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## Comparison of different methods of postoperative analgesia used in obese patients undergoing laparoscopic sleeve gastrectomy

### Porównanie różnych metod łagodzenia bólu pooperacyjnego u osób otyłych poddawanych operacji rękawowej resekcji żołądka metodą laparoskopową

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#### Key words

sleeve gastrectomy, bariatric anesthesia, oxycodone, postoperative analgesia

#### Słowa kluczowe

rękawowa resekcja żołądka, anestezja bariatryczna, analgezja pooperacyjna, oksykodon

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#### INTRODUCTION

The World Health Organization declared obesity as the most dangerous chronic disease, which if left untreated leads to the development of cardiovascular disease, type 2 diabetes, metabolic syndrome, hormonal

disorders, and also increase in the incidence of certain types of cancer. Along with the progress of civilization and the improvement of living conditions in developed countries, the number of obese people is increasing. This problem also applies to the Polish population.

#### Summary

**Introduction.** Laparoscopic sleeve gastrectomy is one of the methods for obesity treatment.

**Aim.** The aim of the study is to present different methods of postoperative pain relief in patients treated with this method worked out on the basis of their own experience.

**Material and methods.** In the treatment of pain in patients undergoing tubular gastrectomy (sleeve gastrectomy) retrospective analysis of 62 patients who used three regimens of postoperative pain. The first group consisted of patients receiving tramadol 100 mg i.v. every 4 hours and metamizol 1 g i.v. every 6 hours (37 patients), the second group – patients who used morphine 10 mg s.c., What 4 h and metamizol 1 g i.v. every 6 hours (11 patients), the third group was used oxycodone 5 mg i.v., which 4 h i.v. 1 g of metamizol as 6 h (14 patients).

**Results.** The best treatments used pain control was achieved in patients receiving oxycodone in combination with metamizol.

**Conclusions.** The after-surgery pain treatment procedures, an effective and safe option seems to be combinations of 5 mg oxycodone dose every 4 h i.v. with metamizol 1 g every 6 hours.

#### Streszczenie

**Wstęp.** Rękawowa resekcja żołądka, wykonywana techniką laparoskopową, jest jednym ze sposobów leczenia otyłości.

**Cel pracy.** Celem pracy jest przedstawienie różnych metod łagodzenia bólu pooperacyjnego u pacjentów leczonych tą metodą wypracowane na podstawie doświadczeń własnych.

**Materiał i metody.** W leczeniu bólu u osób poddawanych rękawowej resekcji żołądka (ang. *sleeve gastrectomy*) analizie retrospektywnej poddano 62 pacjentów, u których zastosowano trzy schematy leczenia bólu pooperacyjnego. Pierwszą grupę stanowili chorzy otrzymujący tramadol 100 mg i.v. co 4 godz. oraz metamizol 1 g i.v. co 6 godz. (37 chorych), drugą grupę – pacjenci, u których zastosowano morfinę 10 mg s.c. co 4 godz. oraz metamizol 1 g i.v. co 6 godz. (11 chorych), w trzeciej grupie stosowany był oksykodon 5 mg i.v. co 4 godz. z metamizolem 1 g i.v. co 6 godz. (14 chorych).

**Wyniki.** Spośród zastosowanych schematów leczenia najlepszą kontrolę bólu uzyskano u chorych otrzymujących oksykodon w skojarzeniu z metamizolem.

**Wnioski.** W leczeniu bólu u osób otyłych po operacji skutecznym i bezpiecznym schematem leczenia wydaje się połączenie oksykodonu w dawce 5 mg i.v. co 4 godz. w połączeniu z metamizolem 1 g i.v. co 6 godzin.

