

Capnography: an Infallible Giant??

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Case Report

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Abstract

Robust monitoring is a crucial feature while managing patients in the perioperative and intensive care settings. Although many monitoring devices are available, they are not replacements for an astute clinician. Capnography has come a long way and is holding its ground stronger than before because of its simplicity and diversity. Yet it is not uncommon to falsely interpret the information as is with any other monitoring device. Severe intraoperative bronchospasm is one condition that can cause a lot of anxiety and apprehension if not appreciated quickly. Through this report, we would like to highlight the significance of the interpretation of capnography as a monitoring tool and the role of a clinician while facing challenging situations.

Introduction

Intraoperative monitoring had come a long way from a time when it was essentially primitive, relying heavily on clinical judgment with hardly any tools available to guide a clinician, to the present time when there are myriad modern gadgets that promise to make life easy for intraoperative physicians. Technological advancement has been a boon for the medical field with primary devices like pulse oximeter and capnography, which have become indispensable for practicing anesthesiologists, and newer tools like ultrasound, infrared spectroscopy, and transesophageal echocardiography, to name a few, which when used can give a sea of information to the anaesthesiologists to plan and manage patients intraoperatively.

Out of all these, the evolution and application of capnography have revolutionized the anesthesia practice becoming a formidable tool in the armory of anaesthesiologists, backed by abundant scientific data to claim its usefulness[1]. Securing an airway is the most critical skill and job performed by anesthesiologists, emergency physicians, and paramedical staff. Once learned, it becomes a part of their routine, carrying it out just like other medical procedures. One reason for this ease is capnography, as it gives conclusive proof of intratracheal intubation[2]. In this case report, we would like to explore the idea of whether capnography is definitive of correct intubation and ventilation at all times, with a particular emphasis on severe bronchospasm when the authors have found themselves in an arduous situation.

Clinical Case

A 55-year-old male patient was posted for on-pump mitral valve replacement. He had MMP (Mallampati) grade 3 on the airway examination. The patient was induced with propofol, and after conforming bag and mask ventilation, an intubating dose of vecuronium was given. Laryngoscopy was attempted, but the patient could not be intubated as the glottis was not visible. The second attempt at laryngoscopy was taken. It was assumed to be unsuccessful as on attempted ventilation, an end-tidal co₂ (carbon dioxide) trace was not seen on the monitor. The chest was silent on auscultation, and there was no visible rise. A senior anesthesiologist took charge of the airway, and the third attempt at laryngoscopy was made with the help of a video laryngoscope. There was an active ooze by this time from the posterior pharyngeal

wall, which made the visualization even worse. This time, no Etco₂(End-tidal carbon dioxide) trace and no chest rise were appreciable. The endotracheal tube was not removed as the intubating anesthesiologist was confident of the correct placement. A diagnosis of severe intraoperative bronchospasm was made, and the patient was managed accordingly. By this time, the Etco₂ trace was appreciable on the monitor, and ventilation also improved. The surgery was uneventful, and the patient was shifted to the surgical ICU, where he was extubated.

Authors have experienced an almost similar situation at least three more times in different specialty operating theaters when severe intraoperative bronchospasm has been misdiagnosed as erroneously placed endotracheal tube leading to its removal, thus causing multiple attempts at laryngoscopy.

Discussion

One of the advantages that capnography offers as a monitoring tool is its simplicity and ease of interpretation[3]. Still, like any other monitoring tool, it is not immune to misinterpretation. As stated earlier, there are some inherent limitations that capnography carries with itself, which, if not recognized, can lead to misdiagnoses, missing the diagnosis completely, and often overtreatment. We would like to highlight a few fallacies: First and foremost is a phenomenon known as “collision broadening,” [4] caused by nitrous oxide in the gas mixture, which can cause overestimation of EtCO₂ by a few mmHg and “collision narrowing” caused by oxygen in the gas mixture [5]. System leaks disconnections are also very common and can lead to undue anxiety if not duly interpreted. Lag time, zeroing time, and calibration of the system are some of the inherent properties of the system with which a physician should be varied. In the case of bronchospasm, capnography image is characterized by a prolonged expiratory phase, which every anesthesiologist and trainee is aware of and being taught to recognize. If allergic, Bronchospasm is usually accompanied by cardiovascular instability[6], which can be a possible cause of non-traceable etco₂ compared to non-allergic bronchospasm in which there is no cardiovascular compromise and will present as a classical prolonged expiratory upstroke. In our witnessed clinical scenario, even though there was no cardiovascular compromise, we still could not appreciate capnography tracing that compelled us to explore and communicate this exciting finding.

Conclusion

Capnography as a monitoring tool is not limited exclusively to the operating theatres but has leaped ahead and found admirers in intensive care settings, emergency areas, and procedural sedation rooms[7]. It is remarkable as well as astonishing to see such a simple tool proving its usefulness and mettle for so many years now. It is “Irreplaceable,” to put in simple words. This case report by no means is trying to undermine the importance of capnography. We are not eschewing capnography as a monitoring tool. Still, we would like to reemphasize the fact that monitoring equipment is to help and guide a physician to tread difficult paths but can't replace a clinician's clinical judgment, experience, and skill.

Declarations

AUTHOR CONTRIBUTION

1) Name: Shalvi Mahajan

Contribution: This author helped with patient management and data collection

2) Name: Sanjay Kumar

Contribution: This author helped with patient management and conceptualization

3) Name: Rashi Sarna

Contribution: This author helped with data collection and manuscript

Preparation

4) Name – Rajeev Chauhan

Contribution: This author helped with patient management and manuscript preparation

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CONFLICT OF INTEREST

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