

MULTIMODAL APPROACH TO THE MANAGEMENT OF POSTOPERATIVE NAUSEA AND VOMITING (PONV)

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Summary

The paper shows a new, multimodal approach to the prevention of postoperative nausea and vomiting (PONV), which are among the most common complications in surgically treated patients. The approach combines the following procedures: risk assessment of postoperative nausea and vomiting, minimization of adverse effects of anesthesia and surgery, prophylaxis using drugs with anti-emetic effect, and optimization of therapy in case the complication develops. Besides reducing the incidence rate of PONV, such approach also reduces both the number of PONV-related serious complications and treatment costs.

KEYWORDS: *postoperative nausea and vomiting, multimodal approach, combination of drugs and procedures*

MULTIMODALNI PRISTUP LIJEČENJU POSLIJEOPERACIJSKE MUČNINE I POVRAĆANJA (PONV)

Sažetak

Ovim radom prikazan je novi, multimodalni pristup prevenciji i liječenju postoperacijske mučnine i povraćanja (PONV, od engl. postoperative nausea and vomiting) jedne od najčešćih komplikacija koja se pojavljuje u operiranih bolesnika. Objedinjuje sljedeće postupke procjenu rizika za razvoj PONV-a, minimaliziranje nepovoljnih učinaka anestezije i operacijskog zahvata, preventivnu primjenu kombinacije lijekova sa antiemetskim učinkom kao i optimalizaciju terapije ako se komplikacija razvije. Ovom metodom, pored snižavanja učestalosti PONV- a, smanjujemo i broj ozbiljnih komplikacija ove pojave kao i troškove liječenja.

KLJUČNE RIJEČI: *poslijeoperacijska mučnina i povraćanje, multimodalni pristup, kombinacija lijekova i postupaka*

INTRODUCTION

Postoperative nausea and vomiting (PONV) are among the most common complications in the immediate postoperative period.

With their incidence rate ranging 20 – 30% these complications are usually the main reason for patient's longer stay in the waking room and unplanned prolongation of treatment for patients scheduled for one day surgery. Besides PONV which usually represents a very unpleasant experience for patients (increasingly exhausting, causes

pain from muscle contraction in the wound region, keeps patients in bed, deprives them of rest and hinders sleep), there are also other, no less significant medical complications (bleeding in the wound region, dehiscence, esophageal rupture, aspiration of stomach contents, requirement for additional infusion and anti-emetic therapy). All this, of course, significantly increases hospital treatment costs.

Patients undergoing cancer treatment are very often immunocompromised due to previous chemotherapy and radiotherapy treatments, as of-

ten as not they have metabolic, electrolytic and energetic disbalance, or require a reoperation which is usually more time-consuming due to adhesions formed after prior surgery. For that very reason the occurrence of PONV in such patients, although not causing fatal complications, significantly hinders their recovery, and PONV-related medical complications seriously disrupts performance and compromise their postsurgical recovery.

Techniques to avoid this complication include a combination of many procedures required for prevention of PONV in surgical patients and prophylactic administration of one or more agents with different mechanisms of anti-emetic action. With combining anti-emetics at lower than recommended doses therapy effects are maximized, and adverse events reduced to minimum. The approach which combines several modalities is called a multimodal approach. According to clinical trials, such approach is shown to be most efficacious in the treatment of this complication and includes the following elements:

1. Assessment of risk for developing PONV
2. Techniques to reduce risk for developing PONV
3. Anti-emetic prophylaxis
4. Optimization of anti-emetic therapy (medication choice, administration time)

RISK ASSESSMENT OF POSTOPERATIVE NAUSEA AND VOMITING

Reasons for developing postoperative nausea and vomiting are numerous, and can be divided as follows:

1. Patient risk factors

A study carried out by Christian C. Apfel et al. in 2 772 patients showed that the incidence of PONV was significantly higher in female population, in individuals suffering from motion sickness and those with a history of PONV in previous surgeries, in non-smokers and patients using opioids in the immediate postoperative period. From this, a simple way to estimate the risk for PONV has been derived.

If one, two, three, or all four of these risk factors are present, the incidences of PONV are 10%, 20%, 40% and 80%, respectively.

2. Procedure-specific risk factors

The type and duration of surgery significantly influence the risk of PONV. Every 30 minutes increases the risk of PONV by 60% above baseline. Lengthy surgeries, especially gynecologic, abdominal and plastic surgery procedures, then breast and rhinolaryngologic surgeries have been associated with a high incidence of PONV (20-35%).

3. Anesthesia-related risk factors

Certain anesthetic agents (opioids, nitrous oxide, inhalational anesthetics, neostigmine, etomidate) are associated with a significantly higher incidence of PONV than other agents (local anesthetics, propofol). Unlike general, especially deep general anesthesia with a controversial effect, regional anesthetic techniques as well as blocking of certain nerves are associated with a very low incidence of PONV. Adequate hydration and hemodynamic stability of patients during surgery along with the use of higher oxygen concentrations contribute to the reduction of PONV.

4. Risk factors in the postoperative period

There are numerous factors that can influence the occurrence of PONV in the immediate postoperative period. Pain, opioid analgesic therapy, rising early, vertigo, hypotension, and early food intake are often associated with the occurrence of PONV.

