DOI: https://doi.org/10.2298/SARH240416055P
UDC: 616-089.5:613.25

ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Analysis of comorbidity and anesthesia technique in patients undergoing bariatric surgery at the University Clinical Center of Serbia

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SUMMARY

Introduction/Objective Altered physiology and metabolism of obese patients represents a big challenge for the anesthesiologist. The objectives of the study are to investigate numbers of comorbidities, choice of anesthesia techniques, intraoperative, and postoperative complications between bariatric and non-bariatric patients.

Methods This retrospective study included 469 patients. The study group of patients included obese patients with body mass index ≥ 30. Control Group included patients in whom elective laparoscopic cholecystectomy was performed, on the same day as bariatric surgery in Control Group.

Results The study group included 235 patients who underwent bariatric surgery, while control group included 234 patients. More patients in study group had comorbidities compared with Control Group (84.4% *vs*. 63.2%, p < 0.001). In the study group, total intravenous anesthesia and target control anesthesia were statistically significant more delivered than in the Control Group (74% *vs*. 0.9%, p < 0.001; 7.2% *vs*. 1.7, p < 0.001, respectively). Difficult intubation was statistically significant more in Control Group (5.6% *vs*. 0.9%, p = 0.004). There was a statistically significant difference in the incidence of intraoperative desaturation and hypotension during induction of anesthesia between the study and Control Group (9.8% *vs*. 2.1%, p < 0.001; 14.5% *vs*. 2.1, p < 0.001, respectively). There was statistically significant difference between the study and control group in minor complication according Clavien–Dindo classification, (20.8% *vs*. 5.1%, p < 0.001).

Conclusion Obesity is associated with higher number of comorbidities and intraoperative complications. There was no statistically difference in major postoperative complications between bariatric and non-bariatric patients.

Keywords: obesity; bariatric surgery; comorbidities; body mass index

INTRODUCTION

According to the definition of the World Health Organization, obesity represents “abnormal or excessive fat accumulation that presents a health risk” [1]. Obesity is defined by a body mass index (BMI). BMI between 25 and 29.9 kg/m² defines overweight, while BMI over 30 kg/m² considers obesity [1, 2]. Obesity or overweight status affects about 60% of the adult population. Also, one in three children is obese. Overall, obesity has been identified as the fourth-leading cause of noncommunicable diseases [1]. In 2019, 20.8% of the population over the age of 15 was obese in Serbia [3]. Comorbidities such as cardiovascular disease, type 2 diabetes, rheumatoid arthritis, major depressive illness, polycystic ovarian syndrome, asthma, and obstructive sleep apnea (OSA) are more likely in obese patients [2, 4, 5, 6].

The metabolic, anatomical, and physiological aspects of obese patients make induction and maintenance of anesthesia challenging [7, 8]. Obese patients often have upper airway obstruction, decreased lung capacities and compliance, higher respiratory exertion, and impaired gas exchange. Respiratory pathophysiology is altered [7, 8]. Difficult ventilation and intubation are expected during anesthesia induction for bariatric surgery [8, 9]. Determining the dose of the anesthetic drugs in obese patients may be particularly challenging. Lipophilic drugs such as propofol, barbiturates, and benzodiazepines characterize high volume of distribution. To achieve adequate serum concentrations, larger loading doses are needed, therefore doses are calculated based on total body weight (TBW). For anesthesia maintenance, dosing these medications should be calculated based on the ideal body weight (IBW) or lean body weight (LBW). Loading succinylcholine dose is calculated based on TBW. Nondepolarizing muscle relaxants dose is calculated based on IBW as in non-obese patients. Fentanyl, sufentanil, alfentanil should be estimated based on LBW, whereas remifentanil on IBW [8, 10].

Obese patients are at greater risk of developing postoperative complications. Wound infection, intra-abdominal infection, bowel injury,

Received • Примљено:
April 16, 2024
Revised • Ревизија:
June 10, 2024
Accepted • Прихваћено:
July 1, 2024
Online first: July 3, 2024

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myocardial and other major complications are more common in these patients [11]. An adequate preoperative assessment is mandatory as optimal intraoperative anesthetic management and postoperative care to prevent postoperative complications after bariatric surgery [7, 8, 12].

We hypothesized that obese patients have higher prevalence of comorbidities, and are more prone to postoperative complications.

The objectives of this study was to examine the prevalence of comorbidities in patients undergoing bariatric surgery compared to patients undergoing elective cholecystectomy. Also, we analyzed the choices of the anesthesia techniques in bariatric and elective surgery, the incidence of intraoperative and postoperative complications between bariatric and non-bariatric patients.

