Effective Use of High Flow Nasal Cannula in A High-Risk Endoscopic Procedure: A Case Report

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ABSTRACT

Tracheoesophageal fistula (TEF) is an uncommon and potentially fatal condition caused by an abnormal linking between the oesophagus and the trachea or bronchus. TEF is a relatively rare complication of esophagectomy with a reported incidence of 0.3%. Patients with TEF are at risk of malnutrition and infections. Oesophageal stenting is the standard approach in treating TEF, but it can be challenging for these patients, as they are prone to developing hypoxic events. The high-flow nasal cannula (HFNC) is a new technique for managing challenging airways, which delivers up to 70 L/min of airflow with FiO_2 from 21% to 100%. This technique proficiently warms and moistens the ambient air to match the body temperature (37℃) using a wide-calibre soft nasal catheter. A case is presented involving a patient with TEF who underwent successful oesophageal stenting, under monitored anaesthesia care, and was managed on HFNC. HFNC can be a valuable choice for endoscopic procedures conducted under monitored anaesthesia care.

Key Words: *Anaesthesia, Airway management, endoscopy, Hypoxia, Non-invasive ventilation, Nasal cannula*.

How to cite this article: Asghar MA, Rizvi SMH, Salim B. Effective Use of High Flow Nasal Cannula in A High-Risk Endoscopic Procedure: A Case Report. *JCPSP Case Rep* 2024; **2** : 65-67.

INTRODUCTION

Tracheoesophageal fistula (TEF) is an abnormal linking between the oesophagus and either the trachea, bronchus, or the lung. These fistulas typically develop because of factors, such as radiotherapy or chemotherapy.[1] TEF after oesophagectomy is a life-threatening complication.[2] The majority of TEF cases are considered inoperable and stenting is the only option.[3] The upper gastrointestinal endoscopic procedures are usually performed under anaesthesia as the patients are more prone to developing hypoxic events. A high-flow nasal cannula (HFNC) can be a preferred method for enhancing gas exchange during endoscopic procedures.[4] A case is presented involving a patient with TEF, who underwent oesophageal stenting under sedation managed on HFNC.

CASE REPORT

A 55-year female, with a known case of oesophageal squamous cell carcinoma status post-two-stage oesophagectomy, presented to the pulmonology clinic with a chronic cough for the past 2 months. Computed Tomography (CT) scan of the chest showed abnormal communication between the gastric conduit and right upper lobe at the level of T5 vertebra resulting in the right upper lobe collapse with fibrocystic changes.

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Received: October 03, 2023; Revised: January 11, 2024; Accepted: January 20, 2024
DOI: https://doi.org/10.29271/jcpspcr.2024.65

The patient was referred to a gastroenterologist. Oesophageal stenting was planned and attempted under conscious sedation but was unsuccessful as the patient aspirated during the procedure and her saturation went down to 40%; so, the case was abandoned.

The case was rescheduled after two days under cover of anaesthesia. She was moved to the operating room for gastroscopy and oesophageal stent placement. Her vitals on arrival were BP, 119/63 mmHg, HR; 89 bpm; SPO_2, 88% at room air; and RR, 26/min. She was conscious and oriented. Standard American Society of Anaesthesiologists (ASA) monitoring was applied. HFNC was applied to the patient after turning her to the lateral position. Oxygen flows were set to 50 L along with 50% FiO_2. She was sedated appropriately with an intact airway with propofol infusion, titrated between 100-200 µg/kg/min.

She successfully underwent oesophageal stenting with a metallic stent, at the site of the fistula. The whole procedure lasted for about 20 minutes. She tolerated the HFNC well and remained haemodynamically stable throughout the procedure without any anaesthetic or procedural complications. The propofol infusion was stopped and the patient was awakened. She was then shifted to the recovery room on HFNC with the same setting. No immediate or delayed complications were observed. She was discharged after 2 days.

DISCUSSION

TEF is a relatively rare complication of oesophagectomy with a reported incidence of 0.3%.[5] Postoperative mortality is significantly increased and the quality of life after surgery is greatly reduced due to pneumonia and respiratory failure associated

with TEF.[5] It also increases the difficulty of anaesthesia management, especially in airway management.

Recently, a steady increase has been observed in the number of endoscopy procedures performed yearly. A significant proportion (>50%) of these procedures now involve sedation, with anaesthesia services playing a crucial role. The objective of employing sedation during endoscopy is to alleviate patient discomfort and anxiety, enhance the overall quality of the examination, and minimise the patient's recollection of the endoscopy experience.[6]

Hypoxemia is the most common side effect of procedural sedation. It has been reported to be around 11-50% during sedated endoscopies. In the present case, it was worse due to TEF. While mortality associated with sedation during endoscopy is typically uncommon, the systemic impact of hypoxemia is significant. Even a brief period of hypoxemia resulting in a SpO_2 level below 90% is associated with prolonged hospital stays, increased admissions to intensive care units (ICUs), and elevated costs.[7]

For the acute and chronic treatment of hypoxemia, there are multiple approaches available for administering oxygen therapy, such as a nasal cannula or face mask. Despite delivering up to 15 L of oxygen per minute, traditional cannulas or face masks have limitations as higher flows often lead to patient discomfort due to inadequate humidification.[4]

Non-invasive ventilation (NIV) may improve outcomes in patients with respiratory failure.[8] However, NIV might be poorly tolerated and is linked to challenges in synchronising breathing, feelings of claustrophobia, stomach distension, and mask-related side effects, such as sores and skin lesions on the bridge of the nose.[9]

The HFNC is a device that delivers oxygen at high-flow rates through a cannula that fits into the nostrils without blockage. This technique proficiently warms and moistens the ambient air to match body temperature (37°C) and achieves 100% relative humidity using a wide-calibre soft nasal catheter. It can deliver up to 70 L/min of airflow with FiO_2 from 21% to 100%. The HFNC is commonly used in ICUs for oxygenation.[10]

In the context of endoscopic procedures, an HFNC can be a valuable tool in managing patients with hypoxemic respiratory failure. In their retrospective study, Chung *et al*. proposed that the HFNC with a 40-60 L/min flow rate is clinically effective for hypoxemic patients undergoing diagnostic and interventional bronchoscopy procedures.[11] Zhang, *et al*. also found that HFNC is more effective than standard nasal cannula in preventing hypoxemia and avoids airway interventions during sedated endoscopy.[7]

Nonetheless, the use of HFNC is not without drawbacks, including potential issues such as nasal pain, irritation of the nasal mucosa, and nosebleeds (epistaxis). Additionally, HFNC can cause gastric distension, which may worsen respiratory function. However, in our specific case, no such adverse events were observed.

A high-flow nasal cannula is a valuable option for endoscopic procedures done under monitored anaesthesia care. It has been proven to be beneficial in various situations, including managing difficult airways, during post-extubation and pre-intubation periods in operating rooms, and ICUs. The use of HFNC can be especially helpful in managing patients with hypoxemic respiratory failure during the perioperative period.

PATIENT'S CONSENT:
Informed consent was taken from the patient for publishing the case report.

COMPETING INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
MAA: Concept, literature search, and preparation of manuscript.
SMHR: Case details, case summary.
BS: Critical review, editing, and discussion writing.
All authors approved the final version of the manuscript to be published.

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