TECHNIQUES TO REDUCE RISK OF PONV

After estimating the probability of PONV based on the number of patient-specific risk factors, further steps aimed to avoid or reduce to a minimum other factors involved in the development of PONV are to be taken.

A multimodal approach includes premedication with benzodiazepines (midazolam) for their anxiolytic properties, selection of regional anesthesia (reduces the incidence of PONV for 20-30%), depending on the type of surgery or combined techniques of general and regional (usually epidural) anesthesia, induction and if possible, propofol maintenance anesthesia to avoid nausea and vomiting during the first 6 postoperative hours (compared to the use of volatile anesthetics). Minimization or non-use of opioid analgesics (regional techniques), adequate patient hydration and adequate

oxygenation using higher oxygen concentrations (FIO_2 0.5- 0.6 during surgery), hemodynamic stability, minimal use of neostigmine by omitting nitrous oxide, are used to supplement prophylactic measures aimed at preventing the development of PONV within the multimodal framework.

Regional techniques along with the catheter use in the immediate postoperative period ensure adequate analgesia with continuous administration of local anesthetics omitting both opioids and their supplementation with other alternative analgesics that do not provoke PONV (clonidine, dexamethasone, neostigmine). NSAIDs do not have any emetogenic effect and at therapy doses, they may be preferred in postoperative pain management.

Oxygenotherapy continuation, avoidance of patient's transfer, maintenance of hemodynamic stability and avoidance of food intake in the immediate postoperative period may contribute to reduce the risk of PONV.

ANTI-EMETIC PROPHYLAXIS

A multimodal approach to PONV management includes also prophylactic administration of anti-emetics and agents with anti-emetic effect if an estimated risk score for developing PONV exceeds 10%. Medications include 5-HT₃ antagonist (granisetron, tropisetron, ondansetron), dexamethasone, droperidol, promethazine, transdermal scopolamine, ephedrine.

When administering the above medications, it should be taken into consideration that some of them are more potent in the treatment of vomiting (5-HT₃ receptor antagonists, for example), unlike droperidol which shows much more potency in the management of nausea.

Choice of anti-emetic prophylaxis that correlates with the estimated risk score for developing PONV, and precise timing of drug administration play a crucial role in obtaining desirable effects.

Consistently, dexamethasone is administered before the introduction of anesthesia, scopolamine patch 4 hours before the expected completion of surgery, while the administration of all other anti-emetics is recommended after completion of surgery.

In patients with only one risk factor for developing PONV, prophylactic actions to reduce

risk of postoperative nausea and vomiting as well as associated prevention initiatives in the immediate postoperative period should completely minimize the development of this complication. A single administration of Dexamethasone 4 mg i.v. is required for these patients before the introduction of anesthesia in case of surgical procedures where PONV can easily cause medical complications (neurosurgical procedures, mandibular immobilization or fundoplication).

Besides prevention, patients with moderately high risk also require prophylactic, preferably combined anti-emetic therapy. In our situation, a combination of dexamethasone 4 mg before the induction and tropisetron 5 mg at the end of surgical procedure is most commonly used.

The therapy should be continued in the following 24 hours without repeat dexamethasone that can be replaced with droperidol 1.25 mg or promethazine 12.5 – 25 mg.

Due to its effects on the QT interval and potentially lethal arrhythmia, the administration of droperidol requires patient observation and ECG monitoring.

A maximal therapeutical effect with minimal adverse events can be obtained with combining drugs of different mechanisms of action. In addition, the choice of drug combination (one that prevents vomiting – such as tropisetron, and another that stops nausea – droperidol, promethazine) enables us to avoid both adverse events.

Patients with very high probability of developing PONV are treated in the same way, except that in their case the administration of a triple anti-emetic combination (i.e. droperidol, tropisetron, promethazine or dexamethasone), is considered to be the most beneficial therapy regimen, including the required implementation of the above prevention procedures.

OPTIMIZATION OF THERAPY FOR PONV

1. Patients who received no prophylaxis

In case of PONV in the immediate postoperative period (within the first 6 hours after the operation) antiemetic therapy should be introduced, i.e. a combination of a 5-HT₃ antagonist at a lower dose (tropisetron 0.5 mg) with droperidol (0.5 mg) or dexamethasone (2-4 mg) i.v.

If PONV occurs after the immediate postoperative period, other possible reasons for its devel-

opment should be first excluded (morphine therapy, blood or secretion in the throat and alike), then start triple therapy that includes a combination of a 5-HT3 antagonist, dexamethasone and droperidol or promethazine.

2. Patients in whom prophylaxis against PONV was inefficient

If nausea or vomiting occurs in spite of prophylactic dexametasone, administration of low doses of a 5-HT3 antagonist, droperidol or another drug of a different mechanism of action (scopolamine, propofol at a dose of 20 mg, promethazine) is recommended. Administration of dexamethasone for treatment of PONV in these patients is not recommended.

Alternative methods such as acupuncture or acupressure can also be used for prevention and treatment of this complication.

CONCLUSION

The multimodal approach to the management of postoperative nausea and vomiting appears to be an effective method which, along with prophylactic administration of one or several types of drugs and optimization of their administration, also combines procedures for grading risk of PONV and those that will reduce the probability of its development.

Such approach is successful in reducing the incidence of this complication, and thereby also avoids the development of serious adverse events, shortens the hospital stay and lowers the treatment costs.

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