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Comparison of Lary Seal Clear and Ambu Aura40 Supraglottic Airway Devices in Airway Management

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Abstract:

Supraglottic airway devices are widely used in modern anesthesia as effective alternatives to endotracheal intubation for routine airway management. Among these devices, the LarySeal Clear and Ambu Aura40 represent two commonly used laryngeal mask airway designs with different material properties, reusability profiles, and clinical features. The LarySeal Clear is a single-use transparent PVC device designed to reduce cross-contamination and allow visual monitoring of secretions, while the Ambu Aura40 is a reusable silicone-based device with an anatomically curved airway tube and reinforced tip to facilitate insertion and positioning. Both devices provide effective ventilation; however, they differ in cost, flexibility, sterilization requirements, patient comfort, and potential airway trauma. This mini-review aims to summarize the design characteristics, insertion techniques, advantages, limitations, and clinical applications of LarySeal Clear and Ambu Aura40 laryngeal mask airways in anesthesia practice.

Keywords: Airway management; Ambu Aura40; General anesthesia; Laryngeal mask airway; Laryseal Clear; Supraglottic airway devices.

Introduction:

Supraglottic airway devices (SADs) are essential tools in airway management, offering a simple and effective alternative to endotracheal tubes.

By 1997, disposable polyvinyl chloride (PVC) LMAs ,such as laryseal clear, became available offering a cost-effective and infection control friendly alternative to reusable silicone LMAs. Despite these advantages, PVC LMAs have certain disadvantages. Silicone is softer, more pliable, and better conforms to the airway, which may reduce postoperative sore throat and mucosal trauma. By contrast, PVC is more rigid, potentially increasing insertion-related trauma, although it significantly reduces per-use cost and eliminates sterilization overhead. Furthermore, silicone LMAs, while more expensive initially, can be reused for multiple cases if sterilized appropriately, potentially reducing overall long-term costs **(1).**

Thus, the transition from silicone to PVC LMAs reflects an ongoing balance between safety**,** cost, material properties, and patient comfort, laying the foundation for modern device innovations such as the LarySeal Clear (PVC-based disposable) and the Ambu Aura40 (reusable silicone-based).

The Ambu Aura40 is a newer addition to the SAD family. It builds on earlier versions of the Ambu Laryngeal Mask (LMA), first introduced in 2004, and is designed to improve both ease of use and patient safety. The Ambu Aura40 is a cuffed device with a preformed 90º angle curve that aligns with the natural anatomical curve of the oropharyngeal cavity. This feature ensures that the patient's head remains in a natural position, reducing stress on the

upper jaw during its use. Its anatomical curve and reinforced tip contribute to faster, easier, and more accurate placement, making it adaptable for a variety of head positions **(2).**

LarySeal™ Laryngeal Mask Airway

Over the decades, modifications and innovations have led to the emergence of various LMA models, each designed to improve safety, ventilation efficacy, and ease of insertion. One such advancement is the LarySeal™ range**,** manufactured by Flexicare Medical Ltd. (UK)**,** which incorporates design features aimed at enhancing performance, reducing trauma, and preventing cross-contamination **(3).**

Design and General Characteristics

The LarySeal™ LMA is a supraglottic airway device that provides an airway seal around the laryngeal inlet without the need for tracheal intubation. It consists of a curved airway tube connected to a soft, inflatable cuff designed to seat over the glottic opening. The transparent body of the LarySeal™ Clear variant allows clinicians to detect regurgitated material, blood, or secretions easily **(4).** Its soft, anatomically curved cuff minimizes pharyngeal trauma and provides an adequate oropharyngeal seal for both spontaneous and controlled ventilation **(5).**

All LarySeal™ devices are equipped with a standard 15 mm connector, compatible with anesthesia breathing systems, and are available in sizes 1–5 for use in neonates, pediatric, and adult patients **(3).**

Table (1): Types of LarySeal™ Laryngeal Mask Airways

The LarySeal™ range encompasses several models to meet different clinical demands **(5)**:

Feature	**LarySeal Clear**	**LarySeal Blue**	**LarySeal Multiple**	**LarySeal Pro**
Device Generation	First-generation supraglottic airway device	First-generation	First-generation reusable	Second-generation supraglottic airway device
Material	Transparent medical-grade PVC	Blue medical-grade PVC	Medical-grade silicone	Medical-grade PVC
Transparency	Fully transparent tube allowing visualization of condensation, secretions, or regurgitation	Opaque blue tube	Semi-transparent silicone	Usually opaque
Reuse	Single-use	Single-use	Reusable after sterilization	Single-use
Gastric Access	No gastric drainage channel	No gastric drainage channel	No gastric drainage channel	**Yes – integrated suction/drainage channel**
Intubation Through Device	Not designed for intubation	Not designed for intubation	Limited	**Yes – acts as a conduit for endotracheal intubation**

Special Design Features	Clear tube for visual monitoring	Color-coded tube for easy identification	Durable silicone design	Epiglottic flap and guide system facilitating ETT placement
Aspiration Protection	Basic airway seal	Basic airway seal	Basic airway seal	Improved protection due to gastric drainage port
Clinical Use	Routine anesthesia airway management	Routine airway management	Repeated clinical use where sterilization is available	Difficult airway rescue, routine anesthesia, or conduit for intubation
Sizes Available	Neonatal, pediatric, and adult sizes (1–5)	Similar size range	Similar size range	Sizes approximately 1.5–5 (depending on manufacturer specifications)
Main Advantage	Allows visualization of airway secretions and condensation	Easy identification and economical	Cost-effective for repeated use	Higher airway seal pressure and ability for gastric suction and intubation

The LarySeal Clear

The LarySeal Clear **(figure 1)** is a single-use PVC (polyvinyl chloride) LMA with a cuff that is matt-textured to mimic silicone feel and reduce trauma during insertion. It's advantage that it's eliminates the need for sterilization and re-processing; reduces cross-contamination risk. Compared to silicone devices, PVC tends to be less flexible and may exert greater localized pressure on mucosal surfaces; being single-use, the environmental footprint is greater; also lacks gastric drainage in many simple LMA designs **(6).**

Figure (1): LarySeal Clear LMA **(7)**

Techniques of Insertion

Insertion of the LarySeal™ LMA generally follows the same principles as the classic LMA technique described by **Brain (8).**

The standard insertion steps include:

1. Adequate patient preoxygenation and induction of anesthesia.
2. Lubrication of the posterior cuff surface with a water-based gel.
3. Head positioned in the "sniffing" position.
4. The device is advanced along the hard palate and posterior pharyngeal wall until resistance is felt, indicating correct placement.
5. Inflation of the cuff with the manufacturer's recommended volume to achieve a seal around the laryngeal inlet.
6. Confirmation of adequate ventilation via capnography and chest movement **(5).**

Alternative methods, such as the 180-degree rotational technique**,** thumb insertion method, or laryngoscope-guided insertion, may be used in specific clinical situations or in patients with difficult airway anatomy **(9).**

Advantages and Clinical Applications

The LarySeal™ range offers multiple advantages over traditional airway devices:

- Single-use design (for most models) minimizes the risk of cross-contamination.
- Transparent body facilitates visual inspection.
- Soft cuff reduces mucosal injury and postoperative sore throat.
- Ease of insertion compared to endotracheal intubation.
- Effective seal for both spontaneous and controlled ventilation.
- Availability of gastric channel (in LarySeal™ Gastro) for aspiration prevention.

Clinical applications include use during general anesthesia**,** short surgical procedures**,** rescue airway management in failed intubation, and emergency airway maintenance in both hospital and prehospital settings **(10).**

Limitations

Despite their advantages, LarySeal™ LMAs share limitations inherent to supraglottic devices.

