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Postoperative nausea and vomiting following orthognathic surgery

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Abstract. The purpose of this study was to assess the incidence and risk factors associated with postoperative nausea (PON) and vomiting (POV) after orthognathic surgery. A review of the clinical records of consecutively enrolled subjects (2008–2012) at a single academic institution was conducted between 9/2013 and 3/2014. Data on the occurrence of PON and POV and potential patient-related, intraoperative, and postoperative explanatory factors were extracted from the medical records. Logistic models were used for the presence/absence of postoperative nausea and vomiting separately. Data from 204 subjects were analyzed: 63% were female, 72% Caucasian, and the median age was 19 years. Thirty-three percent had a mandibular osteotomy alone, 27% a maxillary osteotomy alone, and 40% had bimaxillary osteotomies. Sixty-seven percent experienced PON and 27% experienced POV. The most important risk factors for PON in this series were female gender, increased intravenous fluids, and the use of nitrous oxide, and for POV were race, additional procedures, and morphine administration. The incidence of PON and POV following orthognathic surgery in the current cohort of patients, after the introduction of the updated 2007 consensus guidelines for the management of postoperative nausea and vomiting, has not decreased substantially from that reported in 2003–2004.

Keywords: orthognathic surgery; postoperative nausea; postoperative vomiting.

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Postoperative nausea and vomiting (PONV) remains one of the most frequent and distressing complications following both inpatient and outpatient surgical procedures. PONV has received considerable attention for multiple reasons. Patients have reported that PONV is of greater concern than postoperative pain,[1–4] and patient dissatisfaction after anaesthesia has been associated significantly with the occurrence of PONV.[5,6] A recent systematic review reported that 36% of patients in the general surgical population experience PONV (range 18–45%).[7] In certain high-risk patients, the prevalence of PONV may approach 80%.[8]

Although many types of surgery have been linked to an increased experience of PONV, including ophthalmological, laparoscopic, and gynaecological surgery, the influence of surgery type remains controversial.[7–12] The only large retrospective review of PONV after orthognathic surgery reported that 40% of patients experienced PONV during the first 24 h after surgery, with a particularly high prevalence (56%) after bimaxillary osteotomies.[13]

PONV has been shown to increase healthcare costs through extended recovery room stays, a delay to discharge, and

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unplanned admissions after intended outpatient procedures.[14–17] In patients undergoing intraoral procedures, PONV can lead to intraoral bleeding with continued swallowing of blood, potentially prolonging PONV. Maxillomandibular elastic traction can magnify the anxiety and agitation associated with PONV. However, the risk of PONV varies widely based on patient-related, intraoperative, and postoperative risk factors.[2,8] Two commonly used scores for the risk assessment of PONV are the Koivuranta score[2] and the Apfel score.[8]

On a systems level, postoperative nausea (PON) and postoperative vomiting (POV) are frequently considered and reported as a single unit. However, in terms of pathophysiological pathways, healthcare costs, and the patient's sense of well-being, there are important differences between nausea and vomiting. Although nausea may decrease a patient's sense of well-being and increase anxiety, nausea alone poses no significant health risks. In contrast, vomiting can potentially result in significant health risks such as haematoma, wound dehiscence, dehydration, electrolyte imbalances, and, in extreme cases, esophageal damage or aspiration.[18] The patient's perception of nausea and vomiting also differ. Pre-surgery patients ranked emesis as the most undesirable and nausea as the fourth most undesirable anticipated negative postoperative outcome.[3] Gagging on the tracheal tube ranked second and pain ranked third. In another study examining patient perceptions of PONV, Gan et al.[4] found that patients were, on average, willing to pay US$56 out-of-pocket to avoid PONV and that this amount increased to US$73 for patients who had experienced PON and to US$100 in patients who had experienced POV.

In an ongoing assessment of recovery following orthognathic surgery using a daily diary, our group has seen little change in the proportion of patients reporting issues with nausea/vomiting after discharge (unpublished data). This led us to query whether the occurrence of PONV in a recent cohort of orthognathic surgery patients, following the implementation of the Society for Ambulatory Anesthesia guidelines for the management of postoperative nausea and vomiting in 2007,[19] was similar to that reported earlier by Silva et al.[13]. We further questioned whether, given the underlying biological as well as patient-centred differences, there were independent risk factors for PON and POV.