METHODS

This retrospective study included 469 patients, scheduled for bariatric surgery or elective cholecystectomy at the Hospital for Digestive Surgery, University Clinical Center of Serbia, during the period from June, 2011 to November, 2022. This study was approved by the ethics committee of the University Clinical Center of Serbia, protocol number (661/2).

Obese patients with a BMI ≥ 30 undergoing bariatric surgery were included in the study group (SG). The control group (CG) included patients admitted to the hospital for an elective laparoscopic cholecystectomy procedure and scheduled for surgery on the same day as SG. The preoperative interdisciplinary team of specialists decided about eligibility of the patients for bariatric surgery. This interdisciplinary health care team included an anesthesiologist, surgeon, pulmonologist (a spirometry report was mandatory), cardiologist (an ergospirometry was mandatory), psychiatrist, endocrinologist, and for women, a gynecologist. A cardiological examination with electrocardiogram (ECG) and chest X-ray not older than one month were obligatory before cholecystectomy in CG. Laboratory panel testing (complete blood count, biochemical, and coagulation analyses) within 14 days before surgery was mandatory in both groups. All patients in both groups received antibiotic prophylaxis (cephazolin) 30 minutes before the operation. Low molecular weight heparin for deep vein thrombosis prophylaxis was administered two hours before surgery. In the present study, hypertension, cardiac arrhythmias, coronary heart disease, hyperlipidemia (HLP), diabetes mellitus (DM) type 1 or 2, chronic obstructive pulmonary disease (COPD), obstructive hypoventilation syndrome or OSA, epilepsy, anemia, varicose veins of lower extremities were recorded. The other comorbidities were listed as additional comorbidities. The American Society of Anesthesiologists (ASA) status was used to rated patients conditions.

Difficult intubation was recorded according to definition from the latest the Difficult Airway Society guidelines [13]. All analyzed data were obtained from medical records of patients.

Premedication with benzodiazepines was not routinely used. Before induction of anesthesia, preoxygenation was performed in all patients. Anesthesia techniques – balanced anesthesia (BA), total intravenous anesthesia (TIVA) or target control infusion anesthesia (TCI) was chosen by attending anesthesiologist. Induction of BA was achieved with propofol 1.5–2 mg/kg according to TBW and fentanyl 2–4 mcg/kg LBW. For anesthesia maintenance sevoflurane was used, with minimal alveolar concentration 0.8–1.2 Vol% based on the patient's age. Analgesia was achieved with fentanyl 50–200 mcg/h as an intermittent intravenous bolus according to patient comfort. For TIVA, propofol was used 10–16 mg/kg/h according to TBW and remifentanil 0.25–1 mcg/kg/min according to IBW for induction. During maintenance of anesthesia, propofol was used 4–6 mg/kg/h of LBW and remifentanil 0.2–0.5 mcg/kg/min of IBW. In case of using TCI, Marsh or Schneider model was used with target concentrations of propofol 6–8 mcg/ml according to TBW or LBW, respectively for induction of anesthesia. Maintenance anesthesia doses were 2–4 mcg/ml of LBW. Remifentanil (target effect site) was used in the range 6–10 ng/ml according to IBW for analgesia. In both intravenous techniques the breathing mixture was a combination of oxygen and air. During induction, for laryngoscopy and intubation, succinylcholine was used in dose of 1–1.2 mg/kg according to TBW, or rocuronium in dose of 0.6–1.2 mg/kg according to IBW in all patients. For maintenance neuromuscular blockade rocuronium was used in all anesthesia techniques in dose of 0.3 mg/kg IBW. Reversal of the neuromuscular blockade was performed with neostigmine/atropine or sugammadex in all patients, depending on the attending anesthesiologist.

Intraoperative monitoring [heart rate (HR), ECG, noninvasive blood pressure, peripheral saturation of oxygen (SpO_2) and end-tidal CO_2 concentration] was performed in all patients from both groups. In patients in SG, two peripheral venous lines were placed, while in CG one peripheral venous line was placed. Urinary catheter was inserted and hourly urine output was monitoring in SG. Bispectral Index™ (BIS™ Medtronic, Minneapolis, MN, USA) was used for TIVA or TCI.