Research (TNS in August 2008), shows that in Poland 46 percent of the population are overweight or obese. According to Eurostat data (in November last year, in 2008-2009) in Poland was 16 percent of obese women and 17 percent of obese men. Normal BMI (Body Mass Index) is calculated by dividing weight in kilograms by height in meters the normal range for adult should be within 18.5 and 24.9. Overweight is recognized when BMI is between 25.0 and 29.9. According to WHO guidelines, there are three degrees of obesity: I – BMI 30.0-34.9; II – BMI: 35.0-39.9 and III – BMI > 40.0. The third degree of obesity is sometimes called as morbid obesity. There are many methods of weight reduction, including: diet, increased physical activity, psychotherapy, pharmacotherapy (1). The increasing popularity of surgical treatment of obesity is laparoscopic gastrectomy (sleeve gastrectomy) (2). Effective and safe treatment of perioperative pain in the obese is a major challenge for the anaesthesiologist (3). Increased body weight, residual effects of drugs used during anaesthesia and altered anatomical conditions conducive to the development of postoperative respiratory failure (4, 5). Abdominal surgery is associated with the onset of pain as visceral, requiring effective analgesia (6). Visceral pain is a significant problem in the treatment, it is often difficult to determine its severity and precise location, and it may be transferred to other areas of the body. Pain in the abdomen, even at very high intensity, it can be very disruptive for the patient and often harder to accept than the pain of another location. In this situation currently guidelines recommend the use of opioids (7). A good method for postoperative analgesia in obese patients is the method of administration of drugs into the epidural space, which for technical reasons it is often difficult to apply. One of the drugs prescribed for the treatment of postoperative pain in obese patients is oxycodone, which has a good clinical effect in bariatric patients (8, 9). Physical and chemical properties and pharmacokinetics of oxycodone are similar to morphine. Research indicates that the use of oxycodone provides better analgesia compared to other opioids and causes fewer side effects (9).

## AIM

The aim of the study is to present our preliminary observations concerning the efficacy and safety of pain management in the postoperative period in patients undergoing laparoscopic sleeve gastrectomy.

## MATERIAL AND METHODS

This study was conducted between, December 2010 to September 2012. For the analysis of pain management cases enrolled 62 patients after surgery sleeve gastrectomy (tab. 1). Average body weight was 122 kg (82-166), BMI 42 kg/m<sup>2</sup> (33-57). From the group of patients: 25 patients suffer from diabetes type II, 47 suffer from hypertension, 18 have treated hiperlipidemia, 6 suffer from bronchial asthma, 4 suffer from depression. In 2 patients addition-

ally performed kidney cyst, in 9 gastritis, in 5 diagnosed with sleep apnoea. Initial qualification to the operation performed in the Department of General Surgery. Three weeks before surgery, patients were hospitalized in the Department of Family Medicine and Metabolic Bone Diseases in order to prepare for surgery. For surgical treatment were enrolled patients with following criteria: BMI > 35 kg/m<sup>2</sup> + disease coexisting with obesity or BMI > 40 kg/m<sup>2</sup> and failed to reduce body weight in the past. Patients were aged from 22 to 60 years. Contraindications to surgery were: contraindications for general anaesthesia, mental illness, drug addiction, cancer, inflammatory bowel diseases and lack of informed consent for surgery. Low molecular weight heparin was allowed to stand for 7-10 days prior to surgery, including low molecular weight heparin in both prophylactic doses. Oral hypoglycaemic medication was discontinued for 3-4 days prior to admission to the clinic surgery, leaving only the patient's own insulin until the day before surgery (10). The day before the surgery, assessed the risk of anaesthesia by ASA (American Society of Anaesthesiologists classification), the potential risk of difficult intubation and prescribed premedication in the form of: a proton pump inhibitor (Polprazol 20 mg, Polpharma), Metoclopramide at a dose of 10 mg (Metoclopramide, Polpharma) and benzodiazepines (Midanium 7.5 mg, Polfa SA). An operating table was set in Fowler position (reverse Trendelenburg position), at an angle of 45 degrees relative to the horizontal (5). All patients were operated under general anaesthesia (11). For induction, patients received intravenous fentanyl (Polfa Warszawa SA): 0.1-0.2 mg, propofol (Fresenius): 2-2.5 mg/kg, rocuronium (Fresenius): 0.6 mg/kg, and succinylcholine (Jelfa SA): 1-1.5 mg/kg (12). All drugs, except succinylcholine, used converting to ideal body weight (IBW), which was calculated by the following formula: women: IBW (kg) = height (cm) - 105, men: IBW (kg) = height (cm) - 100 (13). Intubation was performed in the position of the elevation of the upper half of the body. In general anaesthesia used a mixture of oxygen and air in a ratio of 1:1, desflurane, fentanyl and rocuronium. Pressure-Controlled Ventilation was used (8, 9). The level of muscle relaxation was monitored by the coefficient of TOF (train-of-four – the ratio of the amplitude of the response to the fourth square wave impulse to respond to the first) (14). Pneumoperitoneum pressure reaches the value of 12-15 mmHg. During the procedure assumed 36F probe to the stomach which is removed at the end of surgery. In all cases, laparoscopic surgery took place or had to convert to classical technique. 10-20 minutes before awake the last dose of relaxant was administered. After the end of surgery, each patient received a dose specifically reversing sagging – sugammadex (Bridion, NV Organon) to

