

## PATIENT POSITION AS A POSSIBLE RISK FACTOR FOR POSTOPERATIVE NAUSEA AND VOMITING (PONV) IN GYNECOLOGIC LAPAROSCOPY

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Postoperative nausea and vomiting (PONV) are still a significant problem in modern anesthetic practice. Discomfort caused by PONV intensifies other unpleasant elements of recovery, such as pain, frustration or fear. PONV also generates aversion to future anesthesia and have a negative impact on staff and patient's family. PONV can increase the cost of completing a surgical procedure, because it extends the time a patient spends in the postanesthesia care unit (PACU) or delay discharge of ambulatory patients. It is generally accepted that the incidence of PONV after general anesthesia for various types of surgery in the last decade is still between 20-30%, and 70% in laparoscopic abdominal surgery. The incidence is three times higher in females compared to males. Many factors are involved in triggering PONV, such as patient-related factors, the type of surgery, anesthesia management, etc. The results of this study suggest that the patient positioning (modified supine lithotomy position with "Trendelenburg") increases the risk of PONV in gynecologic laparoscopy. *Acta Medica Medianae* 2012;51(4):32-38.

**Key words:** patient position, nausea, vomiting, postoperative, gynecological laparoscopy

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### Introduction

Postoperative nausea and vomiting (PONV), in addition to pain, are the most common adverse symptoms following the general anesthesia. This so-called „big little problem" of anesthesia (1), except for the discomfort and dissatisfaction of the patient, relatives and hospital staff, can extend the patient's stay in the hospital and postpone her discharge, and thus increase the overall costs (2-4) of hospitalization. Possible aspiration of gastric contents during vomiting is additional potential danger to the patient's health, because it can lead to aspiration pneumonia (called Mendelson's syndrome) and even threaten her life. The incidence of PONV in operations under general anesthesia is on average about 20 - 30%. Regarding the type of surgery, the high incidence of PONV in strabismus surgery, inner ear, breast, tonsillectomy, thyroid, abdomen and in laparoscopic cholecystectomy (5)

and laparoscopic gynecological surgery exceeds 70%. Regarding the risk factors related to the patient, the percentage of PONV in children is higher than in adults (increased anxiety), in women is higher than in men (endocrine status) and non-smokers in relation to smokers. Risk factors (6) for PONV in general can be divided into patient-dependent (Table 1) and the factors associated with surgery and anesthesia (Table 2). Physiology of PONV is a complex formation (7). The center for vomiting is in the dorsolateral reticular formation of the medulla, while hemo-receptor trigger zone (HTZ) is located in the area postrema, on the lateral walls of the fourth ventricle. HTZ is outside the blood-brain and cerebrospinal fluid-brain barriers. In the mucosa of the stomach and gastrointestinal tract (GIT), there are mechanoreceptors that transmit impulses over the vagus nerve to the center and trigger the emetic reflex.

In the prophylaxis and treatment of PONV (8), many drugs are used (buterophenons, phenothiazines, metoclopramide, anticholinergics, antihistamines, serotonin receptor antagonists, corticosteroids, H<sub>2</sub> receptor antagonists, etc.), and combinations thereof. Some authors have published papers (9-11) that describe the effects of non-pharmacological techniques for the prevention and treatment of PONV, such as acupuncture, acupressure, transcutaneous electrical stimulation and hypnosis. Modern PONV prophylaxis and treatment involves a combination of two or more drugs, the so-called multimodal

approach (12), particularly in patients in whom there is a presence of multiple risk factors, with the idea that different drugs act synergistically to different mechanisms of PONV and the effect is better. For risk stratification, and in order to evaluate the high-risk patients, various scoring-systems are in use (13-16), of which the best known (named after the author) is Apfel score (17-19). All the scores are concordant regarding the five major risk factors, which are: female gender, non-smoking status, data on previous PONV and / or motion sickness, and duration of surgery/anesthesia over 1 h. Risk assessment and proper selection of anesthetic techniques, i.e. lower use of emetogenic anesthetic, are very important because they also determine the level and extent of prophylaxis and therapy.

