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Case Series

LMA Gastro™ Airway Adds to the Safety Net for High Risk Upper Gastrointestinal Interventional Endoscopic Procedures

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Abstract

Background: Endoscopic gastroenterology procedures are day care procedures done under monitored anaesthesia care, with or without airway control. Need for sharing upper airway while performing endoscopic procedure and continuing with assisted respiration has always been felt. Supraglottic airway devices allow assisted ventilation and also avoid hemodynamic swings and paralysis associated with tracheal intubation. The Gastro™ is a new supraglottic airway device developed specifically for gastrointestinal endoscopy and interventions.

Methods: Complex gastrointestinal (GI) endoscopic procedures like endoscopic retrograde cholangiopancreatography (ERCP) require deep sedation or general anesthesia. Depth of sedation being a continuum is especially not risk free with GI endoscopic procedures on account of shared access to upper airway. Very often comorbidities with the poor physiological conditions require securing of airway with an endotracheal tube (ETT) to prevent hypoxia and aspiration. Gastro™ a new supraglottic airway device with a separate dedicated channel for endoscope, was tried in our setup. Advanced endoscopic procedures were performed in twenty (20) high-risk patients with airway protection using LMA Gastro™ at our centre as a pilot study.

Results: LMA GastroTM was tested on various parameters such as ease of insertion, ease of carrying out procedure and for adverse events as oxygen desaturation, with encouraging results.

Conclusion: All case done with LMA GastroTM had encouraging results. We present a case series of 4 such patients, with various medical scenarios, where LMA Gastro proved to be a useful device with minimal or no adverse events.

Keywords: *Airway; Desaturation; Endoscopy; Endoscopic Retrograde Cholangiopancreatography (ERCP); Laryngeal Mask Airway; Ventilation*

Introduction

Nonoperating room anesthesia (NORA) during gastroenterological procedures is a growing field in the practice of modern anesthesia [1,2]. Securing an airway for complex procedures with a gastroscope in situ under deep procedural sedation or general anaesthesia up untill now required tracheal intubation. With the improvement in health care standards and facilities the numbers of patients with severe comorbidities presenting for upper gastrointestinal endoscopic interventions are rising, and so is rise in the need for a less invasive yet safe and easy to use airway device which also allows for easy access to the endoscopist. Need for same day discharge after intervention for financial and logistics constrains is also rising and warrants use of an anaesthesia plan that allows for a short post procedure recovery time.

The requirement becomes more relevant as these complex procedures require sedation or General Anaesthesia due to the fact that most of these patients are high-risk, frail and old, with poor nutrition and hydration, obstructive jaundice, deranged liver functions, poor American Society of Anesthesiologists (ASA) physical status and depressed airway reflexes. These patients have increased risk of aspiration and hypoxia which can occur with deep sedation especially with an unprotected airway and depressed tone of the pharyngeal muscles. These factors necessitate the use of general anesthesia with endotracheal intubation or supraglottic airway for gastric procedures ERCP or PEG insertion for Cancer patients.

Procedural Sedation during esophagogastroduodenoscopy (EGD) is not risk-free. Level of sedation is a continuum and can ocassionally attain unprecedented depth potentially risking the airway with respiratory compromise [3]. Moderate sedation is associated with pain and highfailure rates, [4] whereas patients undergoing ERCP with deep sedation require the same level of care as those under general anesthesia (GA) [5]. Endotracheal intubation requires the use of neuromuscular blocking drugs which is associated inherent problems compared with the supraglottic airway and thus prolongs the recovery. Hence, it is prudent to choose an airway device that prevents hypoxia-induced cardiorespiratory complications.

Airway device

Dual-channel laryngeal masks also called as "second-generation" supraglottic airway devices (2nd SAD), are characterised by the additional presence of an accessory tube for gastric drainage. After multiple modifications, M. Skinner made a refined device in advanced airway management for aiding upper gastrointestinal endoscopy (i.e. the LMA® Gastro™ Airway1) [6,7].

This silicone-based cuffed LMA -LMA® Gastro TM Airway (Teleflex Medical, Ireland) is a cuffed peri-laryngeal supra-glottic airway (SGA) with an endoscopic channel, which suits all standard endoscopes up to a width of 16mm in diameter [8]. Its design features include a channel for esophageal endoscopic access, a separate channel with a terminal cuff for lung ventilation, and an integrated bite block and cuff pressure indicator. Based on the weight of the patient, it is available in three sizes: #3 (30 - 50 kg), #4 (50 - 70 kg), and #5 (70 - 100 kg). If we place the mask correctly the endoscope is automatically guided directly towards the upper oesophageal entrance and thus the airway is left unobstructed. Its unique design allows for easy insertion of the endoscope without maneuvering around the cuff of the traditional LMA, and an easy way to assist ventilation, if the need arises, without altering the ventilatory parameters, especially peak airway pressures.