Materials and methods

Consecutive subjects from an institutional review board-approved study who underwent orthognathic surgery with or without additional procedures from 1 June 2008 to 30 June 2012 were enrolled in the present study. Only individuals aged between 14 and 60 years with a dentofacial disharmony due to a developmental problem severe enough to warrant surgical treatment and who were American Society of Anesthesiology (ASA) I or II status were eligible for enrollment. Exclusion criteria included the presence of a congenital syndrome, previous facial surgery, recent facial trauma, a systemic medical condition with degenerative, immunosuppressive, musculoskeletal, or neuropathy sequelae, and the inability to follow verbal or written instructions in English. A research associate described the project to each subject and obtained written consent or assent with parental permission and Health Insurance Portability and Accountability Act (HIPAA) authorization to review the clinical records. Analysis of the medical records occurred between September 2013 and March 2014.

All patients were interviewed before surgery by the anaesthesia provider. Anaesthetic agents varied and included nitroprusside and inhalation agents and were determined by the anaesthesiologist. All osteotomies were performed under controlled hypotension. All orthognathic surgical procedures were performed by oral and maxillofacial surgery faculty and residents at the university. A throat pack was placed during the procedure and a nasogastric tube (vented nasogastric tube) was used to evacuate the gastric contents at the conclusion of each procedure. For some Le Fort I osteotomy patients the nasogastric tube remained in place overnight (approximately 12 h) and was then removed. Rigid fixation was used to stabilize the osteotomy sites. Maxillomandibular elastic traction was used postoperatively for all patients. Subjects recovered in the post anaesthesia care unit (PACU) prior to transfer to the short stay unit (SSU) after mandibular osteotomy, or to the floor after maxillary osteotomy or bimaxillary surgery. Medications were provided on an 'as needed basis' after transfer. The same medications were used in the SSU and on the floor. The dosage and type of medication was determined by the attending physician.

Potential patient-related, intraoperative, and postoperative variables were extracted from medical records independently by two examiners. Discordance between reviewers was resolved by joint re-review of the records followed by a consensus decision. Patients with incomplete or illegible medical records were excluded from this study. A risk score defined as the number of patient-related risk factors for PONV present (female gender, non-smoking status, and history of PONV or motion sickness or migraine headaches) was calculated and categorized.[8,9] Intraoperative surgery-related risk factors included duration of surgery, surgery type (mandibular osteotomy alone vs. Le Fort I osteotomy alone vs. Le Fort I and mandibular osteotomies), and whether additional procedures were performed.[12,15,19] Other intraoperative variables included the use of volatile agents, nitrous oxide, anti-emetics, and fluids administered in millilitres per kilogram (ml/kg).[19–21] Postoperative variables included analgesics given in the PACU and in the SSU and on the floor, as well as postoperative steroid dosing regimens.

A patient was considered to have PON if nausea was noted in the nursing or resident notes or if rescue medications for nausea were administered while the patient was in the hospital, and/or to have POV if emesis was noted in the intake or output record. The occurrence of nausea and emesis was recorded, as was the time to first recorded nausea. The length of the hospital stay was also noted.

Statistical analysis

A bivariate analysis was performed to compare those who experienced nausea vs. those who did not, and those who experienced emesis vs. those who did not using χ^2 tests for nominal explanatory variables and Wilcoxon rank sum tests for continuous explanatory variables. Logistic models were used for the binary outcomes (yes or no) of PON and POV separately. A forward selection method with entry level of 0.05 was used. Three sets of potential explanatory variables (patient-related, intraoperative, and postoperative medications) were evaluated sequentially for inclusion in the model. Statistically significant predictors from the patient-related set were forced into the intraoperative set. Significant predictors from the intraoperative and patient-related sets were included in the final selection model. Age at surgery and length of surgery were centred (19 years and 160 min, respectively) and standardized so that each unit of age represented 5 years and each unit of length of surgery represented 5 min.

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