Incidence of Postoperative Nausea and Vomiting when Total Intravenous Anaesthesia is the Primary Anaesthetic in the Ambulatory Patient Population

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Abstract

Introduction: This observational prospective study was designed to assess the incidence of postoperative nausea and vomiting (PONV) in patients presenting for ambulatory surgery. A total intravenous anesthesia (TIVA) technique and PONV prophylaxis guidelines were used.

Methods: This is an observational study. Patients between 18 and 60 years old, American Society of Anesthesiologists (ASA) I-III with a body mass index (BMI) less than 30, scheduled for ambulatory surgery with TIVA were included.

Results: The highest incidence of PONV occurred 4 hours after leaving PACU, which correlates with the time point with the highest incidence of pain. A history of PONV was the most significant risk factor with a P of 0.002 and a prevalence ratio (PR) of 3.39 for nausea. We also found an association between the incidence of nausea and the need for additional pain management with a p of 0.0095 and PR of 2.22.

Conclusion: A TIVA technique has a significant impact in the incidence of PONV with a protective effect during the first 24 hours post-surgery according to our study. The effect seen is extremely valuable in the ambulatory setting where rapid turnovers are needed and access to hospital beds can be limited.

Keywords: Total Intravenous Anesthesia; Postoperative Nausea and Vomiting; Ambulatory surgery.

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Introduction

Postoperative nausea and vomiting (PONV) are considered two of the most undesired complications related to anesthesia with pain being the third one. Pain has a high association with PONV mainly due to the side effects of the opioids used to treat it. [1–3]. These complications lead to delayed recovery, prolonged hospital stay, unplanned readmissions and increased healthcare costs [4]. As a result, there are guidelines and recommendations regarding the use of PONV prophylaxis. Total intravenous anesthesia (TIVA) has been recommended as one of the main anesthesia techniques to minimize the occurrence of PONV and its side effects [5–10].

The reported incidence of PONV in patients not receiving prophylaxis is about 20 to 30%. In patients with risk factors It can be as high as 80% [2,9,11,12]. PONV risk factors are related to the patient's characteristics, type of surgery, and the anesthesia technique [13]. The Apfel criteria are the best predictors for PONV in the perioperative arena [14,15]. According to the Apfel scoring system and the Society for Ambulatory Anesthesia (SAMBA) PONV guidelines, one can estimate the risk of PONV. The risk can be as high as 80% if a score of 4 is obtained in the Apfel scoring system or as low as 10% if no criteria are met [11,16].

As previously mentioned, anaesthetic technique is a key factor in the occurrence of PONV. Inhaled anesthetics can increase its incidence up to 9 times when compared to regional anesthesia [17]. Inhaled anesthetic use becomes the highest risk factor for the occurrence of PONV within the first two hours after surgery [18,19]. Others studies have shown that when TIVA is used the incidence of PONV decreases between 25 and 50%, mainly due to the use and mechanism of action of propofol. This protective effect of propofol has been well documented in the literature [11,20].

This observational prospective study was designed to assess the incidence of PONV in patients presenting for ambulatory surgery. A TIVA technique and the PONV prophylaxis guidelines from SAMBA were used in our study.

Objectives and Methods

To determine the incidence of PONV in patients receiving TIVA as their primary anaesthetic in an ambulatory center in Santander, Colombia between January and December 2016.

Study design

This is an observational study. The subject population consisted of patients that had ambulatory surgery in the ambulatory program at Clinica El Pinar in Santander, Colombia. Trained personnel at the institution collected the information. The Ethics Committee of

Clinica El Pinar approved the intervention protocol.

Study Population: Patients that presented for scheduled ambulatory surgery at clinica el Pinar.

Inclusion Criteria: Patients between 18 and 60 years old, American society of anesthesiologists (ASA) I-III with a body mass index (BMI) less than 30, scheduled for ambulatory surgery with TIVA. No nitrous oxide was used at any point during any of the anaesthetics.

Exclusion Criteria: Patients of ASA IV or whom required hospitalization after the procedure.

Sample size: We used the Open Epi™ Software. We used a PONV incidence of 50%, incidence that has been reported by the last consensus Guidelines for the Management of PONV published by the Society for Ambulatory Anesthesia (SAMBA) [21]. A significance level of 95% and a potency of 80% were used to calculate our sample. Our calculated sample was 364 patients.