In all patients, trachea was extubated at the end of surgery. After the extubation, the majority of patients were transferred to the department after staying for one hour in the recovery room. Patients who required noninvasive mechanical ventilation following surgery were admitted to the intensive care unit (ICU) and stayed overnight. Postoperative multimodal analgesia was achieved with nonsteroid anti-inflammatory drugs, paracetamol and metamizole. If a patient needed additional analgesia, tramadol or morphine were administered intravenously. Intraoperative and postoperative complications were recorded in patient's medical records. Bronchospasm, pneumothorax, desaturation (defined as $SpO_2 < 90\%$), hypotension (defined as systolic pressure < 90 mmHg), hypertension (defined as > 20% of initial arterial pressure), bradycardia (defined as HR < 50 per minute), tachycardia (defined as HR > 100 per minute), and cardiac arrhythmia were defined as intraoperative complications and were reported in anesthesia records.

Postoperative complications were registered and categorized according to the Clavien–Dindo (CD) classification of surgical complications [14]. Minor complications were defined as CD grade I and II, major complications were defined as CD grade III and IV.

Statistical analysis was performed in IBM SPSS Statistics for Windows, Version 28.0. (IBM Corp. Armonk, NY, USA). Data were collected from medical and anesthesia records of patients. Data were described and analyzed using descriptive statistics, mean and standard deviation for continuous variables and counts and percentages for categorical variables. For clinical outcomes, for categorical variables χ^2 test or Fisher's exact test was used. For parametric variables, Student's t-test was used. For non-parametric test Mann–Whitney test was performed. Statistical significance was calculated at level of significance of $p < 0.05$.

RESULTS

Of the total number of patients (469), SG included 235 of patients, while in CG were 234 patients. There was a statistically significant difference in the BMI between SG and CG (44.9 ± 6.2 *vs*. 27.5 ± 4.6, p < 0.001) (Table 1). In CG, 26% of patients had BMI > 30 kg/m². There was a statically significant difference in the age, younger patients were in SG (40.75 ± 9.9 *vs*. 48 ± 13.6, p < 0.001) (Table 1). There was a statistically significant difference in the ASA status between groups (p < 0.001), patients in SG were rated with higher ASA status (Table 1). More comorbidities were reported in the study than in CG (84.6% *vs*. 63.2%, p < 0.001) (Table 2). There was statistically significant difference in prevalence of HTA, DM and COPD in SG (55.8% *vs*. 39.3%, p < 0.001; 58% *vs*. 12.8%, p < 0.001; and 19% *vs*. 7.7%, p < 0.001, respectively (Table 2). More cardiac arrhythmia was detected in CG (2.6 % *vs*. 6.8%, p = 0.047), and additional comorbidity was more verified in SG (38.1% *vs*. 25.6%, p = 0.005) (Table 2). Premedication was more delivered in the study compared to CG (70.6% *vs*. 33.9%, p < 0.001) (Table 3). There was statistically significant difference in using succinylcholine for intubation between the study and CG (87.5% *vs*. 71.7%, p < 0.001) (Table 3). Also, there was statistically significant difference in using TIVA and TCI between study and CG (74% *vs*. 1.1%, p < 0.001; 7.2% *vs*. 1.7%, p = 0.004) (Table 3). BA was the technique of choice in CG, and was statistically more performed (97.7% *vs*. 11.9, p < 0.001) (Table 3). The reversion of neuromuscular blockade was used in both groups, statistically significantly more often used in SG difference (99.1% *vs*. 96.2%, p = 0.032) (Table 3).

For neuromuscular reversion, sugammadex was used more in SG (82.8% *vs*. 0.4%, p < 0.001) (Table 3). There was no statistically significant difference in the occurrence in the total number of intraoperative complications between study and CG (42.6% *vs*. 43.2%, p = 0.894) (Table 4). Difficult intubation was more documented in CG in compare to SG (0.9% vs. 5.6%, p = 0.004) (Table 4).

Table 1. Demographic characteristics of patients

Parameters	Study group (n = 235)	Control group (n = 234)	p-value
Sex, female, n (%)	162 (68.9)	145 (62.2)	0.127**
Age, mean ± SD	40.75 ± 9.9	48 ± 13.6	< 0.001*
BMI (kg/m²), mean ± SD	44.9 ± 6.2	27.5 ± 4.6	< 0.001*
Body weight (kg), mean ± SD	138 ± 6.7	83.04 ± 1.1	< 0.001*
ASA status			
ASA 1, n (%)	2 (0.9)	72 (30.8)	< 0.001**
ASA 2, n (%)	177 (76)	148 (63.2)	
ASA 3, n (%)	53 (22.7)	14 (6)	
ASA 4, n (%)	1 (0.4)	0 (0)	