- They are not definitive airways and do not provide complete protection against aspiration in all circumstances.
- Their use may be contraindicated in patients with full stomachs, morbid obesity, or decreased pulmonary compliance **(10).**

The Ambu® Aura™ family

Among the most widely adopted SAD systems is the Ambu® Aura™ family, developed by Ambu A/S. The Ambu® Aura™ range encompasses several single-use and reusable laryngeal mask designs that aim to optimize anatomical fit, ease of insertion, and ventilatory performance. The devices are preformed with a natural airway curvature, facilitating smoother insertion and improved glottic alignment, while their soft cuff and transparent body enhance patient safety and clinical visibility **(10).**

The Ambu® Aura™ LMAs are primarily single-use to prevent cross-contamination, constructed from medical-grade polyvinyl chloride (PVC), and feature an anatomically preformed 70° curvature to match the human upper airway **(5)**. Some models, such as the Ambu® Aura40™, are reusable, fabricated from medical-grade silicone, and designed for multiple sterilization cycles.

Design and Features

The defining design principle of all Ambu® Aura™ devices is their anatomical curvature, which mirrors the oropharyngeal axis, enabling smoother insertion without the need for finger or introducer guidance. Each model features:

- A soft, inflatable cuff for an effective oropharyngeal seal.
- A smooth, rounded tip that minimizes mucosal trauma.
- A transparent airway tube that allows visualization of secretions or regurgitated material.
- A standard 15 mm connector compatible with anesthesia circuits.
- An integrated bite block that prevents lumen occlusion and protects against dental damage.

These design features aim to provide a secure airway with minimal insertion resistance and high seal pressure, allowing both spontaneous and controlled ventilation **(10).**

(Table 2): (10). Types of Ambu® Aura™ Laryngeal Mask Airways

The Ambu® Aura™ family comprises several distinct models tailored for specific clinical contexts.

Feature	**Ambu Aura40**	**Ambu AuraOnce**	**Ambu AuraStraight**	**Ambu Aura-i**	**Ambu AuraFlex**	**Ambu AuraGain**
Device Generation	First generation	First generation	First generation	First generation (intubating LMA)	First generation	Second generation
Material	Silicone	Medical-grade PVC	Medical-grade PVC	Medical-grade PVC	Medical-grade PVC	Medical-grade PVC
Transparency	Transparent silicone	Transparent PVC	Transparent PVC/silicone	Transparent phthalate-free material	Transparent phthalate-free PVC	Transparent phthalate-free material
Reuse	Reusable	Single-use	Single-use	Single-use	Single-use	Single-use
Gastric Drain Channel	No	No	No	No	No	Yes
Intubation Through Device	Limited	Limited	Limited	Yes – designed as a conduit for endotracheal intubation	Limited	Yes – facilitates intubation

Special Design Feature	Reinforced tip and pre-formed curve for easy insertion	Disposable version with ergonomic D-shaped tube	Straight airway tube useful in certain positioning	Designed to allow blind or fiberoptic-guided intubation	Wire-reinforced flexible tube for head/ neck surgery	Gastric access port and higher airway seal
Aspiration Protection	Low–Moderate	Low–Moderate	Low–Moderate	Low–Moderate	Low–Moderate	High
Clinical Use	Reusable device for routine anesthesia airway management	Routine anesthesia airway	Emergency and routine airway	Difficult airway management and intubation conduit	ENT, dental, or head-neck surgery where tube flexibility is needed	Advanced airway management with aspiration protection
Sizes Available	Sizes 1–6	Sizes 1–6	Sizes 1–6	Sizes ~1–6	Sizes ~2–6	Sizes ~1–5
Main advantage	Reusable silicone LMA with excellent flexibility and durability.	Single-use anatomically curved design with easy insertion and good seal.	Straight tube design facilitates bronchoscopy and airway access.	Designed as a conduit for fiberoptic-guided tracheal intubation; useful in difficult airway and failed-intubation scenarios.	Flexible reinforced tube can be positioned away from the surgical field, making it ideal for ENT, ophthalmic, dental, and head-and-neck surgery	Provides gastric access, high seal pressure, and can also serve as a conduit for intubation; offers the best aspiration protection in the Aura family.

