Piasek Ewa, Padała Olga, Krupa Adrianna, Putowski Maciej, Konopelko Michał. Postoperative nausea and vomitting – prevention and treatment. Journal of Education, Health and Sport. 2019;9(9):790-796. eISNN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.3460317
http://ojs.ukw.edu.pl/index.php/johs/article/view/7498

The journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. § 8. 2) and § 12. 1. 2) 22.02.2019.
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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 25.08.2019. Revised: 31.08.2019. Accepted: 22.09.2019.

Postoperative nausea and vomitting – prevention and treatment

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ABSTRACT

Postoperative nausea and vomiting is a complication, which occurs in 30% of patients undergoing anesthesia and surgery. Moreover, large number of risk factors may result in PONV in up to 80% patients. Risk factors can be divided into patient-dependent and anesthesia

dependent.

Nowadays, prophylaxis and treatment of PONV is multimodal. Using agents affecting different types of receptors, results in decreasing frequency of postoperative nausea and vomiting. Dexamethasone is a corticosteroid used for prevention in patients with intermediate and high risk of PONV. Ondansetron is 5HT3 receptor antagonist. Ondansetron is more effective for post-operative vomiting than nausea. Side effects include: headaches, dizziness, diarrhea and constipation, prolonged QT interval and cardiac arrythmias. Aprepitant, tachykinin 1 (NK1) receptor antagonist is used in prevention of PONV. This antiemetic drug is recommended for patients with high risk of PONV and for whom PONV may result in serious complications. Scopolamine is a selective competitive antagonist of muscarinic cholinergic receptor. Besides sedative and amnestic effect, scopolamine has antiemetic effect, which is used for treatment of PONV.

Postoperative nausea and vomiting may result in dehydration, electrolyte imbalance, suture disruption and bleeding, aspiration of gastric content and pneumonia. Complications mentioned above result in longer hospital stay and increased medical costs. Assessment of risk factor, avoiding emetogenic anesthetics and analgesics, multimodal prophylaxis and treatment is the best solution to decrease risk of PONV.

KEY WORDS : *postoperative nausea and vomiting, antiemetic drug, ondansetron*

Introduction

Postoperative nausea and vomiting is a complication, which occurs in 30% of patients undergoing anesthesia and surgery. Moreover, large number of risk factors may result in PONV in up to 80% patients. [1] Patophysiology of PONV is complex and concerns afferent pathways and various receptors [2]. Risk factors can be divided into patient-dependent and anesthesia dependent. Patient-dependent are: female gender, previous history of PONV or motion sickness, non-smoker and age < 50 years old. Anesthesia dependent include: prolonged duration of anesthesia, volatile agents, nitrous oxide and perioperative use of opioids. [3]

Prevention and treatment

Nowadays, prophylaxis and treatment of PONV is multimodal. Using agents affecting different types of receptors, results in decreasing frequency of postoperative nausea and vomiting.

Dexamethasone is a corticosteroid used for prevention in patients with intermediate and high risk of PONV. The best results are when drug is administered intravenously before start of the surgery. DREAMS TRIAL has shown that single dose (8mg) of dexamethasone given intravenously before small or large bowel surgery significantly decreased frequency of PONV [4] Hyperglicemia, one of side effects, was present only in patients with poorly controlled diabetes. Dexamethasone, in a single dose, do not increase risk of wound infection. [5] Bustos et all studied value of dexamethasone in reduction of PONV in patients undergoing total joint replacement and had proven that use of dexamethasone reduced need for rescue antiemetic drug and reduced length of stay in the hospital. [6]

Ondansetron is 5HT3 receptor antagonist. Ondansetron is more effective for post-operative vomiting than nausea. Single dose is 5 mg, and due to half-life of 4 hours, administration of this antiemetic drug should be at the end of surgery. Side effects include: headaches, dizziness, diarrhea and constipation, prolonged QT interval and cardiac arrythmias. [7] Palonsetron is new long-acting 5HT3 receptor antagonist with 40 hours of half-life. Liu et al. (2017) compared efficiency of ondansetron and palonosetron on nausea and vomiting after laparoscopic surgery. Meta-analysis showed that there is no difference between ondansetron and palonosetron in prevention of PONV and adverse effects after surgery, but palonosetron is more effective in prevention of vomiting [8]

