

Abstract

Post-operative nausea and vomiting pose a crucial and interdisciplinary aspect of the post-operative treatment. In the research article the influence on their incidence of many ontogenetic factors and those resulting from the course of surgery, anesthesia methods and surgical techniques has been described. According to the observation data from the literature, the prevalence of PONV in the laparoscopic cholecystectomy is from 30 to 70 %. This is conditioned by a specificity of the surgery and the necessity of peritoneal emphysema creation.

Many scientific reports indicate the desired results of restricted application of opioid analgesics and supply of co-analgesics and non-opioids manifesting themselves by decreased occurrence and intensity of vomiting, nausea and post-operative pain. Therefore, in this paper we aimed to assess the impact of low-opioid anesthesia with simultaneous application of co-analgesics: lignocaine, ketamine and magnesium sulfate on the occurrence and intensity of nausea and vomiting after laparoscopic cholecystectomy. Moreover, the relationship between the proposed anesthesia and intensity of the post-operative pain was examined.

The docile study group consisted of 39 patients who were anesthetized according to the low-opioid protocol with application of single intravenous doze of 0.1 mg fentanyl, only during the induction phase of anesthesia, and supplied with co-analgesics: ketamine, lignocaine and magnesium sulfate. 37 patients represented the control group and underwent general anesthesia using opioid - fentanyl as a main analgesic. Each patient underwent general anesthesia using propofol for induction, sevoflurane for maintenance of anesthesia, finally the skeletal muscle relaxant-cisatracurium. The painkiller scheme was conducted using 1 g of paracetamol 20 min before induction of anesthesia and 2g of metamizole before recovery from anesthesia. No patient received antiemetic drugs during state of anesthesia. Both groups underwent identic post-operative analgesia using 1 g of paracetamol and 1 g of metamizole in the particular time intervals.

Preoperative clinical examination consisted of examination of general condition, evaluation of the operational risk according to ASA classification and determination of the anthropometric indicators. During anesthesia the circulatory, respiratory and ventilatory parameters of each patient were monitored. Moreover, the duration of anesthesia, a surgery and pneumoperitoneum determined with simultaneous

calculation of a dose of opioid medicines. The arterial blood saturation was examined using pulse oximetry method. Heart activity, systolic, diastolic blood pressure and their mean before and after anesthesia were also taken into examination. Moreover, after creation of peritoneal pneumothorax and 10 minutes of its duration, the following parameters were determined: inspiratory and respiratory oxygen concentration, respiratory minute volume, use of oxygen and carbon dioxide. After surgery the general conditions of the patients were evaluated based on the Aldrete scale. The patients refused the planned dose of the painkillers, instead they took the additional ones and antiemetic medicines. During examination the intensity of post-operative nausea and vomiting were evaluated based on ten-point verbal scale. The evaluation took place 24 hours after surgery in the time interval: after 2 h after surgery, between 2 and 6 hours, 6 and 12 hours, finally between 12 and 24 h after surgical procedure. Obtained results were subjected to statistical analysis.

The study showed a reduction in the incidence of nausea ($p = 0.005$) and vomiting ($p = 0.04$) in the group of patients who underwent low-opioid anesthesia. The analysis of the intensity of nausea at defined time intervals also showed significant differences between the groups after 2 - 6 hours after surgery ($p = 0.025$). Nevertheless, no differences between the groups considering the intensity of vomiting were found. There was also no relationship between the total dose of fentanyl used during surgery and the occurrence and intensity of PONV.

Among the remaining factors related to surgery and anesthesia, the study showed a significant impact of duration of pneumoperitoneum on the intensity of vomiting up to 2 hours after surgery in the control group ($p = 0.01$). The analysis of anthropometric factors showed significant differences between the groups only in the case of the BSA coefficient ($p = 0.026$), which was significantly and statistically lower in the case of patients in the study group in whom vomiting appeared.

The study also examined the effect of low-opioid anesthesia on the intensity of postoperative pain. In the group of patients who underwent anesthesia with a minimum dose of opioids, there were significant differences in the intensity of pain between 2 and 6 hours after surgery ($p = 0.001$), 6 and 12 hours after surgery ($p = 0.001$) and 12 and 24 hours after surgery ($p = 0.0001$), where patients without pain belonged only to the study group. Nevertheless, the effect of the total dose of fentanyl on the intensity of postoperative pain, intake of planned and additional painkillers in the postoperative

period and significant differences between the groups in terms of taking antiemetic drugs was not demonstrated.

Analysis of the factors related to the surgery and anesthesia did not show significant differences in the case of circulatory and metabolic parameters between the examined groups. In the group of patients who used the anesthesia protocol with a minimal dose of opioid medicines, significant differences were found among the ventilation parameters: an increase in median hemoglobin oxygen saturation after anesthesia ($p = 0.01$), a significant increase in the median value of inspiratory oxygen concentration ($p = 0.002$) and expiratory oxygen concentration ($p = 0.017$) immediately, after peritoneal emphysema and a significant increase in the median value of inspiratory oxygen concentration ($p = 0.042$) and its expiratory concentration ($p = 0.011$) in the last ten minutes of peritoneal emphysema.

The results of the study allowed to prepare the following conclusions:

1. The application of the proposed low-opioid anesthesia protocol resulted in a reduction in the occurrence and intensity of nausea and vomiting, as well as the intensity of pain within 24 hours after laparoscopic cholecystectomy.
2. The dose of fentanyl used did not affect the occurrence and intensity of nausea and vomiting as well as the intensity of pain within 24 hours after laparoscopic cholecystectomy.
3. BSA index and duration of peritoneal emphysema affected the occurrence of postoperative nausea and vomiting. Remaining anthropometric features of the patients and factors related to the course of surgery and anesthesia did not affect the occurrence of postoperative nausea and vomiting.
4. Low-opioid anesthesia protocol using sevoflurane as a volatile anesthetic to maintain anesthesia ensured the stability of cardiovascular and respiratory parameters.
5. Evaluation of the effect of fentanyl on the occurrence and severity of postoperative nausea and vomiting based on the obtained results and data from national and international literature requires further clinical studies and research.