*Student's t-test, ** Pearson's χ^2 test, p < 0.05 statistically significant difference
BMI – body mass index; ASA status – American Society of Anesthesiologists status

Table 2. Comorbidities

Parameters	Study group (n = 235)	Control group (n = 234)	p-value
Overall comorbidities, n (%)	198 (84.6)	148 (63.2)	< 0.001*
Hypertension, n (%)	130 (55.8)	92 (39.3)	< 0.001*
DM (type 1 or 2), n (%)	134 (58)	30 (12.8)	< 0.001*
Cardiac arrhythmia, n (%)	6 (2.6)	16 (6.8)	0.047*
HLP, n (%)	27 (12.6)	20 (8.5)	0.160*
CHD, n (%)	5 (2.2)	8 (3.4)	0.408*
Epilepsy, n (%)	3 (1.3)	3 (1.3)	0.992**
COPD, n (%)	44 (19)	18 (7.7)	< 0.001*
Anemia, no (%)	5 (2.2)	5 (2.1)	0.989*
Varicose veins of the lower extremities, n (%)	13 (5.6)	12 (5.1)	0.840*
OSA, n (%)	10 (4.3)	3 (1.3)	0.053**
Additional comorbidity, n (%)	88 (38.1)	60 (25.6)	0.005*

*Pearson's χ^2 test, **Fisher's exact test, p < 0.05 statistically significant difference
DM – diabetes mellitus; HLP – hyperlipidemia; CHD – chronic heart disease; COPD – chronic obstructive pulmonary disease; OSA – obstructive sleep apnea

Table 3. Anesthesia techniques

Anesthesia techniques	Study group n = 235	Control group n = 234	p-value
Premedication, n (%)	166 (70.6)	79 (33.9)	< 0.001*
Neuromuscular relaxant for intubation			
Succinylcholine, n (%)	203 (87.5)	167 (71.7)	< 0.001*
Rocuronium, n (%)	27 (11.6)	62 (26.6)	
Cisatracurium, n (%)	2 (0.9)	4 (1.7)	
TIVA, n (%)	174 (74)	2 (1.1)	< 0.001**
TCI, n (%)	17 (7.2)	4 (1.7)	0.004**
BA, n (%)	28 (11.9)	229 (97.7)	< 0.001*
Reversion neuromuscular blockade, n (%)	233 (99.1)	225 (96.2)	0.032*
Neostigmine, n (%)	40 (17.2)	221 (98.7)	< 0.001*
Sugammadex, n (%)	193 (82.8)	1 (0.4)	
Neostigmine and sugammadex, n (%)	0 (0)	2 (0.9)	

*Pearson's χ^2 test, **Fisher's exact test, p < 0.05 statistically significant difference
TIVA – total intravenous anesthesia; TCI – target-controlled infusion; BA – balance anesthesia

Table 4. Intraoperative complications

Parameters	Study group n = 235	Control group n = 234	p-value
Total complications, n (%)	100 (42.6)	101 (43.2)	0.894*
Difficult intubation, n (%)	2 (0.9)	13 (5.6)	0.004**
Bronchospasm, n (%)	3 (1.3)	3 (1.3)	0.999**
Pneumothorax, n (%)	2 (0.9)	0 (0)	0.49**
Desaturation, n (%)	23 (9.8)	5(2.1)	< 0.001*
Hypotension, n (%)	34 (14.5)	5 (2.1)	< 0.001*
Hypertension, n (%)	49 (20)	67 (28.6)	0.055*
Bradycardia, n (%)	20 (8.5)	19 (8.1)	0.999*
Tachycardia, n (%)	19 (8.1)	39 (16.7)	0.005*
Cardiac arrhythmia, n (%)	0 (0)	2 (0.9)	0.248 **

*Pearson's χ^2 test, **Fisher's exact test, p < 0.05 statistically significant difference

Table 5. Postoperative complications according Clavien–Dindo classification

Clavien–Dindo classification	Study group n = 235	Control group n = 234	p-value
Grade I, n (%)	43 (18.3)	11 (4.7)	< 0.001*
Grade II, n (%)	6 (2.6)	1 (0.4)	0.13**
Grade IIIa, n (%)	0 (0)	0 (0)	0.999**
Grade IIIb, n (%)	1 (0.4)	0 (0)	0.988**
Grade IV (a and b), n (%)	0 (0)	0 (0)	0.999**
Grade V, n (%)	0 (0)	0 (0)	0.999**
Minor complications, n (%) #	49 (20.8)	12 (5.1)	< 0.001*
Major complications, n (%) #	1 (0.4)	0 (0)	0.999**

