LMA gastro for gastro-intestinal endoscopic procedures: Pearls, pitfalls, and troubleshoots of its usage

INTRODUCTION

Complex upper gastro-intestinal endoscopy (UGIE) procedures take a long time and are challenging because of a high-risk patient profile, a non-supine position, a non-operating room set-up with space restrictions, and airway sharing-related issues. Deep sedation levels that are usually administered can often lead to hypo-ventilation, airway obstruction, and hypoxia. The largest portion of out-of-operating room malpractice claims involving anaesthesiologists is because of UGIE procedures.

General anaesthesia (GA) has been shown to have a better safety profile during endoscopic retrograde cholangiopancreatography (ERCP) compared to sedation, with shorter procedure times, lower perforation rates, and a lower risk of coughing. Endotracheal intubation has its own set of drawbacks including the requirement of muscle relaxation and GA, greater haemodynamic alterations, and a prolonged recovery time.

Conventional second-generation supraglottic devices (SGDs) provide a secure airway and can be tolerated in moderate-deep sedation but are not suitable for use during ERCP because of their smaller size gastric port. The laryngeal mask airway (LMA) Gastro™CuffPilot™ Airway (LGA; Teleflex® Medical, Athlone, Ireland) is a second-generation magnetic resonance imaging (MRI)-safe SGD explicitly designed by Skinner in 2017 to control the patient’s airway while facilitating endoscopies via the integrated endoscopy channel. In our experience, endoscopists many-a-times face difficulty in navigating the endoscope through the conduit and across the various body curves during the procedure.

Our objective in this communication is to delve into the description of the LGA, provide some pearls related to its clinical use, and discuss some of the common problems and counter-measures based on our experience.

Description of the device

The design features of the LGA include a channel for oesophageal intubation and a separate channel with a terminal cuff for lung ventilation (Figure 1a and b). The device has an adjustable holder and a strap to secure it (Figure 1c). The LGA has a large endoscope channel with a 16 mm diameter allowing for the free passage of endoscopes with a maximum diameter of 14 mm (Figure 1d), sufficient for all standard endoscopes (11.3 to 13.7 mm). Nevertheless, an endotracheal tube (ETT) may still be preferred in some conditions such as a full stomach, restricted mouth opening, an emergency procedure, and poor lung compliance.

It comes in three sizes: #3 (30–50 kg), #4 (50–70 kg), and #5 (70–100 kg). It has a standard 15 mm connector, Luer-cone type inflation valve (Figure 1a). The minimum inter-incisor distance required for device insertion is 24 mm (size 3) and 28 mm (sizes 4, 5) (Figure 1a).

The device has an integrated bite block that reduces the chances of damage to the endoscope because of

Figure 1: LMA Gastro with a cuff pressure indicator (a), side view with an integrated bite block (b), an adjustable holder (c), and LGA with an endoscope in situ (d); LMA securely fixed with strap in the supine position (e) with an adjustable holder padded with a gauze piece (f); LGA insertion in the prone position (g); endoscopy ongoing with LGA in situ (h) and proper placement of the LGA holder (i)
Cuff pilot technology enables continuous intra-cuff pressure monitoring, whereby the green zone indicates optimal pressure (40–60 cmH₂O), the yellow zone indicates 0–40, a clear zone between green and red (60–70), and the red zone indicates pressure >70 cmH₂O [Figure 1b]. The cuff pressure indicator line must not be beyond the green zone to reduce hyper-inflation-related adverse effects. It has a soft silicone cuff that has been shown to reduce the risk of sore throat and achieve higher seal pressures. The pre-curved design allows easy insertion in the supine, prone, or lateral positions for airway rescue. The device allows endoscopy under GA, thus allowing continuous end-tidal carbon dioxide monitoring, reducing movement, perforation, and bleeding. We have encountered a few instances where LGA could rescue the patient’s airway in the prone position and endoscopy could proceed once the patient stabilised.

Pre-use testing/preparation and insertion procedure
The cuff should be deflated completely, and adequate lubrication of the dorsal surface of the cuff and the interior of its endoscopy channel should be ensured. Silicon spray performs better than jelly in ensuring smooth endoscope movements in our experience.

LGA is generally inserted supine, and the patient is turned prone [Figure 1e and f]. However, prone LGA insertion [Figure 1g] has many advantages [Table 1]. An airway cart stocked with all rescue devices should be placed nearby. Adequate placement is suggested by parameters such as seal pressure, inspired and expired tidal volume difference, and square wave capnogram.

An adequate depth of anaesthesia should be ensured by checking for the ability to apply jaw thrust or trapezius squeeze test. In difficult insertion cases, slight diagonal tilting of the mask is successful. One should ensure that the mid-portion of the bite block is at the level of the incisors.

There should be no movement of endoscope controls while it is inserted, and excessive pressure should be avoided to prevent mucosal injury. Intra-cuff pressure may rise slightly on endoscope insertion, and one should be prepared to remove air from the cuff.

