POSTOPERATIVE NAUSEA AND VOMITING

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INTRODUCTION

Nausea and vomiting following anesthesia for minor outpatient procedures is a fairly common occurrence. The spectrum may range from a mild unsettled feeling of the stomach, to severe nausea with intractable vomiting requiring repeated pharmacologic intervention and possible admission for monitoring of electrolyte imbalance. In recent history, nausea and vomiting following surgery has been attributed to a number of causes, including patient variables (sex and weight), underlying disease processes, anesthesia variables (type of anesthesia, anesthetic agents used), and the surgical procedures performed. Although serious complications secondary to postoperative nausea and vomiting are rare, it is not uncommon for a patient's discharge from the hospital to be delayed due to nausea. In addition, antiemetic agents used for treatment of nausea may cause sedation and prolong the hospital stay.

Nausea and vomiting are controlled primarily by the emetic center located in the lateral reticular formation of the brainstem. The emetic center is heavily influenced by the Chemoreceptor Trigger Zone (CTZ) and afferent visceral innervation. The CTZ is a richly vascularized area of the brain which interprets chemical stimuli from the bloodstream and cerebrospinal fluid, and relates this information to the emetic center. The emetic center orchestrates a complex series of events resulting in expulsion of gastrointestinal contents.

Stimuli for nausea may be chemically or neurologically mediated at the level of both the CTZ and the emetic center. Naturally occurring chemical stimuli, which act at the level of the CTZ and emetic center and tend to cause nausea and vomiting, include Serotonin or 5-hydroxytryptamine (5-HT), histamine, dopamine, and muscarinic receptor agonists, each via their own receptors. Exogenous substances may include, but are not limited to, opioid analgesics, chemotherapeutic agents, and cardiac glycosides, all of which may induce nausea and vomiting. Neurologic input from the forebrain, the GI tract, and the vestibular portion of the eighth cranial nerve may also influence the emetic center and CTZ. Table 1 illustrates common antiemetic agents and their sites of action (agonist-antagonist pairs).

Table 1

Common Antiemetic Agents

Receptor	Agent
HIST -	Tricyclic antidepressants - promethazine (Phenergan)
DOPA -	Droperidol and domperidone
MUSCA -	Scopolamine
SEROTONIN -	Ondansetron

PATIENT VARIABLES

Certain patients are at a much greater risk of encountering postoperative nausea and vomiting, due to underlying disease processes. This includes any disorder which slows the emptying of the GI tract. Some of the more commonly encountered causes may include diabetic gastroparesis and muscular dystrophies. If an underlying disease process is identified during the history and physical, appropriate prophylactic measures

should be taken to decrease the patient's risk of postoperative nausea and vomiting.

INTRAOPERATIVE CONSIDERATIONS

Throughout surgery, a variety of agents are used to maintain "balanced" anesthesia. These agents include sedative hypnotics, barbiturates, narcotic analgesics, volatile inhalation agents and various other medications for maintenance of optimal blood pressure and heart rate. Several studies have been performed comparing anesthesia techniques using certain agents alone and in combinations, looking for differences in the incidence of postoperative nausea and vomiting. Although the studies are not in complete agreement, there seems to be a significant increase in postoperative nausea and vomiting with inhalation agents commonly used for general anesthesia. There also seems to be an increased incidence of nausea with techniques employing doses of narcotic analgesics such as fentanyl in both monitored anesthesia care (MAC) and general anesthesia cases. It should be noted however that the agents currently available are far less stimulating to the CTZ and the emetic center than the agents which they replaced. This explains the marked decrease in the incidence of postoperative nausea and vomiting from a near epidemic level of 75% to 80% in the ether era to a more acceptable level of 20% to 30% today.

A further decrease in nausea has been noted with the increased usage of Propofol (Diprivan) for both general and monitored anesthesia care cases. Propofol has been shown, through double blind studies, to possess antiemetic effects. This tendency may be illustrated through the decreased incidence of nausea and vomiting associated with propofol both at the lower doses used for MAC and the higher doses needed for general anesthesia, as compared to combinations of propofol and other agents. Postoperative nausea and vomiting may be treated symptomatically or prophylactically using any number of agents.