### Materials and methods

In the period from 2005 to 2012 in the General Hospital Pirot, 222 laparoscopic gynecologic surgeries were performed under general anesthesia. Diagnosis, number and distribution of patients by age are shown in Table 3. The retrospective study included 154 patients with non-smoking status (Apfel score II), aged 20 - 39 years, ASA I-II, divided into two groups. In the first group there were 67 patients operated for ovarian cyst, who assumed a classic horizontal supine position on the operating table during surgery (Figure 1). The second group included 87 patients, surgically treated for infertility and sterility, who were on the operating table in a position that is a combination of gynecological (modified lithotomy position) and the so-called Trendelenburg position (Figure 2). Before induction of anesthesia, the patients were placed in a horizontal lithotomy position and after intubation and creating pneumoperitoneum (PP) into Trendelenburg, with additional 25-30 degrees. The omitted from the study were the patients with a previous history of PONV and motion sickness, diabetics and patients

with body mass index (BMI) above 30. Also, the cases where the operation lasted over one hour were not analyzed.

All operations were elective in terms of urgency. For these reasons, the operation of ectopic (tubal) pregnancy was not included into the study. The operations were always performed by the same team of gynecologists. All team members, including anesthesiologist, had completed training in laparoscopy, and one of the operator was an instructor. The patients did not receive prophylactic antiemetics. After preoperative preparation, which involved a routine laboratory tests and internist examination, the intake of food was suspended for eight hours and of fluids for four hours before surgery. Keeping a balanced general anesthesia was in accord with standard scheme and the clinical doses of anesthetics. After premedication with atropine and midazolam, the preoxygenation followed in duration of three minutes. For induction of anesthesia, propofol was used for intubation- leptosuccin, for muscle relaxation - rocuronium, for analgesia - fentanyl, and gas mixture of oxygen / nitrogen oxide in ratio 40%-60% for maintenance of anesthesia. After creating pneumoperitoneum, in order to reduce gastric distension (20), all patients had an oro / nasogastric tube (in the form of aspiration catheter) inserted, which was evacuated after surgery and before awakening. Volatile anesthetics (sevoflurane) were not used. Block reversion with neostigmine was not done. During the operation, we used the standard non-invasive monitoring of vital signs (blood pressure, pulse rate, oxygen saturation, ECG and capnography). After surgery, the patients were observed for 30 minutes to wake up in a recovery room under the supervision of the anesthetist. Then they were transferred to the Department of Gynecology and discharged from hospital the following day. For the treatment of postoperative pain, we used ketorolac and metamizol.

Table 1. Patient-dependent risk factors

Proven	Probable / Possible
Female and endocrine status, ovulatory and luteal phases of the menstrual cycle	Pregnancy, diabetes, pancreatitis, viral infection
Age	Physical constitution and obesity (BMI)
History of previous PONV	Preoperative fear and anxiety
History of motion sickness	Preoperative fasting
Smoking status (nonsmokers)	Individual disposition for PONV

Table 2. Risk factors dependent on surgery and anesthesia

Proven	Probable / Possible
Length of surgery	Position of a patient on the operating table
Anesthetic agents (thiopental, etomidate, opioids, neostigmine ...)	Anesthetic agents (nitrous oxide, volatile anesthetics ...)
Emetogenic surgery (abdominal, laparoscopic, gynecological, ORL ...)	Early postoperative oral intake of food and liquids
Use of postoperative opioids	Early postoperative mobilization
Duration of (general) anesthesia	Technique of anesthesia