Data Analysis: All obtained information was entered into an Excel database. The data was then exported and a descriptive and bivariate analysis was executed using Stata™ 12.0 software.

The descriptive analysis of the qualitative variables was done by using relative and absolute frequencies. The quantitative variables are presented as median and standard deviation. We performed a bivariate analysis to calculate the prevalence ratio using poisson regression, p values and confidence interval.

Table 1 PONV prophylaxis used.

Prophylaxis	% Patients	Average Dose	Dose Range
Dexamethasone	99%	4 mg	4–16 mg
Ondasetron	92%	7.75 mg	4–8 mg
Haloperidol	14.2%	1 mg	0.5–2 mg
Metoclopramide	4.6%	10 mg	10 mg

Table 2 Pain control medications used.

Prophylaxis	% Patients	Average Dose	Dose Range
Ketoprofen	88.8 %	99,57 mg	50–100 mg
Morphine	61.6 %	3,68 mg	2–8 mg
Tramadol	40.1 %	79,34 mg	50–100 mg
Diclofenac	4.6%	10 mg	10 mg
Ketamine	4.6%	12 mg	10–30 mg
Acetaminophen	0.5%	750 mg	500–1000 mg
N butil bromure of Hioscine	0.3%	20 mg	20 mg

Results

Descriptive Analysis

A total of 367 patients were enrolled in our study. The average age was 34.1 years with a standard deviation of 12.7. Regarding gender, 13.62% of patients were male and 86.38% were female.

The vast majority of our patients were ASA 1, 85.01%. 14.44% of patients were ASA 2 and 0.545% were ASA 3. The average weight was 63.28kg, height was 163 centimeters and BMI was 23.61.

Regarding comorbidities, 8.5% of patients were obese, 4.9% were hypothyroid, 2.2% had a history of hypertension and 0.5% had Type 2 diabetes mellitus.

In our study 12% of patients had a history of PONV, 16.6% of motion sickness and 0.3% of patients had experienced nausea and emesis within the previous 24 hours. None of the patients were taking any kind of medication for PONV prophylaxis.

Regarding a history of substance abuse, 7.9% of patients had a history of tobacco smoking.

5.7% of patients presented comorbidities such as anxiety, depression, gastritis, allergic rhinitis, irritable bowel and carbohydrate intolerance.

All patients included in the study had TIVA as their primary anesthetic. Our TIVA consisted of a targeted control infusion (TCI) of propofol and remifentanil. A bispectral index (BIS) between 40 to 60 was used to assess the depth of anesthesia.

The main surgical intervention in our study population was esthetic surgery accounting for 82.6% of the cases. Out of this percentage, mammoplasty augmentation was the most common procedure with 51% of patients, followed by liposuction with 18.5% of patients.

Other surgical interventions included rhinoplasty, orthopaedic procedures such as arthroscopies, and general surgery procedures such as herniorrhaphies. The average length of the different procedures was 1 hour and 37 minutes. An umbilical herniorrhaphy was the shortest surgical intervention with a duration of 10 minutes. The longest procedure was a liposuction with mammoplasty augmentation lasting 360 minutes.

The incidence of PONV was assessed at 4 time points during the perioperative period. First when leaving the operating room, second when leaving the post anesthesia care unit (PACU), third 4 hours after leaving PACU and finally 24 hours after discharge.

At the end of the procedure 2.0% of patients presented with nausea and 0.3% had emesis. 16.9% of patients experienced pain at this time point. Out of this percent, 30.6% required morphine for pain control.

When leaving PACU, 3.8% of patients experienced nausea and 0.3% emesis. 23.8% of patients had mild to moderate pain, 3.2% of these patients required pharmacologic pain management with less than 3mg of morphine in 90% of cases.

10.1% of patients leaving PACU at 4 hours manifested nausea and 5.3% mild emesis. 38.7% of patients had mild pain that did not require pharmacological intervention. 14.7% of patients had moderate pain with half of this group requiring pharmacological management with NSAIDS and 4.6% with severe pain requiring opioids.

At the 24 hour PACU post-discharge time 10.1% of patients had nausea and 3.9% emesis. 63.5% of patients had pain with 60% of this percentage having mild pain that was managed with oral over the counter analgesics.

86.7% of patients were satisfied with their care given a score of 10 out 10 for Clinical El Pinar and 95.4% of patients gave a score of 10 out of 10 to the anesthesiologists taking care of them.