The separate channel for endoscope also allows for easy gliding motion of the endoscope and thus provide excellent working conditions for the endoscopist allowing for easy rotation and manipulation of the endoscope (Figure 1).

Figure 1: *LMA Gastro™ (Courtesy: Product catalogue).*

We carried a pilot study by doing advanced endoscopic procedures in twenty (20) high-risk patients with airway protection being carried by LMA Gastro™. We tested the device on various parameters such as ease of insertion, ease of carrying out the procedure, and adverse events as Desaturation. We present a case series of 04 such cases of complex endoscopic procedures in patients with poor performance status, multiple co-morbidities and difficult airways (MP class III and IV with mouth opening <3 fingers), where LMA Gastro proved to be a useful device on all of the above parameters for such patients with minimal or nil adverse events.

Cases

All the patients provided written informed consent for participation in this study. In all the cases, a suitably sized LMA® Gastro™ was inserted after the standard routine general anesthesia protocol, and GA was maintained using intravenous anaesthetic agents. The patient were premedicated with an antisialagogue (Inj Glycopyrrollate), antiemetic (Inj Ondasetron), analgesic opioid (Inj Fentanyl) in standard dosage as per the body weight. Patient was induced with total Intravenous anaesthesia (TIVA) using Inj Ketamine @ 1 mg/Kg body weight and Inj Dexometamidine infusion @.

Patient were kept on spontaneous ventilation with 6 ltr/min Oxygen support. The following parameters were noted:

- Ease of Insertion: Time taken and ease of comfort while placing the airway device (LMA Gastro) after giving the intravenous anaesthetic agent to the patient.
- Hemodynamic parameters: Blood pressure and Heat rate, initially at the start of procedure and then every 3 minutes during the procedure.
- Desaturation: Monitoring of SpO_2 and taking note of fall of SpO_2 < 94%.
- Duration of procedure.

Case 1

45 years old male, (height, 175 cm; weight, 60 kg; body mass index, 19.6 kg/m^2) with a history of hypertension and recurrent esophageal cancer with previous esophagogastrectomy, a case of carcinoma oral cavity (Left) being planned for radical Hemi-mandibulectomy was planned for PEG insertion for maintaining enteral nutrition post-surgery (Figure 2).

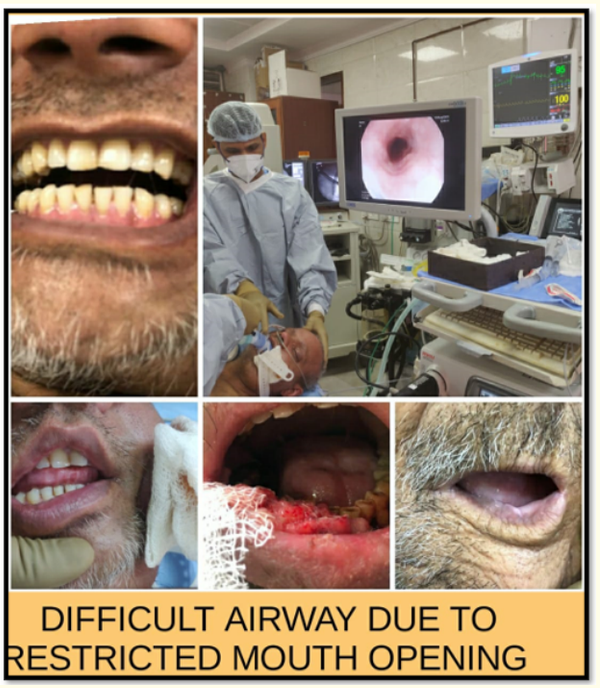

Figure 2: *LMA Gastro™ being used in various patients with difficult mouth opening and complex co morbidities. The haemodynamics remain stable.*

However, mouth opening was 2 finger breadth due to the growth and thus planned for nasal endoscope guided PEG insertion, which would have been quite uncomfortable, both for the patient as well as the endoscopist. However, LMA Gastro™ size #4 was inserted successfully in the first attempt after induction (Figure 1). Subsequently the cuff was inflated with air until the integrated cuff pressure indicator was at the green level, which corresponded to a pressure of 60 cmH_2O on the manometer. SGA positioning was satisfactory. The LMA cuff fit well around the glottis. The oropharyngeal leak pressure (OPLP) was 38 cmH2O. A standard 12-mm EGD scope was inserted through the LMA's endoscopic channel, and the endoscope could be used along with the advantage of airway protection in this particularly difficult airway. The entire procedure was completed in 30 minutes.