Figure 1. Classic supine (backstroke horizontal) position on the operating table

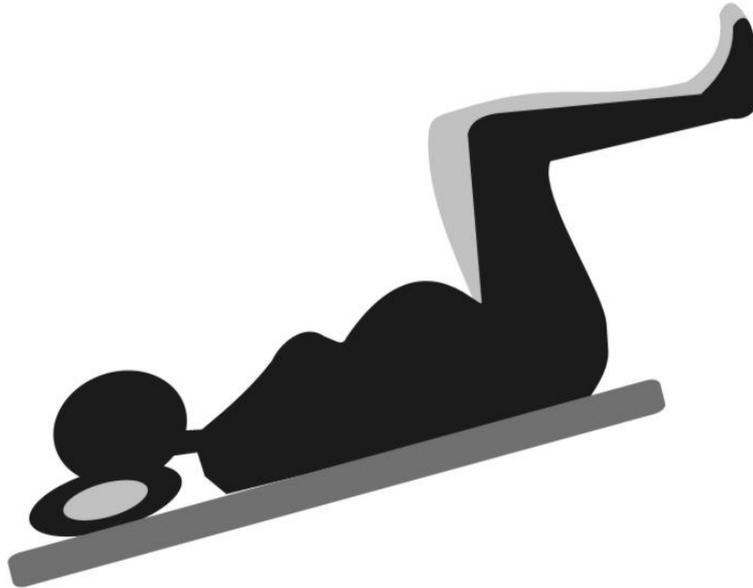


Figure 2. Gynaecologic + Trendelenburg position on the operating table

Table 3. Laparoscopic gynecologic surgery in General Hospital Pirot (2005-2012)

Diagnoses	Number of patients	Mean age
Cystis ovarii	95	34,8 (17-80)
Infertilitas primaria	77	29,5 (18-47)
Sterilitas secundaria	16	32,3 (24-41)
Graviditas EU (tubaria)	16	28,7 (18-36)
Myoma uteri	08	48,4 (31-71)
Endometriosis ovarii	06	34,8 (29-46)
Hydrosalpings	04	31,2 (18-40)
TOTAL	222	34,2 (17-80)

The presence/absence of PONV was recorded in the first 15 minutes after extubation, and later at the Department of Gynecology at 1, 4, 8 and 24 h (on discharge). Data were collected by the gynecologists and anesthetists on duty, and nurses at the Department of Gynecology. To measure the intensity of nausea, the visual analog scale (VAS) was used, with a range of 0-100, where zero represents complete absence of nausea, and 100 described by patients as „the worst possible" nausea. Also, the length of nausea and number of vomiting were noted. Three or more episodes of vomiting are considered clinically significant.

**Results**

The results recorded in these intervals are shown collectively as an early PONV - the first four hours, and late PONV from 4-24 hours after surgery.

In group I (Table 4) out of 67 patients in the first four hours after surgery there were 28 patients who complained of nausea (41.8%) and four (6%) patients complained of vomiting. During the period of 4-24 hours after surgery, nausea was present in 25 (37.3%) patients and vomiting in two (3%) patients.

In group II (Table 5), out of 87 patients in the first four hours after surgery, nausea was

reported in 55 (63.2%) and vomiting in 8 cases (9.2%). In the late period (4-24 h), 51 patients complained of nausea (58.6%) and 5 (5.8%) patients complained of vomiting.

In group I, out of 28 patients with PONV, 11 (39.3%) patients rated the intensity of nausea on a visual analogue scale with 20, nine patients (32.1%) with 40, and 8 (28.6%) patients rated it with 50. The average intensity of nausea on the VAS scale in group I was 35.

In group II, out of 55 patients with PONV, 8 (14.5%) patients marked the intensity of their symptoms on the VAS scale with 30, 14 (25.5%) patients marked it with 40, 17 (31%) with 50, 7 (12.7%) with 60, 3 (5.4%) with 70, 4 (7.3%) with 80 and 2 (3.6%) with 90. The average intensity of nausea in group II was 50.5.

