact test. Analyses were conducted using the Statistical Package for Social Sciences program version 20.0 (SPSS Inc., Chicago, IL). Statistical significance for all analyses was set at $p < 0.05$.

RESULTS

A total of 104 patients were included in the study period: 49 (47.1%) underwent laparoscopic roux-en-Y anastomosis, 44 (42.3%) underwent laparoscopic sleeve gastrectomy, and 11 (10.6%) underwent laparoscopic gastric plication. Demographic data are presented in Table 1, and Table 2 shows the prevalence of comorbidities. Induction of anesthesia was

conducted by using propofol in 58 (55.7%) patients and thiopental in 46 (44.3%). Table 3 presents the means and percentages of the perioperative outcomes. Tramadol, morphine, and pethidine were the analgesic drugs used for postoperative pain relief, in 25 (24%), 62 (59.6%), and 17 (16.4%) patients, respectively. Paracetamol was administered to 81 patients (77.9%) as an additional analgesic. Nausea and vomiting were observed in 11 (44%) patients given tramadol, 20 (32.2%) given morphine, and three (17%) given pethidine. Anesthesia, surgery, and recovery room duration were all found to be significantly higher in the Roux-en-Y anastomosis group than in the others ($p < 0.01$, $p < 0.01$, and $p = 0.005$, respectively). Perioperative characteristics due to the anesthesia induction agent were presented in Table 4.

Table 1. Characteristics of the patients

	Mean $\pm$ SD; n	Median	Range
Age (years)	41.48 $\pm$ 11.74	43	18 – 68
Gender (F/M)	78/26 (75/25)	–	–
BMI (kg/m ²)	43.51 $\pm$ 7.65	41	35.16 – 86.73
ASA (II/III)	27/77	–	–

BMI: Body Mass Index

Table 2. Distributions of comorbidities

Comorbidities	n (%)
Diabetes mellitus type 2	49 (47.1)
Hypertension	30 (28.8)
Asthma	2 (1.9)
Hypothyroidism	2 (1.9)
Ischemic heart disease	1 (0.9)
Chronic Renal Failure	1 (0.9)
Obstructive Sleep Apnea Syndrome	1 (0.9)

Two patients in the gastric plication group and two in the Roux-en-Y group required intensive care unit admission after surgery. One patient in the gastric plication group and one in the Roux-en-Y group died during the postoperative period. The main causes of the deaths in the hospital were myocardial infarction after Roux-en-Y anastomosis, and pulmonary embolism and pneumonia after gastric plication. Two patients in the Roux-en-Y anastomosis group and one patient in the gastric plication group required reoperations associated with anastomotic leaking and bleeding after surgery, respectively.

The patient in the gastric plication group was also diagnosed and followed up as sepsis in the intensive care unit.

Table 3. Variables in the sample (Perioperative outcomes)

	Mean $\pm$ SD, (Range); n (%)
Mallampati I/II/III/IV	12/55/34/4
Difficult intubation	9 (8.6)
Duration of Anesthesia	185.33 $\pm$ 42.10 (110-300)
Duration of Surgery	168.02 $\pm$ 39.86 (100-270)
Duration in Recovery room	25.67 $\pm$ 7.20 (20-80)
Nausea-vomiting	34 (32.3)
Diarrhea	1 (0.9)
Fever	1 (0.9)
Sore throat	4 (3.8)
Intensive Care Unit admission	3 (2.8)
Pulmonary embolism	1 (0.9)
Pneumonia	1 (0.9)
Bronchospasm	12 (11.4)
Allergic reactions	1 (0.9)
Cardiovascular Complications (MI*)	1 (0.9)
Wound infection	3 (2.8)
Sepsis	1 (0.9)
Bleeding	2 (1.9)
Mortality	2 (1.9)

*MI: Myocardial Infarction

Table 4. Perioperative characteristics associated with the anesthesia induction agent

	Pentotal (n = 56)	Propofol (n = 48)	p
Duration in recovery room (Mean $\pm$ SD)	25,17 $\pm$ 4,56	26,25 $\pm$ 9,42	0,981 [†]
Duration of hospital stay (Mean $\pm$ SD)	7,71 $\pm$ 3,30	7,50 $\pm$ 4,39	0,709 [†]
ICU admission (n)	2	1	0,651 [§]
Requirement of mechanical ventilation (n)	0	1	0,278 [§]
Postoperative complications (n)	7	4	0,219 [§]

[†] Mann-Whitney U test; [§] Chi-Square test.

Nine patients experienced difficult intubation, twelve patients suffered from bronchospasm, one patient had intestinal transit problems associated with the surgery (vomiting or diarrhea requiring admission or specific treatment), one patient had a fever of unknown origin, and three patients had surgical wound infections.

DISCUSSION

The present study revealed a mortality rate of 1.9% for bariatric surgery caused by cardiovascular system disorders. Type 2 Diabetes mellitus is the most frequent comorbidity among the study sample. Nausea-vomiting and bronchospasm have the highest occurrence rate in complications.