reach a value of TOF at least 90% (2 mg/kg). There were no cases of the difficult intubation. The mean operative time was 130 min (90-155). There were no cases of respiratory complications resulting from the residual effects of drugs relaxants. In any case, there was no need to take the patient to the ICU. After operation, patients were handed over to the Department of General Surgery, which were monitored: heart rate, blood pressure and oxygen saturation.

**Table 1.** Characteristics of the study group before surgery.

Parameter	Median	Minimum	Maximum
Age in years	45	21	60
Height in cm	168	150	191
Body weight in kg	122	82	166
BMI (kg/m <sup>2</sup> )	42	33	57

In the treatment of pain in patients undergoing sleeve gastrectomy identifies three treatment regimens. In all groups, the metamizol was administered i.v. at a dose of 1 g every 6 h with combination of other drugs. The first group (37 patients) consisted of patients receiving additional tramadol (Polpharma SA) 100 mg i.v. every 4 hours, the second (11 patients) – patients who used morphine (Polfa Warszawa SA) 10 mg s.c. every 4 hours, in the third group (14 patients) was administered oxycodone (Mundipharma) 5 mg i.v. In the assessment of the efficacy of analgesic used 11-point numerical scale (Numerical Rating Scale – NRS, where 0 means no pain and 10 means the worst imaginable pain). Pain intensity was measured at 4 hours, at the following time points: 8.00, 12.00, 16.00, 20.00, 24.00, and 4.00. In case of pain was assessed on 4 in NRS, modifications pain relief treatment was made.

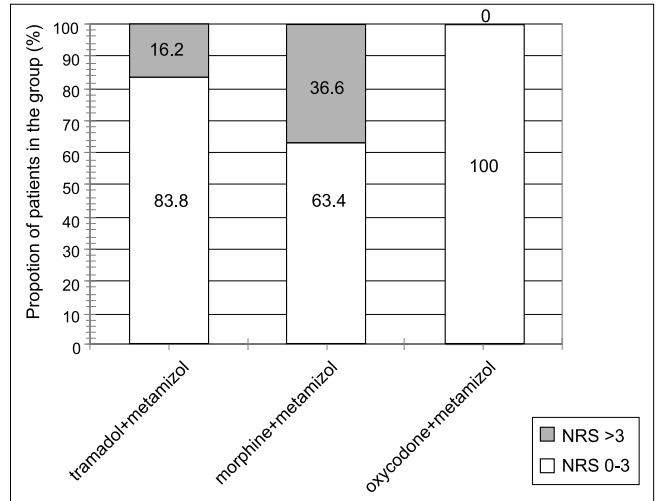
**RESULTS**

We analysed the effectiveness of therapeutic treatment applied on the first day in obese patients undergoing sleeve gastrectomy, based on the intensity of pain recorded using the NRS.