The Ambu Aura40

The Ambu Aura40 **(figure 2)** stands out due to its ergonomic design and reinforced tip, which help prevent folds during insertion that could result in improper positioning and airway leaks. Additionally, the device is autoclavable up to 40 times, offering significant durability. The curvature of the airway tube and reinforced tip are key features that contribute to its fast and precise placement. A color-coded pilot balloon indicates the mask size and provides clear feedback on the degree of inflation, simplifying its use **(11).**

Aura40 is a first-generation style device lacking a gastric drainage channel, which raises concern in settings of high airway pressure or risk of aspiration. The sealing (oropharyngeal leak pressure) tends to be lower than in specialized second-generation LMAs or devices such as ProSeal.

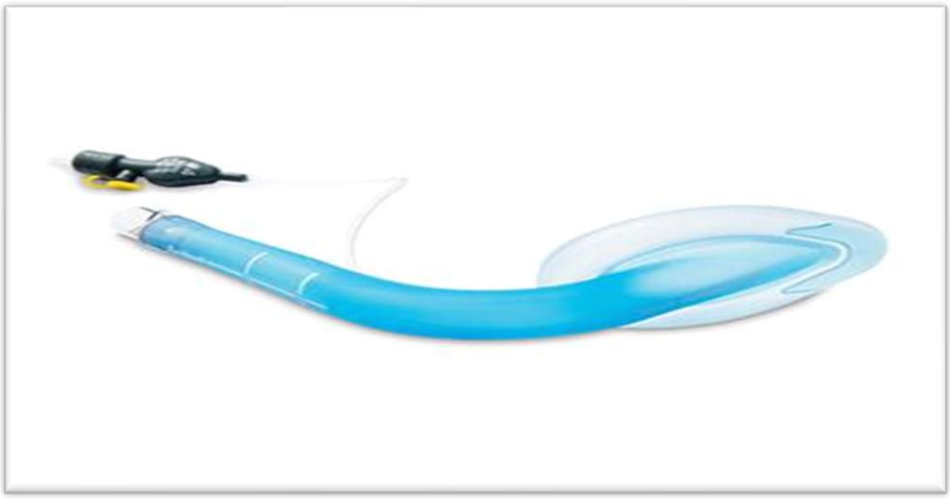

Figure (2): ambu aura 40 **(12)**

Techniques of Insertion

Insertion of the Ambu® Aura™ LMA follows the classic approach first described by **Brain (8)** and later refined by **Brimacombe (5).**

Standard technique:

1. Preoxygenate the patient and induce anesthesia.
2. Lubricate the posterior surface of the cuff with a water-based gel.
3. Position the patient's head in the "sniffing" position.
4. Hold the device like a pen, with the index finger at the junction between tube and cuff.
5. Insert the LMA along the hard palate and posterior pharyngeal wall until resistance is felt.
6. Inflate the cuff with the manufacturer's recommended volume.
7. Confirm placement through chest rise, capnography, and auscultation **(9).**

Alternative methods such as the 180° rotational technique, thumb insertion, or laryngoscope-assisted insertion may be employed in patients with limited mouth opening or anticipated airway difficulty.

Advantages

The Ambu® Aura™ range offers numerous advantages compared to traditional and reusable LMA systems:

- High first-attempt success rate due to preformed anatomical curve.
- Disposable models minimize infection and cross-contamination risk.
- Soft cuff reduces mucosal trauma and postoperative sore throat.
- Good oropharyngeal seal pressures, suitable for both spontaneous and positive pressure ventilation.

- Availability of specialized models for intubation (Aura-i), gastric access (AuraGain), and flexible positioning (AuraFlex).
- Transparent design permits visual monitoring of secretions.
- Wide size range supports use in pediatric and adult populations.

These features enhance the device's safety and utility across diverse clinical environments **(10, 11).**

Limitations

Despite their many advantages, Ambu® Aura™ LMAs have limitations inherent to all supraglottic devices:

- They do not provide a definitive airway and may not fully protect against aspiration.
- Not ideal for patients with a full stomach, morbid obesity, or reduced lung compliance.
- The reusable Aura40™ model requires rigorous sterilization protocols to prevent contamination **(10).**

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