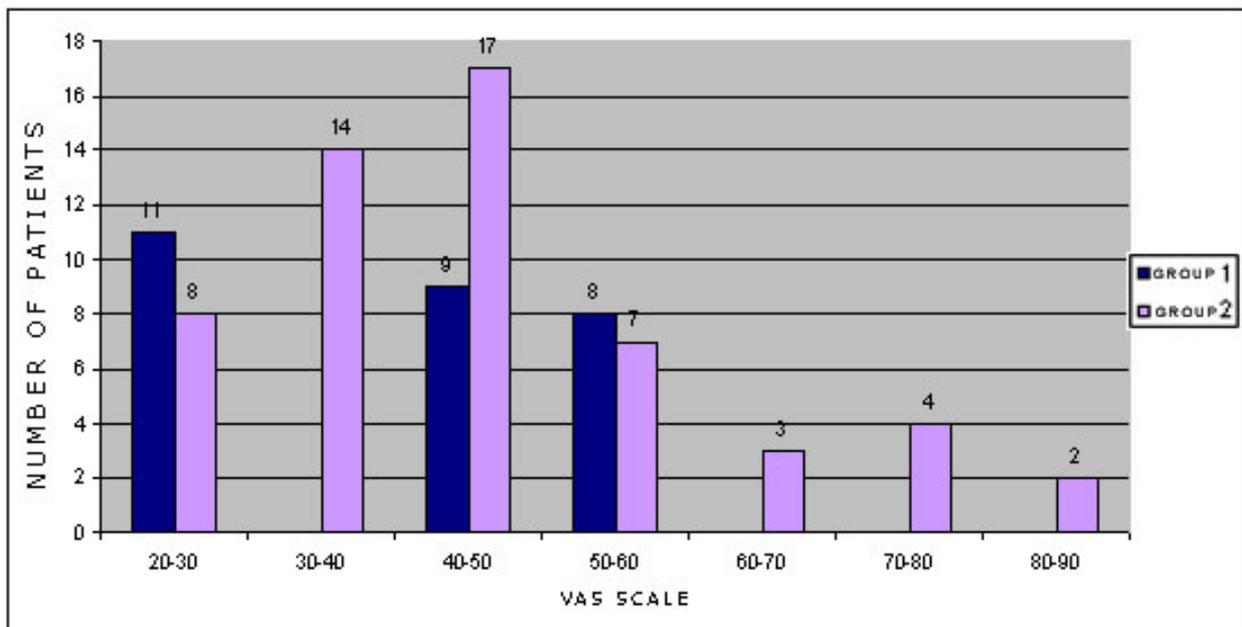
The frequency and severity of PONV were measured by VAS and shown in Graph. 1

Table 4. PONV in group I - the horizontal (supine) position

Early PONV (0-4h after surgery)		Delayed PONV (4-24h after surgery)	
Nausea	28/67 (41,8%)	Nausea	25/67 (37,3%)
Vomiting	4/67 (6%)	Vomiting	2/67 (3%)

Table 5. PONV in group II - lithotomy position with Trendelenburg position

Early PONV (0-4h after surgery)		Delayed PONV (4-24h after surgery)	
Nausea	55/87 (63,2%)	Nausea	51/87 (58,6%)
Vomiting	8/87 (9,2%)	Vomiting	5/87 (5,8%)



Graph. 1 Measuring the intensity of PONV - VAS scale

## Discussion

There are not many papers in the literature (21-23) regarding the position of the patient on the operating table as a possible risk factor for PONV. In the recent years, researches have been mainly focused on multimodal approach, and search for the best combination of two or three antiemetics for the prophylaxis and treatment of PONV in high-risk patients. This approach was promoted by Scuderi (24) just in patients who underwent the laparoscopic gynecological interventions. Today, it is widely accepted (25) that total intravenous anaesthesia (TIVA) is a choice for laparoscopic surgical procedures, and that the use of nitrous oxide, volatile anesthetics (26), leptosuccin, opioid analgesics and neostigmine potentiates PONV. Despite this, the incidence of PONV is still the highest in laparoscopic surgery. Iatrogenic pneumoperitoneum (PP), besides a well-known risk of gas embolism and negative

effects on circulation and respiration (which are frequently present in the gynecological position with „legs up“), leads to an increase in pulmonary artery pressure (PAP), central venous pressure (CVP) and pulmonary capillary „wedge“ pressure (PCWP), a decrease in cardiac output (CO). The increase of intra-abdominal and gastric pressure, with surgical manipulation, additionally activates vagus nerve and splanchnic afferent nerve fibers, distend the stomach and intestines and stimulates mechanoreceptors in the GIT in charge of the transmission of impulses to emetic center.

Our results indicate that the position of the patient on the operating table, which is a combination of lithotomy position and Trendelenburg, further emphasizes the negative effects of PP in the sense that the hollow abdominal organs and diaphragm are pushed by the force of gravity more cranially.

In contrast to the type of surgical intervention, regarding our patients, we cannot say

that they belong to a high-risk group, because we had only two of the patient-dependent factors present - female gender and non-smoking status. It is known that smokers are more prone to PONV, although the mechanism is still not completely elucidated (27,28). Patients were equaled by the ASA status, age, pre- and postoperative treatment of suspension *per os* intake and the physical constitution (BMI), although the impact of obesity on PONV has not been completely proven (29). We did not take into account additional endocrinological factors - some authors (30-32) have reported a higher incidence of PONV in the ovulatory and luteine phase of the menstrual cycle, which should be kept in mind when scheduling elective surgery.