Case 2

51 years old female with hilar cholangiocarcinoma with proximally migrated CBD stent was planned for cholangioscopic retrieval of the CBD stent. LMA Gastro™ was used and ERCP scope was introduced through the endoscope channel. The procedure was complex requiring use of Cholangioscope. Multiple attempts were needed for stent removal. Procedure lasted for two hours and could be done safely without compromising airway and patient comfort and with much ease due to use of Gastro™. Post procedure recovery was swift and uneventful.

Case 3

64 years old male with Choledocholithiasis with obstructive jaundice was planned for ERCP with CBD clearance. Patient had multiple co-morbidities in form of T2DM, Hypertension and CAD-Post PCI.

Smooth conduct of procedure was warranted and so was short hospital stay. Airway was secured using LMA Gastro™ under propofol sedation. Endoscopic CBD clearance was uneventful without unintended hemodynamic changes. Recovery from the anaesthesia was smooth and patient could be discharged to home same day evening after mandatory observation period.

Case 4

57 years old female a case of Cerebrovascular Accident with left hemiparesis and GCS of $E2V_{aphasic}$ M4 was planned for PEG insertion. She was malnourished with a weight of just about 40 kg. There was a high risk of aspiration due to an underlying neurological condition. LMA Gastro™ was inserted. The procedure and post-procedure period went off well with no complications.

Discussion

In this case series, we demonstrated the feasibility of the LMA Gastro™ airway as a valuable tool for advanced gastrointestinal endoscopic interventions under anesthesia in high-risk patients. The LMA Gastro™ has an integrated (inbuilt) bite block, wide endoscope channel and an adjustable holder which allows a well-lubricated endoscope easily into the esophageal lumen.

Endoscopic access through the SAD helps in prevention of complications otherwise associated with deep sedation, such as loss of airway reflexes with hypoventilation, hypoxemia, and risk of pulmonary aspiration, while avoiding hemodynamic swings and paralysis associated with tracheal intubation. Moreover, LMA® Gastro™ can also serve as a useful rescue device when the patient's airway needs to be secured during EGD in the lateral position compared to tracheal intubation, which can be challenging in such a position.

Patients who have previously showed poor tolerance to endoscopy under conscious sedation and who subsequently need to undergo prolonged and repeated procedures and patients with multiple comorbidities and need for stable hemodynamics may be of particular benefit from the use of the LMA Gastro™.

Total no of patients(n) = 20			
Ease of Device Placement	Very easy (12)	Easy (8)	Difficult (Nil)
Comfort of procedure	Easy (4)	Comfortable (15)	Difficult (1)
Desaturation	Nil		
Haemodynamic Stability	Stable (15)	Tachycardia (5)	Hypertension (2)
Duration of Procedure	ERCP (90 min)	PEG Insertion (25 +- 5min)	
Recovery	> 15 min (5)	< 15min (15)	

Table 1: *Performance of LMA gastro on various patient parameters.*

Conclusion

Endoscopic access inbuilt into the LMA can help prevent various complications associated with sedation, such as hypoventilation, hypoxemia, loss of airway, and pulmonary aspiration while also preventing the occurrence of hemodynamic swings and paralysis which is associated with the standard procedure of tracheal intubation. This becomes specially important in those where sedation is more challenging and potentially harmful because of pre-existing medical comorbidities, such as morbid obesity or severe obstructive sleep apnoea. It hastens post procedure recovery by shortening the extubation and recovery time as compared with tracheal intubation. Moreover, LMA® Gastro™ serves as a useful rescue device during EGD, when the patient is in the lateral position, thereby providing an airway that is less invasive than a tracheal tube but more secure than an oropharyngeal airway. In conclusion, we report our experiences with the new LMA® Gastro™ Airway in upper GI endoscopy as most satisfying both for the patient as well as the care giver in various clinical settings, such as emergencies and high-risk patients.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

PK Singh**-** Writing-original draft; Anurag Garg- Writing-review and editing; Ajai Chandra, Rahul Jain- Supervision; review and editing.

Ethics

It is declared that all procedures were conducted in accordance with the Helsinki Declaration-2013.

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