EDITORIAL

Optimizing Oxygenation during Gastrointestinal Endoscopy: The Rise of HFNC Therapy

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Gastrointestinal (GI) endoscopy is a common diagnostic and therapeutic procedure done in various healthcare centers over the world. The current standard of care involves the administration of sedation for the patients undergoing the procedure, most commonly with propofol and midazolam. This is done for better patient cooperation, amnesia during the procedure, and quality improvement.[1] Due to the presence of the endoscope in the pharynx and possible collapse of the airway due to sedation, there are increased chances of hypoventilation. This is most commonly manifested as hypoxia, which may lead to frequent interruptions in the procedure and require airway maneuvers. The incidence of desaturation during endoscopy varies between 12% in non-sedated patients to 47% in sedated patients.[2] Persistent hypoxia can cause arrhythmias and acute kidney injury with the possibility of permanent organ damage. Conventionally, this risk is mitigated by the use of oxygen up to 15 L/min delivered through a facemask with or without a reservoir or using nasal cannulae. However, this may not be ideal as the fit of the mask may not be adequate or it may get dislodged during the procedure leading to dilution of oxygen due to entrainment of air. The use of dry gas at such flows may lead to drying of the mucosa which may lead to ciliary dysfunction and severe damage to the respiratory epithelium.[3] Alternatives include the use of supraglottic jet ventilation and the use of noninvasive ventilation (NIV) by facemask. Compliance may be an issue with tight-fitting masks and the need for disconnection during the procedure.[4]

High-flow nasal cannula (HFNC) is a device which can provide a continuous flow of humidified gas between 20 and 60 L/min and the fraction of inspired oxygen (FiO_2) can be adjusted between 0.21 and 1.0. It consists of a blender to mix air and oxygen in the appropriate ratio and an active humidifier connected to a water source. The high flow prevents dilution of inspired oxygen in patients with high respiratory drive as it exceeds the maximal inspiratory flow of the patient. The high continuous flow creates a positive end-expiratory pressure (PEEP) of upto 4 cm of H_2O in the pharyngeal space which keeps the airway open, prevents its collapse, and promotes washout of CO_2 from the dead space.[5] These effects in combination with active humidification prevent drying of the airways and helps in better secretion clearance. High-flow nasal cannula has been used initially as a respiratory support in pediatric patients with bronchiolitis and other causes of respiratory failure in neonates as an alternative to continuous positive airway pressure (CPAP) or as a weaning strategy from invasive ventilation or CPAP.[5] In adults, it has been used in the operating room settings as an aid to preintubation oxygenation, apneic oxygenation during airway procedures, and in the ICU setting, it has been used in patients with hypoxic respiratory failure with high respiratory drive, postextubation respiratory support, mild-to-moderate hypercapneic respiratory failure as an alternative to NIV where it has shown to be non-inferior to NIV.[6–9] Additionally, in patients with obstructive sleep apnea intolerant to CPAP, HFNC may be used as an alternative treatment.[10] A meta-analysis in patients with acute decompensated heart failure with hypoxia showed that HFNC reduced the intubation rate compared with conventional oxygen therapy. The meta-analysis also did not show a significant difference between HFNC and NIV use in these patients in relation to intubation, dyspnea scores, or arterial blood gas parameters.[11] High-flow nasal cannula has also been used as a respiratory support in patients with dyspnea due to terminal cancer at the end of life.[12]

Studies on the use of HFNC in patients undergoing GI endoscopy have been previously published showing decreased incidence of hypoxic episodes in HFNC as compared with conventional oxygen therapy.[13,14]

Mohamed and Selima[15] in this issue, published a prospective randomized controlled trial comparing HFNC and conventional oxygen therapy in patients undergoing prolonged diagnostic and/or therapeutic GI endoscopy for a time period of 15 minutes or more in the ICU setting. Patients in the conventional oxygen therapy had a significantly higher incidence and severity of hypoxia as compared to the HFNC group. The present study seems unique as compared to the previous studies that used FiO_2 of 1.0 and flows of 60 L/min in the HFNC group and 15L/min in the conventional oxygen

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therapy group, however, the current study has used a lower and almost similar FiO_2 in both the groups (HFNC group: $FiO_{2;}$ 0.4 and in conventional oxygen group: Oxygen flow 5 L/min through nasal canula). In this way, the current study has better matched both the groups. This has possibly allowed a better comparison of the oxygen therapy through both the devices and given more clarity about the role of HFNC (due to higher gas flow and better alveolar delivery of oxygen) in avoiding hypoxia in GI endoscopy as compared to conventional oxygen therapy through the nasal canula. The lower FiO_2 as compared to the previous studies may also help in avoiding the consequences of hyperoxia, although it was not monitored during this or any other previous study.[16,17]

Given the amount of evidence in favor of HFNC, it should be made the standard of care for the procedures requiring the manipulation of the upper airway (endoscopy and bronchoscopy) done under sedation in the ICU. The cost of the equipment may be an impediment to its widespread use, but given the advantages shown most recently in the current article, the benefits of patient safety would tilt the balance in its favor especially in patients with high risk of hypoxemia during the procedure.[15]

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