*Pearson's χ^2 test, **Fisher's exact test, p < 0.05 statistically significant difference
#Minor complications – Clavien–Dindo grade I and II; #Major complications – Clavien–Dindo grade III, IV and V

Incidence of intraoperative desaturation occurred significantly more in the study than in CG (9.8% *vs*. 2.1%, p < 0.001) (Table 4). Hypotension episodes was statistically significant more documented in study compared to CG (14.5% *vs*. 2.1%, p < 0.001) (Table 4). There was statistical significance in occurrence of tachycardia between study and CG, more tachycardia was registered in CG (8.1% *vs*. 16.7%, p = 0.005) (Table 4). Postoperative complications according CD classification gradus I was significantly more documented in the study compared to CG (18.3% *vs*. 4.7%, p < 0.001). There was statistically significant difference in occurrence of minor postoperative complications (CD grade I and II) between the study and CG (Table 5).

DISCUSSION

Obesity is a chronic disease of the modern age. Obesity itself is already a severe condition and patients often have two or more comorbidities [2, 5, 6]. In the present study, more comorbidities were reported in obese patients than in patients for elective cholecystectomy. TIVA and TCI were the most common choice in bariatric patients. There were statistically significant more minor postoperative complications in SG.

In SG, average BMI was 44.9 kg/m², the mean age was 40 and 68.9% of patients were female which is in agreement with results from The International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) and in the research of the North-Western Europe countries. IFSO and North-Western Europe countries reported that bariatric patients have an average BMI 40–45 kg/m², are in their forties with the majority of patients being female [11, 15].

According to the results of the National Institute for Public Health in Serbia, 20.8% of the general population is obese [3]. In CG, 26% patients were obese. It seems that a significant number of obese patients are going for the elective surgery daily.

Comorbidity frequency in bariatric patients varies significantly among countries, according to the population studies including hypertension (up to 83.2%), HLP (up to 82.1%), DMT2 (up to 47.4%), and musculoskeletal pain (43.7%) [11, 15, 16, 17]. In this study, bariatric patients suffered from hypertension (55.8%), DMT2 (58%), and HLP (12.6%). The IFSO reported a large variation of the OSA incidence from 49.5% in Canada, Ontario to the lowest rates in Russia (2.7%), and 40% in UK [15, 18]. In the current study, OSA was found in 4.3% patients. The reason for a large disparity in the OSA incidence between observed centers may be found that experts conducting polysomnography studies are needed [15]. COPD was documented in 19% of patients in SG with a statistical difference compared to CG. Verberne et al. [6] reported that one third of patients presenting with COPD have an average BMI of 33.7 kg/m². There was a statistically significant difference between the ASA status in study and CG. The majority of patients were rated with ASA score ≥ 2 in SG, while in CG the most of patients were rated with ASA status 1. According to literature, regardless whether obese patients have comorbidities, they will be rated with a higher ASA status. Patients with a BMI between 30 and 40 will be rated with ASA status 2, and for BMI over 40 with ASA status 3 [19].

The choice of anesthesia technique in obese patients depends of the excessive volume of distribution. These patients are often under- or over-dosed with anesthetic drugs [10, 20].

TIVA and TCI with current pharmacokinetic models represent safe and precise anesthetic techniques, but definitely necessary combustible dose titration in obese patients. The use of BIS monitoring is mandatory, but clinical effects are also important [20, 21]. In the present study, TIVA and TCI with mandatory BIS monitoring were used significantly more often during bariatric surgery compared to cholecystectomy, where BA was used more frequently. Research shows that opioid-free anesthesia in bariatric surgery is also a safe technique [22].

A difficult intubation is expected in bariatric patients. De Jong et al. [23] showed that succinylcholine was the most common choice for muscle relaxation for intubation in the ICU (in 70% of cases), while in the operating room succinylcholine was used in only 19% of obese patients. For intubation, atracurium and cisatracurium were the main choice in 73% of patients, whereas rocuronium was used in only 1% of patients in the operating room, and

11% of patients in the ICU [23]. The frequency of difficult intubations in obese patients was 8.2% in the operating room and 16.3% in the ICU [23]. In our study, difficult intubation was observed only in 0.9% of patients in SG, in contrast to 5.6% patients in CG. This may be explained by the fact that we expected a difficult intubation in SG, and the anesthesiologist was prepared for it. Every patient in SG was positioned according to the recommendations (rapid airway management positioner).

