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*REVIEW ARTICLE*

# Intraoperative nausea and vomiting during cesarean section under regional anesthesia

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*SUMMARY*. Nausea and vomiting during regional anesthesia for cesarean section are very common and unpleasant events. They cause significant distress to the patient and also interfere with the surgical procedure. They have multiple etiologies, which include hypotension, vagal hyperactivity, visceral pain, i.v. opioid supplementation, uterotonic agents and motion. The obstetric anesthesia literature has addressed these causative factors for nausea and vomiting individually, making it difficult for the anesthesiologists to have a comprehensive understanding of these important complications. This review highlights the anesthetic and non-anesthetic causes of intraoperative nausea and vomiting during regional anesthesia for cesarean section and the appropriate prophylactic and therapeutic management. Intraoperative nausea and vomiting can be best prevented by controlling hypotension, optimizing the use of neuraxial and i.v. opioids, improving the quality of block, minimizing surgical stimuli and judicious administration of uterotonic agents. Although prophylactic antiemetics have been advocated during cesarean sections, strict adherence to these practices can effectively lower the incidence of intraoperative nausea and vomiting without the requirement of antiemetic agents. Antiemetics, therefore, should be reserved for the prevention of intraoperative nausea and vomiting in high-risk patients and for the treatment of nausea and vomiting not responding to routine measures.


*Keywords*: Nausea; Vomiting; Cesarean section; regional anesthesia

## INTRODUCTION

Regional anesthesia has been shown to be effective, safe and the anesthetic of choice for elective and emergency cesarean sections. Despite major advances in spinal, epidural and combined spinal-epidural anesthesia techniques, intraoperative nausea and vomiting (IONV) are still present in a significant number of patients. These symptoms can be distressing and uncomfortable for patients and may have a negative impact on their overall birthing experience. Most of the factors predisposing to IONV during regional anesthesia for cesarean section overlap with those involved in other surgical procedures, but some are unique to this operation.

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Comprehensive reviews on postoperative but not on intraoperative nausea and vomiting are widely available in the literature.[1–5] This is particularly true in obstetric anesthesia. This review highlights the predisposing anesthetic and non-anesthetic factors responsible for IONV during regional anesthesia for cesarean section and the appropriate prophylactic and therapeutic management. We have reviewed articles from Pubmed, MEDLINE 1966 to present, EMBASE 1988 to present, Cochrane database and MDConsult using the key words *cesarean*, *caesarean*, *regional anesthesia*, *nausea*, *vomiting* and their combination. Additional pertinent references from relevant articles have also been included.

## OUTLINE

- Incidence of IONV
- Physiology of nausea and vomiting
- Risk factors
- Causes and related prophylactic measures
- Additional prophylaxis
- Treatment
- Conclusion

**Table 1. Incidence of intraoperative nausea and vomiting during cesarean section**

| Study | Anesthesia | Nausea | Vomiting |
|---|---|---|---|
| Pan PH (2001)[7] | Epidural $N = 51$ | 57% | 25% |
| Harmon D (2000)[8] | Spinal $N = 47$ | 36.2% | 17% |
| Carvalho JCA (2000)[9] | Spinal $N = 40$ | 30-35% (Pre) | 15% (Pre) |
| Albouleish EI (1999)[10] | Spinal $N = 38$ | 55.3% (Pre)<br>79% (Post) | 42.1% (Pre)<br>58% (Post) |
| Ure D (1999)[11] | Spinal $N = 25$ | 68% | 16% |
| Stain DJ (1997)[12] | Spinal $N = 19$ | 76% | 24% |
| Lussos SA (1992)[13] | Spinal $N = 21$ | 57% (Pre)<br>57% (Post) | 24% (Pre)<br>24% (Post) |
| Chestnut DA (1987)[14] | Epidural $N = 33$ | 21% (Pre)<br>36% (Post) | 0 (Pre)<br>15% (Post) |
| Santos A (1984)[15] | Spinal $N = 25$ | 40% | 12% |

Numbers reflect control groups in randomized controlled trials. Pre, pre-delivery; Post, post-delivery.

## INCIDENCE

The incidence of IONV during spinal anesthesia for non-obstetric surgery ranges from 7% to 42%.[6] The overall incidence of IONV during regional anesthesia for cesarean section is extremely variable, up to 80%, depending on the anesthetic technique used (spinal, epidural or combined spinal-epidural) and on the preventive and therapeutic measures taken (Table 1).[7–15] The incidence of IONV may also vary significantly according to the stages of the surgical procedure (e.g. pre-delivery vs. post-delivery), different factors being implicated in the etiology.[10,13,14]

## PHYSIOLOGY OF NAUSEA AND VOMITING

The central neural regulation of nausea and vomiting is vested in two separate units in the medulla, the chemoreceptor trigger zone (CTZ) and the vomiting center.[3,16] The CTZ, located in the area postrema on the floor of the fourth ventricle, is a highly vascularized area where the blood-brain barrier is poorly developed. The vomiting center is located in the lateral reticular formation of the medulla and integrates the vomiting response. It receives many excitatory inputs from the nerve endings of vagal sensory fibers in the gastrointestinal tract, the labyrinth via the vestibular nuclei, higher centers in the cortex, CTZ and intracranial pressure receptors. These structures are rich in dopaminergic, muscarinic, tryptaminergic, histaminic and opioid receptors. Antiemetic drugs block these specific receptors.[3] Efferent impulses from the emetic center are transmitted to the vagus, phrenic and spinal nerves of the abdominal muscles to cause the mechanical act of vomiting.

## RISK FACTORS

The obstetric patient, due to the physiological changes of pregnancy, is prone to nausea and vomiting. This is attributed to impaired motility of the esophagus, stomach and small bowel as a result of smooth muscle relaxation fostered by increased levels of hormones particularly progesterone, perhaps primed by estrogen during pregnancy. Hormonal changes are postulated to alter lower esophageal sphincter (LES) function causing an incompetent sphincter. The large gravid uterus contributes to the manifestations of upper gastrointestinal symptoms by mechanically compressing the stomach. Alterations in small bowel transit times in the third trimester have also been investigated as potentially contributing to nausea and vomiting.[17,18] Apart from these gastrointestinal effects, hormonal changes during pregnancy may influence the neurovestibular system and emetic center in the brainstem, further increasing the risk of IONV.[17,18]

A simplified risk score has been designed for predicting postoperative nausea and vomiting (PONV) in patients requiring general anesthesia for non-obstetric surgery. The predictors are female gender, history of motion sickness or PONV, non-smoking and the use of opioids.[19] In non-obstetric patients, the variables conferring increased odds of IONV under spinal anesthesia include addition of vasoconstrictor to the local anesthetic, block height $\geqslant T_5$, baseline heart rate $\geqslant 60$ beats/min, history of car sickness and hypotension.[6] The predictors for IONV have not been studied in obstetric patients undergoing regional anesthesia and there are no data to suggest that these predictors are applicable to obstetric patients.