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Postoperative nausea and vomiting after oral and maxillofacial surgery: a prospective study

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Abstract. Postoperative nausea and vomiting (PONV) is one of the most unpleasant experiences after surgery. It reduces patient satisfaction and also increases hospital costs due to longer hospitalizations. The aim of this prospective study was to determine whether orthognathic surgery is associated with more PONV than less invasive maxillofacial surgery. Three hundred and eight patients aged 8–87 years who underwent maxillofacial surgery were included. The PONV score, based on the Apfel score, was calculated preoperatively. PONV occurred in 142 (46.1%) patients during the first three postoperative days; these patients were further categorized as having postoperative nausea (PON) and/or postoperative vomiting (POV). PON was most frequent after orthognathic surgery to the mandible (75%), and POV was most frequent after maxillary surgery, including bimaxillary surgery, Le Fort I osteotomy, and surgically assisted rapid palatal expansion (SARPE) (43.1%). There was a small significant relationship between the preoperative PONV score and the incidence of PONV: patients experienced more PONV when the PONV score calculated preoperatively was higher. The incidence of PONV after orthognathic surgery was very high compared with the incidence after dental extractions and other minor surgeries. Further investigation is required to establish a strategy to reduce PONV after orthognathic surgery.

Key words: PONV; nausea; vomiting; complications; orthognathic surgery; anaesthesia; prospective study; anti-emetic.

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Postoperative nausea and vomiting (PONV) is a common and frequent complication after general anaesthesia[1]. PONV leads to longer hospitalizations, thereby increasing healthcare costs, and affected patients often have negative feelings related to the surgery and anaesthesia[2]. PONV is defined as nausea, retching, or vomiting during the first 2 days after surgery[3]. The reported incidence varies between 20% and 30%, but it can be as high as 80% in high-risk patients[3–5]. Fur-

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thermore, patients who undergo maxillofacial surgery are more predisposed to PONV, especially after orthognathic surgery to the maxilla[6]. This can be explained by swallowed blood, an altered diet, and hypotension in the perioperative period[1].

Unfortunately, there are only a small number of major studies demonstrating a higher incidence of PONV after oral and maxillofacial surgery. Perrott et al. found PONV to be the most common of the postoperative complications following oral and maxillofacial surgery[6]. A high incidence of PONV in orthognathic surgery to the mandible and/or maxilla was found by Silva et al.[7]. No other studies have reported the incidence of PONV after specific interventions in oral and maxillofacial surgery.

The purpose of this study was to identify the specific interventions in the field of oral and maxillofacial surgery that are more related to PONV. Risk factors for PONV can be categorized into those associated with the preoperative period, the perioperative period, and the postoperative period, as outlined below.

Preoperative risk of PONV

The identification of patients at risk of PONV remains a challenge[8]. Apfel et al. developed a simplified risk score to predict PONV[9–11]. The Apfel score assesses the following: (1) female sex (this is a major risk factor and triples the risk of PONV); (2) history of motion sickness or PONV (this indicates general susceptibility to PONV); (3) smoking status (being a non-smoker roughly doubles the risk of PONV, although the underlying pathophysiology remains unknown); (4) postoperative opioid use (PONV shows a dose-dependent association with opioid use)[8–13].

A screening score based on the Apfel score was used in a previous study to calculate the risk of PONV preoperatively using different variables: each patient undergoing surgery was asked about their age (<50 years = 1, ≥50 years = 0), sex (female = 1, male = 0), history of motion sickness and/or PONV (yes = 1, no = 0), and their smoking status (non-smoker = 1, smoker = 0). The PONV score was then calculated based on these patient-specific variables, along with the predicted duration of the operation (<60 min = 0, ≥60 min = 1), predicted use of perioperative and postoperative opioids (yes = 1, no = 0), and the type of surgery (ophthalmological, orthopaedic, laparoscopic, otolaryngological, and other). These patients undergoing general anaesthesia were found to have scores ranging from 0.1 to 0.8[11].

Perioperative risk of PONV

General anaesthesia is associated with an 11-fold increased risk of PONV, which is frequently caused by the emetic properties of volatile anaesthetics and the opioids administered[13–15]. In addition, the type of surgery is an independent risk factor for PONV[1,4,16]. If the risk of PONV is high and general anaesthesia is required, the use of intravenous propofol can reduce the incidence of PONV[17,18]. Adequate perioperative intravenous fluid administration also reduces PONV. This may be related to a reduction in the release of serotonin, which decreases in response to the reduction in systolic blood pressure that is associated with intestinal hypoperfusion[19–21].

Postoperative risk of PONV

Opioids are commonly used postoperatively after general anaesthesia[4]. Some researchers have suggested that pain is a primary factor that induces nausea in the recovery unit[22]. Furthermore, PONV is frequently associated with pain postoperatively[23]. At the University Hospitals Leuven, the synthetic opioid piritramide is the opioid most often used for postoperative pain therapy.

Materials and methods

This prospective study included 308 patients aged 8 to 87 years who were due to undergo general anaesthesia for maxillofacial surgery. All surgical procedures were performed at the University Hospitals Leuven. Patients undergoing oral and maxillofacial surgery at the hospitals who agreed to participate and signed the informed consent form were included. If the patient was younger than 18 years of age, a parental signature was obtained. Patients under the age of 8 years and patients who were unable to communicate were excluded. Patients who underwent major oncological surgery were also excluded from the protocol, due to their postoperative stay in the intensive care unit. The study was approved by the Ethics Committee of the University Hospitals Leuven. The maxillofacial surgeries were categorized based on bleeding risk, as follows[24–27]: maxillary osteotomy surgery (bimaxillary surgery (BIMAX)/surgically assisted rapid palatal expansion (SARPE)/Le Fort I; $n = 72$), bilateral sagittal split osteotomy (BSSO; $n = 32$), temporomandibular joint (TMJ) surgery ($n = 12$), dental extraction ($n = 113$), and other minor surgery ($n = 79$) (Table 1).

A PONV score was calculated for every patient preoperatively; this score varied between 0.1 and 0.8 and was based on sex, history of motion sickness and PONV, smoking status, the use of perioperative and postoperative opioids, type of

Table 1. Distribution of the interventions to specific surgical groups.

Intervention	Group	Number
Arthroscopy	TMJ surgery	11
BIMAX	BIMAX/SARPE/Le Fort I	35
Biopsy	Other minor surgery	1
Osteotomy, block	Other minor surgery	1
Orthodontic bone anchors	Other minor surgery	5
Bone augmentation	Other minor surgery	19
BSSO	BSSO	32
Cryotherapy	Other minor surgery	1
Cystectomy	Other minor surgery	2
Eminectomy	TMJ surgery	1
Tooth extraction	Dental extraction	39
Frenectomy	Other minor surgery	2
Dental implants	Other minor surgery	3
Le Fort I osteotomy	BIMAX/SARPE/Le Fort I	6
Orbital floor fracture repair	Other minor surgery	1
Oral tumour resection	Other minor surgery	1
SARPE	BIMAX/SARPE/Le Fort I	31
Sialoendoscopy	Other minor surgery	1
Tooth transplantation	Other minor surgery	11
Soft tissue surgery	Other minor surgery	1
Vestibuloplasty	Other minor surgery	1
Removal of osteosynthesis material	Other minor surgery	29
Wisdom tooth removal	Dental extraction	74

BIMAX, bimaxillary surgery; BSSO, bilateral sagittal split osteotomy; SARPE, surgically assisted rapid palatal expansion; TMJ, temporomandibular joint.

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