During the induction of anesthesia, the main complication was desaturation – 9.8% in SG compared to 2.1% in CG. De Jong et al. [23] reported severe hypoxemia in ICU obese patients (50%), while in the operating theatre no severe hypoxemia was occurred [24]. In our study, all desaturations during apnea time were lasting less than 90 seconds in both groups and did not affect patient's safety. Reduced oxygen reserve due to lung restriction is the reason for desaturation during apnea time. An adequate patient positioning and nasopharyngeal insufflation of oxygen during the apnea period is sufficient to prevent desaturation in almost 100% of morbid obese patients [25]. In the present study, only in morbid obese patients with BMI > 55 nasopharyngeal insufflation of oxygen was used during the apnea period.

The literature data favor the reversion of the complete neuromuscular blockade [7, 12, 26]. Gaszynski et al. [26] showed the benefit of using sugammadex, the train-of-four ratio was 3.5 times faster, than in the group receiving neostigmine for decurarization [26]. In our study, 82.8% of patients in SG received sugammadex in compared 0.4% of patients in CG for faster and safer reversal of neuromuscular block.

According to a multinational study of North-Western European countries, complications after bariatric intervention occurred in 6.5% of patients. The most common were bleeding, anastomotic leakage, gastrointestinal perforations and postoperative ileus [11]. In our research, the most common complications were CD grade 1 and 2 in SG. There was a statistically significant difference in minor complications between groups, but with no significant difference in major complications. More minor complications were documented in SG.

Limitations

The limitation of this study is that only elective laparoscopic gallbladders were observed in CG. The reason is that it is the most common elective laparoscopic surgery, and patients are discharged home on the first or second postoperative day.

CONCLUSION

This study showed that one third of the patients in the elective program are obese. Bariatric patients are younger with more comorbidities compared to non-bariatric patients. In order to increase the safety of anesthesia in bariatric patients a multidisciplinary approach is required. TIVA and TCI are safe anesthesia technique in bariatric surgery. This study showed that bariatric patients have the same incidence of major postoperative complications as patients after elective cholecystectomy. Further research is needed to determine the clinical significance of our findings, in particular in the safety of the anesthesia technique and incidence of perioperative complications.

Conflict of interest: None declared.

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Анализа коморбидитета и технике анестезије код пацијената на баријатријској хирургији у Универзитетском клиничком центру Србије

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САЖЕТАК

Увод/Циљ Измењена физиологија и метаболизам гојазних пацијената представљају изазов за анестезиолога. Циљеви овога рада су испитивање учесталости коморбидитета, типа анестезије, учесталости интраоперативних и постоперативних компликација код пацијената који су подвргнути баријатријској хирургији и пацијената којима је учињена елективна холецистектомија.

Методе Ова ретроспективна студија је обухватила 469 пацијената. Испитивана група укључивала је гојазне пацијенте са индексом телесне масе ≥ 30. Контролну групу су чинили пацијенти за елективну лапароскопску холецистектомију оперисани истог дана када и баријатријски.

Резултати Испитивана група је укључила 235 пацијената, док је контролна група обухватила 234 пацијента. Учесталост коморбидитета била је статистички значајно већа у испитиваној у односу на контролну групу (84,6% и 63,2%, $p < 0{,}001$). Постојала је статистички значајна разлика у анестезиолошкој техници – тотална интравенска анестезија и анестезија циљано контролисаном инфузијом више су примењиване у испитиваној групи (74% наспрам 0,9%, $p < 0{,}001$; 7,2% наспрам 1,7, $p < 0{,}001$). Број отежаних интубација је био статистички значајно већи у контролној групи (5,6% наспрам 0,9%, $p = 0{,}004$). Постојала је статистички значајна разлика у инциденци десатурације и хипотензије током увода у анестезију – ове компликације су биле чешће у испитиваној у односу на контролну групу (9,8% наспрам 2,1%, $p < 0{,}001$; 14,5% наспрам 2,1, $p < 0{,}001$). Постојала је статистички значајна разлика у инциденци малих компликација између испитиване и контролне групе према класификацији Клавијен–Диндо (20,8% наспрам 5,1%, $p < 0{,}001$).

Закључак Гојазност је повезана са бројним коморбидитетима и вишом инциденцом интраоперативних компликација. Упркос томе, не постоји статистички значајна разлика у великим постоперативним компликацијама између ове две групе оперисаних болесника.

Кључне речи: гојазност; баријатријска хирургија; коморбидитети; индекс телесне масе