A recent review of bariatric surgery including more than 100,000 surgical interventions between 1998 and 2006 reported a global mortality prevalence of 4.6%. That study also defined older age (>65 years), male gender, and surgeons who are less experienced in bariatric surgery as independent risk factors for mortality. In addition, a higher mortality rate was found in malabsorptive techniques, and a lower risk in laparoscopic gastric banding [11]. A systematic review conducted by Buchwald et al. reported global mortality rates of 0.28% during the first 30 days of the postoperative period and 0.35% in the first two years after intervention. They also indicated that old age, male gender, and BMI were specific risk factors for mortality [12]. In the study of Weiner et al., the mortality rate after laparoscopic sleeve gastrectomy was higher compared to gastric bypass or banding (0.4% and <0.1%, respectively) [13]. Pulmonary embolism, including its complication, deep vein thrombosis, is a common cause of morbidity and mortality after bariatric surgery. A varied prevalence of venous thromboembolism has been reported, from 0.2 to 1.3% at 30 days and 0.42 at 90 days during the postoperative period [14]. Regarding the information mentioned above, mortality can be associated with the consequence of comorbid disorders such as cardiovascular diseases and coronary heart disease [15,16]. In a recent study, Moszkowicz et al. indicated that careful patient selection, safer alternative procedures, and close follow-up in the postoperative period might help diminish the risk of serious complications and their potential results [17].

The present study revealed a mortality rate of 1.9%; one patient had comorbidities (diabetes mellitus type 2 and hypertension), but the other had none. In addition, the first patient had a myocardial

infarction in the early postoperative period, which led to his death. The second one had a pulmonary embolism after surgery, which impaired the patient's condition and led to the patient's death. A current study indicated that high doses of thromboprophylaxis administration decrease the rate of venous thromboembolism by 50% in morbidly obese patients [18]. In contrast, routine doses of thromboprophylaxis were used in our patient, which may have been involved in the patient's mortality. Consistent with the literature, these outcomes suggested that obesity, with or without comorbidities, can be accepted as an independent risk factor for mortality.

In a large meta-analysis, the overall incidence of difficult intubation in obese patients was reported to be 15.8%, compared to 5.8% in the general population [19]. The present study revealed a global difficult intubation ratio of 8.9%, including 3.6% with Mallampati II, 17.6% with Mallampati III, and 25% with Mallampati IV scores in the airway assessment. However, Brodsky et al. reported that neither obesity nor BMI could be a predictive value, and that obstructive sleep apnea is not a risk factor for difficult intubation [20]. In the current study, nine patients required video laryngoscopy during the intubation process after two failed conventional laryngoscopies. As indicated by Marrel et al., using a video laryngoscope substantially improves visualization of the tracheal aperture in morbidly obese patients [21].

Hans et al. reported that no difference was observed between pressure-controlled ventilation and volume-controlled ventilation, while partial arterial oxygen pressure and partial arterial carbon dioxide pressure values revealed similarities between the two ventilation techniques in morbidly obese patients who underwent abdominal surgery [22].

Nevertheless, some authors have indicated that a positive end-expiratory pressure (PEEP) application of 10 cmH₂O after a recruitment maneuver could be beneficial in obese patients, resolving atelectasis, preventing small airways collapse, and improving ventilation-perfusion and oxygenation [23]. In addition, recent studies have revealed that a PEEP of 15 cmH₂O is effective in preserving functional residual capacity and improving oxygenation during laparoscopic surgery in morbidly obese patients [24,25]. In the present study, PEEP was maintained at a level of 5-8 cmH₂O, and no complications were observed to be associated with this PEEP value. However, further studies are required to elucidate the optimal PEEP levels and tidal vol-

ume administration during general anesthesia in morbidly obese patients.

In the current study, anesthesia induction was mainly conducted by using propofol. Jung et al. assessed thiopental disposition in seven obese and eight lean patients undergoing abdominal surgery, and they showed that the elimination half-life of thiopental was substantially longer in the obese patients (27.8 hours) than in the non-obese patients (6.33 hours); the increased volume of distribution associated with obesity [26] primarily caused this difference. On the other hand, a study conducted by Servin et al. revealed that the elimination half-life of propofol was similar in obese (29.1 minutes) and non-obese patients (24.2 minutes); this result was associated with the simultaneous rise in the volume of distribution and clearance [27]. In a relation manner, recovery room duration and Aldrete scores were similar in patients given propofol and those given thiopental.

Furthermore, two randomized studies demonstrated that sevoflurane was associated with providing hemodynamic stability, quick recovery, and low incidence of nausea and vomiting, and was superior to isoflurane in bariatric surgery [28,29]. A current study showed that desflurane, a new anesthetic agent, leads to faster recovery, thus contributing to fast-tracking and early recovery room discharge of patients. Sevoflurane was the only anesthetic agent used in this study. The recovery time of the sevoflurane group in the study of Colla et al. was similar to that found in the present study [30].

A multimodal approach is recommended in pain management to reduce the risk of respiratory depression and the incidence of opioid-related side effects such as nausea, pruritus, and delayed bowel function [31]. Moreover, epidural analgesia is technically difficult and can delay mobilization. Therefore, opioids with paracetamol or non-steroid anti-inflammatory drugs (NSAIDs) as part of a multimodal regimen can be preferred for postoperative analgesia in morbidly obese patients. In addition, NSAIDs should be used with caution in patients at high risk of postoperative renal dysfunction [32]. The present study revealed a 32.7% global incidence of nausea and vomiting.

There are several limitations in this study. First, we could not present long-term postoperative outcomes, as the procedures were performed recently. Second, the numeric rating scale for pain of the patients had not been assessed, which led to a gap in

evaluating the effect of pain on hospital stay duration.

In conclusion, the present study revealed that the anesthesia methods and approaches used have no association with morbidity and mortality in bariatric surgery. However, the fatalities in this study show that bariatric procedures require a multidisciplinary team in which the anesthesiologist has a key role during the perioperative period to design strategies for the prevention and treatment of complications. Moreover, well-designed protocols in anesthesia management might enhance the perioperative care modalities of this unique group of patients. Further studies, with larger sample sizes over a prolonged follow-up period, are needed in order to elucidate the exact effects of independent risk factors on perioperative morbidity and mortality.

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