Pitfalls of LMA®Gastro™
The LGA has its own set of drawbacks. The narrow internal diameter of the airway lumen does not allow the passage of an adequate-sized tracheal tube. Many endoscopists find it difficult to negotiate the scope through its gastric channel and rotational movements required to navigate it through various curves inside the body. This could be because of insufficient endoscope lubrication, the mask seated too high/too low in the pharynx which may crimp the endoscope, incorrect placement in the laryngeal vestibule, an acutely flexed patient’s neck, and over-inflation of the cuff and bigger endoscopes such as endoscopic ultrasound. A majority of the cases can be troubleshooted by slight withdrawal and re-insertion or manoeuvres such as neck extension or jaw thrust.

Pearls for LMA®Gastro™ use based on our experience
Whenever ventilation difficulty is encountered, the LGA is seated too high, malpositioned, or folded. We have summarised some pearls for the successful use of the LGA based on our experience and existing literature [Table 1].

Reported experience and alternative indications for LMA®Gastro™
Recent studies (Terblanche et al. and Tran et al.) have shown a high success rate of LGA insertion and endoscopy completion with minimal adverse events. Schmutz et al. demonstrated the feasibility of LGA for complex and prolonged UGIE procedures (e.g., peroral endoscopic myotomies) in high-risk patients at a high risk of aspiration.

LGA was found to be invaluable in cases of failed prior endoscopy because of poor tolerance of sedation for the procedure. Saxena et al. successfully used the LGA for insertion of trans-oesophageal echo-cardiography probes. LGA can potentially be useful in combined bronchoscopy and gastroscopy procedures or for emergency airway management in patients with haematemesis as it allows simultaneous diagnostic endoscopy and haemorrhage control.

In the coronavirus disease 2019 era, prevention of aerosol exposure was an important concern, and securing the airway using the LGA along with a viral filter was suggested as a useful alternative for UGIE procedures under GA. The advantage of the LGA in this situation is that it provides a near-complete seal of the oropharynx and reduces the need for intra-procedural airway manipulations.

Future perspectives
Some design modifications can potentially resolve the procedural difficulty encountered by endoscopists. One of the suggestions is to widen the endoscopy...
Table 1: Pearls for LMA Gastro™ CuffPilot™ Airway use

| Pearls for LGA use                                      | Explanation/Remarks                                                                 |
|--------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1. Endoscopists should get trained in endoscopy through LGA by practising on mannequins which are purpose-made for endoscopy, and product information should be provided. Endoscope navigation skills on patients should initially be gained in routine diagnostic procedures during the learning curve of endoscopists. | Simulation-based training will help the operators to get acquainted with the device prior to its clinical use. Smaller bored routine diagnostic endoscopes allow more manoeuvrability through LGA and would help to accustom endoscopists to its use in simpler procedures before embarking upon complex interventional endoscopy procedures. |
| 2. Prone insertion of LGA is more convenient and saves the endoscopy suite time [Figure 1g]. However, patients should be carefully selected, and it is prudent to exclude predicted difficult airway cases. Staff should be trained in swiftly removing the scope and turning the patient from prone to supine in the case of any sudden intra-operative loss of airway. | Inserting the LMA on the trolley and then turning the patient prone onto the fluoroscopy table is very difficult because of space constraints in the endoscopy suite [Figure 1e and 1f]. Vigilance and preparation are mandatory for difficult mask ventilation. An airway cart stocked with all rescue devices should be placed nearby. The nasopharyngeal airway and oropharyngeal airway should be kept ready to be able to provide mask ventilation in the prone position in an emergency. The LMA fixation tab (adjustable holder) is a rigid plastic tab that projects out very close to the lips and can injure the lips during a prolonged procedure. Lubricating jelly should be liberally smeared inside the lumen of the gastric port and applied to the endoscope shaft before insertion and re-applied every time the shaft is taken out and re-inserted. |
| 3. Fixation tab needs to be padded with a gauze piece [Figure 1f and 1l]. | Inadvertent patient movement can increase the risk of visceral injuries, and instrumentation under lighter planes can increase the chances of bronchospasm and laryngospasm. Lower cuff pressure helps in easier negotiation of the endoscope as the endoscopy channel lies on the dorsal aspect of the cuff and would be compressed by the inflated cuff. |
| 4. Lubrication of the port is very crucial to facilitating the smooth insertion of the endoscope. Instead of lignocaine jelly, a silicon spray or non-anaesthetic water-soluble jelly may be used as it is difficult to account for the amount used. | Excessive pressure during endoscopy insertion can lead to trauma, damage to endoscope fibres, and dislodgement of LMA. |
| 5. BIS or any depth of anaesthesia monitor must be used especially when total intravenous anaesthesia is used without a muscle relaxant. | If the endoscopist conveys procedural difficulty, it is better to refrain from inserting an LMA and switching over to either ETT or sedation as necessary. |
| 6. The cuff pressure should be kept to the lowest possible which provides a good seal, which mostly approaches the yellow portion of the cuff pressure indicator in our experience. | Consider insertion of one size smaller LMA if the patient’s weight lies at the borderline of the weight criteria. |
| 7. A catheter mount should be used to fix the circuit to the LMA [Figure 1h]. | The device should be secured well in place, and the patient’s head should be held steady by an assistant during the procedure. |
| 8. An adjustable holder should preferably be attached after LMA insertion to the appropriate most proximal groove as its best position would be just outside the lip, but not too far away from the teeth for optimal fixation. | Head extension manoeuvre or application of jaw thrust and positive end-expiratory pressure may help in select cases. |
| 9. The designated endoscope should be passed beforehand through the channel to check its free movement, and the channel should be thoroughly lubricated. | |
| 10. If the endoscopist anticipates a difficult procedure, restrictions to the endoscope movements imposed by the LMA can further increase procedural difficulty. | |
| 11. The use of a larger-size LMA can lead to the folding of cuff walls medially and difficulty in ventilation. | |
| 12. Inadequate ventilation through LGA following an initial successful placement can be because of displacement or migration of LGA during the procedure because of repeated endoscope manipulation. | |