Aprepitant, tachykinin 1 (NK1) receptor antagonist is used in prevention of PONV. Aprepitant is administered orally 1 hour before anesthesia and surgery in a dose of 40mg. [5] This antiemetic drug is recommended for patients with high risk of PONV and for whom PONV may result in serious complications. [3] Thernau et al. (2017) found that addition of aprepitant to a standard antiemetic therapy (dexamethasone, droperidol and ondansetron) in patients undergoing bariatric surgery decreased PONV in early post-operative period. [=9]

Metoclopramide is the most common drug for treatment of PONV. [3] It is dopamine D2 receptor antagonist with half-life of 5-6 hours – due to that fact metoclopramide should be administered at the end of surgery. Probability of side effects, such as dyskinesia and extrapyramidal symptoms is low, but it increases with every next dose. [7]

Droperidol is butyrophenone, prophylactic doses are 0,625 up to 1,25mg. Onset of antiemetic effect is within 3 to 10 minutes , with maximum effect at 30 minutes after administration – droperidol should be injected at the end of surgery. [7] Adverse effects are extrapyramidal symptoms and prolongation of QT interval. [3] Low dose of this antiemetic agent do not increase risk of arrythmias and sudden cardiac arrest, but a black box warning for droperidol is still present in some countries. [5]

Scopolamine is selective competitive antagonist of muscarinic cholinergic receptor. Besides sedative and amnestic effect, scopolamine has antiemetic effect, which is used for treatment of PONV. Scopolamine is administered through transdermal patch for approximately 72 hours. Transdermal patch is usually placed two hours before surgery. Adverse effects include: dry mouth, somnolence, amblyopia, mydriasis and dizziness. [10] Bergese et al. (2015) has showed that triple prophylaxis (ondansetron, dexamethasone and scopolamine) reduced incidence of PONV after neurological surgery in general anesthesia. [11]

Dimenhydrinate, histamine type 1 receptor antagonist, is used due to its antiemetic effect. Recommended dose is 1 mg/kg intravenous. Sedation, dry mouth, urinary retention, dizziness and extrapyramidal symptoms are common side effects of antihistaminergic drugs. [7] Dimenhydrinate is not as effective as other antiemetic agents and it's not first choice in treatment of PONV. [5]

Midazolam is a benzodiazepine, used as an anxiolytic. Meta-analysis conducted by Grant et al. (2016) has showed that preoperative and intraoperative use of midazolam reduced frequency of PONV and use of rescue antiemetic in first 24 hours after surgery. [12] Due to complications such as postoperative sedation and delirium, especially in elderly and mentally ill patients, midazolam should not be used as a sole agent. [7]

Pregabalin, an anticonvulsant, used for treatment of seizures, diabetic neuropathy and postsurgical pain, is helpful in treatment of PONV. Grant et al. (2016) performed an meta-analysis of randomized trials on preoperative use of pregabalin and its efficiency to reduce PONV. Meta-analysis showed that pregabalin not only reduce PONV, nausea and vomiting, but also decreased post-operative visual disturbance. [13] Wang et al. (2017) performed a meta-analysis concerning usefulness of gabapentin in reducing PONV after laparoscopic cholecystectomy and found out that gabapentin decreased PONV incidence and morphine consumption. [14]

Summary

Post-operative nausea and vomiting may result in dehydration, electrolyte imbalance, suture disruption and bleeding, aspiration of gastric content and pneumonia. Complications mentioned above result in longer hospital stay and increased medical cost. From patient's point of view, PONV is said to be most unpleasant complication. [14] Nowadays, regional techniques are being chosen over general anesthesia. It allows to avoid emetogenic anesthetics and provides regional analgesia after surgery, which results in reduced use of opioids. [5] Assessment of risk

factors, avoiding emetogenic anesthetics and analgesics, multimodal prophylaxis and treatment is the best solution to decrease risk of PONV. [3]

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