Antiemetic agents may be divided into several groups, including phenothiazine, butyrophenones, antihistamines, anticholinergic, benzomides, and serotonin antagonists. (Table 2) These agents work via several mechanisms including competitive inhibition at receptor sites, increased gastrointestinal motility and sedation.

Table 2

ANTIEMETIC AGENTS

ANTIDOPAMINERGICS

PHENOTHIAZINE DERIVATIVES

Chlorpromazine-

(Thorazine) 10-25 mg PO q 4-6 hrs. Rectal dosage 50-100 mg q 6-8 hrs. 25-50 mg IM or IV q 3-4 hrs. In children over 6 months 0.25 mg/lb q 3-4 hrs PO, or 0.5 mg/lb q 6-8 hrs rectally. Parenteral administration in children over 6 months .25 mg/lb IM q 6-8 hours. Max dose < 5 yrs/50 lb = 40mg/day >5 yrs 75 mg/day.

Trifluprомazine-

(Vesprin) 5-15 mg IM q 4 hrs not to exceed 60 mg per day. In adults may be given IV 1 mg bolus up to 3 mg. In children over 2 1/2 yrs IM dosing of 0.2-0.25 mg/kg up to a maximum of 10 mg.

Perphenazine-

(Trilafon) 8-16 mg PO daily in divided doses. Not to exceed 24 mg daily. Parenteral dosage 5 mg deep IM q 6 hrs not to exceed 15 mg QD Not recommended for children.

Prochlorperazine-

(Compazine) 5-10 mg 3-4 times daily. Available as spansule, suppository, elixir and injectable form. For children over 20 pounds 2.5mg 1-2 times daily up to 7.5mg. 30-39 pounds 2.5mg 2-3 times daily up to 10mg. 40-85 pounds 2.5mg TID, or 5mg BID up to 15mg. All above PO or rectal dosages. Parenteral dosage 5-10mg Deep IM or 2.5-10 slow IVP q 3-4 hrs up to 40 mg/day. In children 0.06mg/lb x 1 dose deep IM

Promethazine-

(Phenergan) 25mg q 8-12 hrs PO, or 12.5-25 IV or IM q 4 hours. For children over 2 years 12.5-25mg PO BID or 6.25-12.5mg Q 4 hrs IM or IV

Thiethylperazin-

(Torecan, Norzine) 10 mg PO, rectal or IM 1 to 3 times daily. Norzine not available for parenteral administration.

OTHER ANTIDOPAMINERGICS

Metoclopramide-

(Reglan) 10 mg IV q 4-6 hrs

ANTICHOLINERGICS

ANTIHISTAMINICS

Cyclizine-

(Marezine) Oral administration 50mg q 4-6 hrs up to 200 mg/day. Children over 6 yrs 25mg q 6-8 hrs up to 75 mg/day.

Meclizine-

(Antivert, Bonine) 25-50mg P.O. Q.D. administered one hour prior to travel. Indicated for Tx/Prevention of motion sickness.

Buclizine-

(Bucladin-S) 50mg P.O. Administered 30 minutes prior to travel. Dose may be repeated 4-6 hours later then B.I.D. for maintenance.

Diphenhydramine-

(Benadryl) 10-50mg deep I.M. or I.V. max 400 mg. per day. Children over 20 pounds 5 mg/Kg day deep IM or IV to a Max 300mg in 4 divided doses. (Indicated for motion sickness, not specifically nausea and emesis).

Dimenhydrinate-

(Dramamine) PO administration 50-100mg q 4-6 hours up to 400mg/day. Children's PO dosage ages 2-6 12-25mg q 6-8 hrs up to 75 mg/day. Ages 6-12 25-50 mg q 6-8 hrs up to 150mg/day.

OTHER ANTICHOLINERGICS

Trimethobenzamide-

(Tigan) Adult dosage 250 mg TID-QID orally or 200mg rectally TID-QID. Parenteral dosage 200 mg IM TID-QID. Children under 30 lb except premature or neonates, 100mg for 30-90 lb 100-200 mg both TID-QID. Parenteral use not recommended in children.

Scopolamine-

(Transderm-Scop)).5 mg patch applied post auricularly pre-op.

MISCELLANEOUS

Diphenidol-

(Vontrol) 25mg PO q 4 hrs. Children over 50 lbs 0.4 mg/lb per dose not to exceed 2.5 mg/lb day.