LMA=Laryngeal mask airway, LGA=LMA Gastro™ airway, BIS=Bispectral index, ETT=endotracheal tube

CONCLUSION

The LGA has recently gained huge favour, but in our experience, endoscopists face trouble during endoscopy insertion and the rotational movements at the time of intervention. Thorough lubrication of the shaft and some manoeuvres can help troubleshoot the procedural difficulty, and we believe that the potential patient safety benefits reaped are likely to counterfeitr the few limitations observed. Future design modifications and robust literature studies supporting
its use will go a long way in the wider adoption of this device.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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Submitted: 19-May-2022
Revised: 11-Sep-2022
Accepted: 14-Sep-2022
Published: 12-Oct-2022

REFERENCES

1. Leslie K, Allen ML, Hessian EC, Peyton PJ, Kasza J, Courtney A, et al. Safety of sedation for gastrointestinal endoscopy in a group of university-affiliated hospitals: A prospective cohort study. Br J Anaesth 2017;118:90-9.
2. Stone AB, Brovman EY, Greenberg P, Urman RD. A medicolegal analysis of malpractice claims involving anesthesiologists in the gastrointestinal endoscopy suite (2007-2016). J Clin Anesth 2018;48:15-20.
3. Smith ZL, Mullady DK, Lang GD, Das KK, Hovis RM, Patel RS, et al. A randomized controlled trial evaluating general endotracheal anesthesia versus monitored anesthesia care and the incidence of sedation-related adverse events during ERCP in high-risk patients. Gastrointest Endosc 2019;89:855-62.
4. Terblanche N, Middleton C, Choi-Lundberg D, Skinner MW. Efficacy of a new dual channel laryngeal mask airway, the LMA® Gastro™ Airway, for upper gastrointestinal endoscopy: A prospective observational study. Br J Anaesth 2018;120:353-60.
5. Schmutz A, Loeffler T, Schmidt A, Goebel U. LMA Gastro™ airway is feasible during upper gastrointestinal interventional endoscopic procedures in high-risk patients: A single-center observational study. BMC Anesthesiol 2020;20:1-7.
6. LMA® Gastro™ Airway with Cuff Pilot™ Technology: Instructions for Use. 2016. Available from: https://www.lmaco-ifu.com/sites/default/files/node/4283/ifu/revision/7560/pbf2100000b.pdf. [Last accessed on 2022 Feb 21].
7. Teleflex Incorporated. LMA airway portfolio [Brochure], 2018. Available from: https://www.teleflex.com/usa/en/product-areas/anesthesia/airway-management/lma-airways/product-literature/LMA_Portfolio-Brochure_MC-003980.pdf. [Last accessed on 2022 Feb 12].
8. Gupta A, Gupta N. Comment on: A bench test of a modified gastro LMA for the insertion of the duodenoscope. Indian J Anaesth 2022;66:546.
9. Tran A, Thiruvenkatarajan V, Wahba M, Currie J, Rajbhoj A, van Wijk R, et al. LMA® Gastro™ Airway for endoscopic retrograde cholangiopancreatoscopy: A retrospective observational analysis. BMC Anesthesiol 2020;20:113.
10. Church NJ, Seward EW, Pereira SP, Hatfield AR, Webster GJ. Success of repeat ERCP following initial therapeutic failure. Gastrointest Endosc 2006;63:AB293.
11. Saxena S, Aminian A, Nahrwold DA, Daper A. LMA gastro airway seen through the eyes of a cardiac anesthesiologist. J Cardiothorac Vasc Anesth 2019;33:2365-6.
12. Thiruvenkatarajan V, Lorenzetti M, Chung A, Wong CK, Currie J, Wahba M, et al. Airway management considerations for upper gastrointestinal endoscopic procedures in COVID-19 Era. Dig Dis Sci 2020:65:2739-42.

How to cite this article: Gupta A, Parida R, Subramaniam R, Kumar KR. LMA gastro for gastro-intestinal endoscopic procedures: Pearls, pitfalls, and troubleshootings of its usage. Indian J Anaesth 2022;66:S333-6.