Postoperative nausea and vomiting: The achilles heel of anesthesiologists

We are more often fooled by things we think we know than things we do not… Claude Bernard

Postoperative nausea and vomiting (PONV) has been the Achilles heel of anesthesiologists since over a century now. From being described as the big “little problem” in 1991,[1] it has now progressed into a chronic, “gnawing itch,” that does not want to go away soon. Despite predisposing factors not exactly being under control of the anesthesiologists, PONV is often blamed on anesthesia, and since ages has been denigrating anesthesiologists.

The prevailing incidence of PONV remains dis pleasingly high.[2] Unfortunately, 10% of the patients with no risk factors will experience PONV. If patients have three or more risk factors (female gender, history of PONV/smoking/motion sickness, use of opioids postoperatively), the incidence dramatically surges to 61% and 79%, respectively.[3] Almost thirty years ago, Macario had patients rank their most feared expectations from anesthesia.[4] The patients appraised from most undesirable to least undesirable (in order): vomiting, gagging on the tracheal tube, incisional pain, nausea, recall without pain, residual weakness, shivering, sore throat, and somnolence. It is not surprising that patients three are ready to pay anywhere between US $56 to US $100 (approximately 3500–6500 INR) for a hypothetical ideal antiemetic.[5] PONV incurs augmented medical costs, morbidity, delayed recovery/discharge, and readmissions. Thus, it behooves those involved with anesthetic care to understand, preempt, and formulate personalized plans to deal with this distressing complication.

There have been multitudes of research, and journals are inundated with an exponential number of manuscripts claiming eureka moments pertaining to the remedy of PONV. Regrettably, most manuscripts are corrupted due to flawed methodology. Future researchers are advised to steer clear of typical yet avoidable mistakes. Preferably they should address original/pertinent hypothesis, instead of continually inspecting predictable antiemetics, whose efficacy have already been established by meta-analysis. Emphasis must be made on choosing a power analysis driven representative sample size. Instead of using doubtful risk factors, groups should be compared with recognized risk scores for predicting PONV.[6] Even though nausea and vomiting have been considered sequential, existing data differentiates their pathophysiology, implying that specific risk factors be used for each.[7,8] The main outcome/endpoint must be well defined. Symptoms such as retching, nausea, vomiting, and specific rescue intervention(s), should be reported (with the exact incidences) separately. It is recommended to utilize the various established predictive models for PONV.[8-13] The observation period should last for at least 24 hours post-surgical procedure, encompassing preferably early, intermediate, or delayed postoperative period. Finally, causes of potential bias, problems related with multiplicity of analysis and outcomes, and inherent limitations related with data interpretation, should be factored in before justifying a conclusion.

A critical role in the central mechanism of vomiting is played by area postrema, a highly vascularized structure located on the dorsal surface of the medulla oblongata at the caudal end of the fourth ventricle. It is very sensitive in detecting emetic stimuli/agents in blood and cerebrospinal fluid as it lacks a blood–brain barrier. Various neurotransmitter receptor systems [dopaminergic (D2), cholinergic (muscarinic), histaminergic (H1) serotonergic (5-HT3)] and neurokinin NK1 systems have been conjectured to be responsible for nausea and vomiting. Their corresponding receptors have been the targets for antiemetic pharmacological research. Extrapolation of success in treating chemotherapy-induced nausea vomiting (CINV) into anesthesia has for long been the route taken to find a remedy for PONV. Weak and narrow spectrum antiemetic properties of 5-HT1A receptor agonists encouraged the neuropharmacological quest to investigate the role of neurotransmitter systems other than the serotonergic system to make available a highly effective broad-spectrum antiemetic. Initial studies reported the emetic action of the tachykinin, substance P (SP).[14] It was observed that depletion of SP in the central emetic pathway could potentially lead to antiemesis.[15] This was followed by research evaluating the efficacy of potent, highly selective nonpeptide NK1 receptor antagonists.

Okafor et al. reviewed the potential of one of the new entrant “neurokinin-1 antagonist” in this issue.[16] This opens new avenues for plausible manipulation of the central emetic pathway to develop a “road map” for optimal dosage for prevention, as well as rescue protocol for both adult and pediatric population scheduled for anesthesia. This also throws up a prospect for multicenter collaboration on accumulating and analyzing outcome data. It should perhaps generate interest in exploring pharmacodynamic/pharmacokinetics of commonly used anesthetic agents’ interaction with SP
in the area postrema. Other areas of possible research for anesthesiologists may involve the practicality of NK1 receptor antagonists in pain management, bronchospasm, preoperative anxiety, and stroke.

It is the appropriate requirement of the time to take up the challenge of designing and development of novel modalities of antiemetic drugs and yet keep it economical to ensure effectiveness and beneficial outcomes. The race is heating up between 5-HT3 antagonist (latest being long acting palonosetron), NK1 receptor antagonists, and other nonpharmacological (ginger/acupuncture) therapies to find an effective cure for the relentless itch that needs to be exterminated.

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