Benzquinamide-

(Emete-con) 25mg(0.2-0.4 mg/kg) IV or 50mg (0.5-1.0 mg/kg) IM with a repeat dosage in one hour if needed. Subsequent doses at q 3-4 hrs. IV dose should be one time only with any further doses IM.

Droperidol-

(Inapsine) May be administered IM or IV. Starting dose of 1/2 cc (2.5 mg) which may be repeated if needed initially. Subsequent doses of 1/2 cc q 3-4 hours.

Hydroxyzine HCL-

(Atarax, Vistaril, Marax)- 50-100 mg QID IM or PO. If initial dose is IM subsequent doses may be given PO. In children 0.6 mg/kg QID.

Dronabinol-

(Marinol) Indicated for Tx of nausea and vomiting associated with chemotherapy. Dosage of 5mg per square meter 1-3 hours prechemotherapy, then q 2-4 hours maximum of 4-6 doses daily. May increase by increments of 2.5 mg/sq meter up to a maximum of 15 mg/square meter.

Ondansetron-

(Zofran) Indicated for treatment of nausea and vomiting with chemotherapy. Three doses of 0.15 mg/kg are given with the first being prechemotherapy and the second two at four and eight hours after therapy. This competes for serotonin receptors in the CNS as its presumed mechanism of action.

POSTOPERATIVE CONSIDERATIONS

Postoperative factors which may influence nausea and vomiting include pain, motion, dizziness, postoperative oral intake, and analgesics. A careful evaluation of the time of onset of nausea may help, by revealing an association with movement, position changes, administration of medications, or intake of food or drink.

Postoperative nausea and vomiting may be due to a number of factors including patient factors, anesthesia associated factors, physical factors (movement/transport) and surgical procedures performed. Many of these are beyond the control of podiatric practitioners, however, the practitioner should understand these factors and be able to recognize the patient with increased potential for postoperative nausea and vomiting when performing a preoperative history and physical.

When considering treatment of postoperative nausea and vomiting, one should understand different receptor activity of the various antiemetic agents and be able to choose options from other classes of antiemetic agents if initial therapies are partially or completely ineffective.

TREATMENT

Treatment of postoperative nausea and vomiting in patients begins with a standing order for either Dramamine 25mg IV Q 4 hours or Reglan 10mg IV Q 3 hours. Reglan is the drug of choice for prophylaxis and treatment of postoperative nausea and vomiting in the patient with diabetes mellitus, due to the fact that many of these patients experience gastroparesis associated with their disease. Prevention of nausea and vomiting in the diabetic patient is of utmost importance since they are more prone to metabolic complications and electrolyte abnormalities. Reglan is also commonly used on other patients since it helps to clear contents of the GI tract. In the author's experience, Reglan has been effective in patients with mild to moderate postoperative nausea and vomiting.

If Dramamine is chosen, the starting dose is 25 mg IV, and may be titrated in 25mg increments until a response is reached, or the dosage ceiling is reached. Dramamine has also been successful in the treatment of mild to moderate postoperative nausea and vomiting.

If Dramamine is not effective initially, or after dosage titration, the next alternative would be to include a phenothiazine derivative such as Phenergan. Phenergan is usually dosed 25mg IV Q 4 hours. One source, in a review of the anesthesia literature, recommended 25mg IV concurrently with 25mg IM, for outpatients where there was a history of nausea and vomiting with previous surgery, or where there was nausea and vomiting associated with the procedure.

After a phenothiazine derivative is attempted, the next choice is usually Inapsine, a CNS sedative. A single dose of 1/2cc (2.5 mg) is usually sufficient to control moderate to severe postoperative nausea and vomiting. If necessary, the dose may be repeated initially and then given every 3-4 hours on a PRN basis.

In addition to these antiemetic agents it has been found that in patients with a history of peptic ulcer disease, gastro-esophageal reflux, or hiatal hernia, it is often helpful and/or necessary to add an H2 receptor antagonist such as Zantac administered 50mg IV q 8 hours.

In patients with a previous history of difficulty with postoperative nausea and vomiting, prophylaxis may be attempted with either a postauricularly applied scopolamine patch, or bewzquinamide 25mg IV/50 mg IM preoperatively. This step-wise approach in the treatment of postoperative nausea and vomiting has proved effective for members of the Podiatry Institute.

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