Bivariate Analysis

The highest incidence of PONV occurred 4 hours after leaving PACU which, interestingly, correlates with the time point with the highest incidence of pain referred by our patients.

A history of PONV was the most significant risk factor with a P of 0.002 and a prevalence ratio (PR) of 3.39 for nausea. For emesis

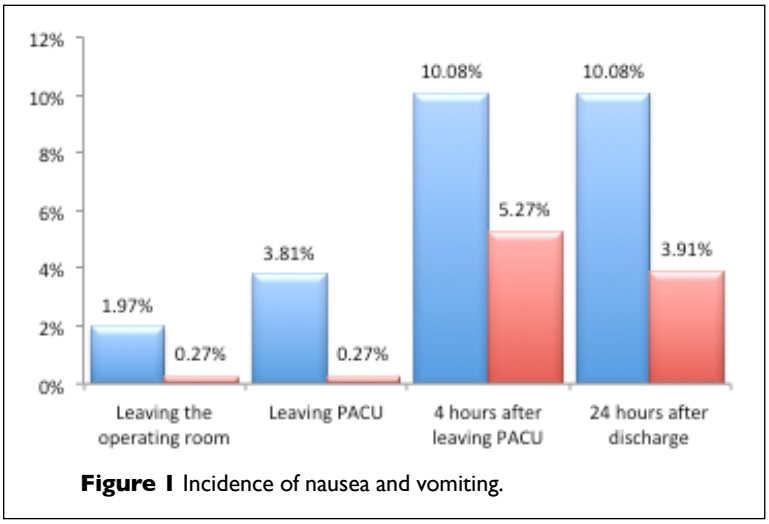

Figure 1 Incidence of nausea and vomiting.

we calculated a P of <0.0001 and a PR of 7.35 A history of motion sickness had a P of 0.0493 and a PR of 2.56.

The incidence of nausea was clearly correlated with the occurrence of pain. Nausea had a strong correlation with moderate pain at PACU arrival (p:0.0473 and PR:4,22) and PACU discharge (p:0.0002 and PR: 9,08) and severe pain at PACU discharge (p: 0.0473 and PR:4,22).

We also found an association between the incidence of nausea and the need for additional pain management with a P of 0.0095 and PR of 2.22.

Discussion

The results of our study show a significant reduction in the incidence of PONV. This effect is pronounced within the first 24 hours after ambulatory surgery when a TIVA technique is used.

It is important to mention that in our study we used a TIVA technique and followed the SAMBA PONV guidelines.

During the first hour 1.97% of patients presented nausea and 3.81% within the second hour in PACU. The incidence of emesis was 1% within the first 2 hours. When looking at pain control after surgery, 24% of patient needed pharmacological management with morphine. We also found an increase of 10% in the incidence of nausea and 5% of emesis 4 hours post PACU discharge. We believe this is most likely related to the use of narcotics for pain control on discharge and the ride home. Finally we found that at 24 hours the incidence of nausea did not increase and that of emesis when down by 40%.

The incidence of PONV found in our study correlates with the one reported in the literature around the globe. It also adds to our knowledge of PONV incidence in Colombia. Based on our findings we believe that a TIVA technique has significant advantages, one of which is the protective effect on PONV. Propofol is the cornerstone in this technique and has a significant effect on the decreased incidence of PONV. The potential mechanisms have been described extensively in the literature. [22–24]

Risk factors for PONV are widely known in the literature [2,9,11,12]. The higher incidence of PONV post hospital discharge is most likely related to the use of opioids for pain control before discharge and the ride home.

Finally a key metric for both surgeons and anesthesiologists is patient satisfaction. We found this to have a significant impact in patients' lives and recovery. We calculated patient satisfaction at 86%.

Conclusion

A TIVA technique has a significant impact in the incidence of PONV. This technique has a protective effect during the first 24 hours post surgery according to our study. The effect seen is extremely valuable in all patients but more so in the ambulatory setting where rapid turnovers are need and access to hospital beds can be limited. Avoiding PONV also adds to patient satisfaction, better pain control, and avoidance of increase healthcare costs by decreasing unnecessary hospitalizations and readmissions. We believe that a TIVA technique and the implementation of the SAMBA PONV prophylaxis guidelines should be considered in all ambulatory surgicenters.

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