By the anesthetic technique applied, we managed to avoid some anesthetic agents that are considered emetic, such as thiopental, etomidate, sevoflurane and neostigmine. In the same context, for relieving the postoperative pain, the opioid analgesics were not used. Patients who had registered persistent nausea and/or vomiting in the first four hours after surgery were treated with ondansetron 4mg iv, and those in which the symptoms were present and subsequently were treated with repeated dose of ondansetron and dexamethasone 4mg iv, which is in accordance with the recommended instructions (33-35) for the prophylaxis and treatment of PONV. Early postoperative mobilization and patient's verticalization were avoided. All patients were discharged from hospital after 24 hours of surgery completion, except for two patients from the first and five patients from the second group, who, for clinically significant PONV (three or more vomiting episodes despite treatment), were kept one day longer.

All cited authors agree that laparoscopic gynecologic surgery are highly emetogenic, as

our results show. In both our groups, there is high percentage of early PONV (group 1 - 41.8%, group 2 -63.2%) and late PONV (37.3% group 1, 58.6% in group 2). There is an apparent difference between the groups, and it shows a higher incidence of both early and late postoperative nausea in group 2. Measuring the intensity of nausea on the VAS scale also shows that the average intensity of nausea in group 2, marked as 50.5, is significantly higher than in group 1 - 35. Also, the intensity of POMP higher than 50 was not recorded in group 1, while group 2 included patients with PONV intensity up to 90 on VAS .

### Conclusion

Our results show that the incidence of PONV is generally higher in laparoscopic gynecologic surgery when patients on the operating table are placed in a position which is a combination of lithotomy position and Trendelenburg (group 2) compared to surgeries in which the patients are placed in the classic supine position (group 1). We concluded that the combination of these positions on the table (group 2) potentiates the negative effects of iatrogenic pneumoperitoneum which through the diaphragm movements cranially and pronounced compression of abdominal organs further stimulates the mechanoreceptors in the GIT, and n. vagus afferent fibers, activating thus the vomiting center in the area postrema in the cerebrum. We consider that all patients waiting for laparoscopic gynecologic surgery in the mentioned position on the operating table should be treated as high risk ones for developing PONV. In this sense, regardless of the number of present patient-dependent risk factors, we recommend routine antiemetic prophylaxis in the form of multimodal regime.

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## POLOŽAJ BOLESNIKA NA OPERACIONOM STOLU KAO MOGUĆI FAKTOR RIZIKA ZA POSTOPERATIVNU MUČNINU I POVRAĆANJE (POMP) KOD GINEKOLOŠKIH LAPAROSKOPSKIH OPERACIJA

*Aleksandar Ćirić, Velimir Colić, Sava Rančić i Duško Madžić*

Postoperativna mučnina i povraćanje (POMP) predstavljaju još uvek značajan problem u savremenoj anestezijološkoj praksi. Neprijatnost zbog POMP potencira druge nepoželjne manifestacije u toku oporavka bolesnika, kao što su bol, frustracija i strah. POMP, takođe, utiče na stvaranje averzije kod bolesnika prema budućim anestezijama i ostavlja negativan utisak kod bolničkog osoblja i bolesnikove rodbine. POMP povećava cenu kompletne hirurške procedure, jer produžava vreme koje bolesnik provodi u jedinici intenzivne nege, odnosno odlaže otpust ambulantnih bolesnika. Današnji opšteprihvaćeni stav je da se učestalost POMP nakon opšte anestezije, za različite vrste hirurških zahvata, u proseku kreće od 20-30% (do 70% u laparoskopskoj abdominalnoj hirurgiji) i da se tri puta češće javlja kod žena nego kod muškaraca. Mnogi činioci učestvuju u mehanizmu nastanka POMP, poput faktora koji zavise od bolesnika, vrste hirurgije, tehnike vođenja anestezije i drugih. Rezultati našeg istraživanja sugerišu da određeni položaj bolesnika na operacionom stolu kod ginekoloških laparoskopskih operacija može povećati rizik za nastanak POMP. *Acta Medica Medianae 2012;51(4):32-38.*

**Ključne reči:** položaj bolesnika, mučnina, povraćanje, postoperativno, ginekološka laparoskopija