In the first group of patients who received tramadol and metamizol (16.2%), and in patients of the second group receiving morphine in combination with metamizol (36.6%), pain assessed on the 4 or more in NRS (at least once within the first day after surgery). Patients with the third group at any time point did not feel pain more than 3 points on the NRS (fig. 1). There have been reports of nausea and vomiting in patients, but their incidence did not differ between groups (it is likely that the same method of operating may increase the incidence of nausea and vomiting in the postoperative period). There was no occurrence of other significant adverse effects in any of the groups under analysis.

**DISCUSSION**

Obese patient is a patient requiring special treatment of perioperative aesthetic. Increased body



**Fig. 1.** Rating intensity of pain in each group.

weight, coexisting diseases affect the functioning of the cardiovascular and respiratory systems, the use of drugs debilitating physical fitness are factors that might be a potential threat to the health and life of these patient (15, 16). Proper evaluation of aesthetic before surgery, optimization of treatment, the suitable methods of anaesthesia, proper post-operative care and good pain control are the factors necessary for the safe conduct of an obese patient through the perioperative period (17, 18). The residual effect of muscle relaxants is a significant problem after general anaesthesia, especially in obese patients, because these patients often observed respiratory distress in the form of sleep apnoea (18, 19). Sugammadex, used to reverse the neuromuscular block allows avoiding this life-threatening complication of patients (20, 21).

In an analgesic in obese people after surgery effective and safe treatment appear to be a combination of oxycodone (22) at a dose of 5 mg i.v. every 4 h and of metamizol 1 g. i.v. every 6 h. Thanks to the combination of two drugs with different mechanisms of action, lower dose of opioid can be applied, while maintaining effective pain relief and reducing the risk of side effects. In the case of s.c. morphine in combination with i.v. metamizol, until 36.6% of patients required modification of the treatment, which confirms that in obese people absorption from the subcutaneous tissue can be difficult (23).

Past experience to confirm the efficacy and safety of oxycodone made from the second day, after the anastomotic leak test, it is recommended to patients oral dosage form of oxycodone in combination with naloxone (ratio 2:1) as a tablet of 20 mg taken as 12 h (8). Oxycodone has an important feature: high efficiency in the treatment of visceral pain. Oxycodone is a semi-synthetic derivative of thebaine. Given orally has a nearly twice potent than morphine. Parenteral has a slightly more potent than morphine (dose ratio is 1:0.7). After intravenous administration of oxycodone a maximum concentration reaches after 20 minutes. Is rapidly

distributed to the aqueous phase – the volume of distribution is 3 L/kg. Protein binding is 45%. The biological half-life of the drug, regardless of the route of administration is 4 h. Is metabolized in the liver, excreted by the kidney. The principal effect of the oxycodone is selective stimulation of peripheral and central mu and kappa receptors. A lot of experimental and clinical research indicates the crucial role of kappa receptors in the pathogenesis of visceral pain (22). The adverse event profile of oxycodone is similar to other opioids. Since recently available oral formulation comprising a form of sustained release oxycodone combined with an opioid antagonist – naloxone. With this combination, intestinal motility is not significantly impaired, which is a great advantage compared to other opioids (naloxone is me-

tabolized by the liver in about 98%, does not antagonize the analgesic effect of oxycodone). Oral, long-acting form of the preparation, it is also convenient for the patient and not troublesome for nursing personnel (9). Because the study was based on a retrospective analysis requires further studies to confirm the observations described.

## CONCLUSIONS

In three separate regimens of pain in obese patients undergoing gastric reduction surgery, the best pain control were achieved in patients who received oxycodone i.v. in combination with metamizol i.v. In all patients in this group the pain score was 3 or less in NRS in all the analysed time points.

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