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A new SAD: LT®evo

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New development
Enhanced patient comfort
Cuff pressure
Prehospital and clinical use
SAD

Summary: *Just over 30 years ago, the founder of VBM Medizintechnik came up with the idea for a new supraglottic airway device (SAD), and just four years later (in 1999), the first laryngeal tube was launched on the market. In 2014, the laryngeal tube, the LTS-D, was introduced to the market. Extensive experience in the development and manufacture of SADs, as well as changing medical requirements for SADs, have led to the development and market launch of the new SAD, the LT®evo. This article highlights the technical changes, demonstrates the correct insertion and monitoring of the LT®evo, and presents initial experiences and interesting aspects, including those relating to inhospital applications.*

Exciting technical details

Just over 10 years after the market launch of the LTS-D laryngeal tube, the new LT®evo, a supraglottic airway device (SAD) that has been significantly revised in key details, is being introduced to the market (› Fig. 1). It is intended for use not only in the prehospital setting but also in clinical practice.
This also enables compliance with the requirements of the guidelines as well as the Pyramid Process (a process regarding paramedic education in Germany) and facilitates training on patients in the hospital setting.

The LT®evo is a second-generation supraglottic airway device. These are fundamentally characterised by the presence of a so-called drain tube.
The LT®evo is currently available in four sizes (› Tab. 1). It features a 15 mm standard connector and a large ventilation channel. This opens into a large ventilatory opening, which is situated between the proximal and distal cuffs. The large ventilation channel and the large ventilatory opening allow for an unobstructed flow of breathing gas. The ventilatory opening is fitted with so-called epiglottis deflectors. These can help prevent the ventilation opening from

being obstructed by the epiglottis. Due to the size of the ventilation channel and ventilatory opening, the LT®evo (sizes 4 and 5) allows to insert a tracheal tube with an ID of up to 8.0 mm into the trachea (for sizes 2 and 3, correspondingly smaller tracheal tubes can be inserted)(› Tab. 2). However, this requires the use of a fibrescope.

Once the LT®evo is in place, a fibrescope can be used to insert a tracheal tube through the ventilation channel of the LT®evo into the trachea.

The LT®evo has two cuffs. Due to their shape, the thin-walled cuffs of the new SAD require a maximum filling volume of just 50 ml. This allows for a seal even at lower cuff pressures. Overall, the LT®evo is made from a more flexible and softer material. Added to this is a shape that allows for excellent adaptation to the contours of the relaxed anatomy of the upper airway. Due to its tapered tip and slim, oval cross-section, the LT®evo can be inserted with virtually no resistance.

For insertion a mouth opening of less than 20 mm is required. The LT®evo features an integrated biteblock. This helps to prevent both damage to and obstruction of the SAD caused by the patient biting down. Overall, this new development enhances patient comfort and facilitates the insertion of this supraglottic airway device.

The drain tube of the LT®evo can accommodate an 18 Fr gastric tube for the sizes 5 and 4. This allows to rapidly empty the patient's stomach content in an emergency situation, thereby minimising the risk of regurgitation, whilst also rapidly improving lung compliance and thus the potential for oxygenation.

Regardless of which supraglottic airway device is used, every user must be aware that all SADs provide only a temporary and incomplete airway protection. In an emergency, the supraglottic airway device should be replaced by a tracheal tube as soon as possible. If a laryngeal tube has been used as SAD, reintubation is possible whilst the laryngeal tube remains in place. This requires only an intubation aid (e.g. the S-Guide) with a tracheal tube pre-loaded and, ideally, a video laryngoscope. If a video laryngoscope is not available, a standard laryngoscope may also be used. This procedure is also possible with the LT®evo in place. Additionally, when using the LT®evo, a tracheal tube can be inserted into the trachea through the LT®evo using a fibrescope whilst the LT®evo is in place.

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Fig. 1 Technical details of the LT®evo:
1 Proximal ventilation channel/connector, **2** Drain tube, **3** Teeth marks, **4** Biteblock, **5** Proximal cuff, **6** Distal ventilatory opening, **7** Distal cuff

Tab. 1 Product specifications of the LT®evo [1]

Size	2	3	4	5
Patient weight guidance	10 – 25 kg	25 – 50 kg	50 – 90 kg	› 90 kg
Minimum interdental gap	13 mm	17 mm	19 mm	19 mm
Gastric tube size	≤ 12 Fr	≤ 16 Fr	≤ 18 Fr	≤ 18 Fr
Recommended inflation volume	30 ml	40 ml	45 ml	50 ml
Tracheal tube size via ventilation channel (LT®evo) using fibrescope	≤ ID 5 mm, corresp. to ≤ OD 6.7 mm	≤ ID 6.5 mm, corresp. to ≤ OD 8.7 mm	≤ ID 8 mm, corresp. to ≤ OD 10.7 mm	≤ ID 8 mm, corresp. to ≤ OD 10.7 mm
All LT®evo devices have a standard 15 mm OD connector.				

In general, however, one should always carefully consider whether reintubation needs to be performed prehospital. If the patient – and this applies to all SAD – can be ventilated well and safely via the SAD, then reintubation only appears more sensible in the hospital, as significantly better conditions (staff, equipment, environment) are usually available there. The latter applies in particular to fibreoptic equipment.

Clinical use of the LT®evo

In addition to its use as a supraglottic airway device in hospital emergencies – for example, to rapidly secure the airway during inhospital resuscitation – the LT®evo is also highly suitable for use in certain surgical procedures. Examples include arthroscopy, knee replacements (particularly with the head in a slightly lowered position), or hip replacements.

Tab. 2 Advantages of the LT®evo

For insertion only a small mouth opening is required (Manufacturer's instructions for use)	A minimum mouth opening of 19 mm is sufficient
Large drain tube (Manufacturer's instructions for use)	18 Fr for size 5 and 4
Two cuffs (Manufacturer's instructions for use)	Proximal and distal cuff
Efficient sealing at a low cuff pressure	Monitoring of clinical use
Definitive airway management with the LT®evo in place	Fiberoptic intubation thru the LT®evo in place

In principle, the new SAD can be used wherever laryngeal masks would otherwise be used.
When using the LT®evo, it has been shown that low cuff pressures (approx. 40 cmH_2O) are sufficient to minimise or even completely prevent leaks. Spontaneous breathing by the patient with the LT®evo was also possible without any problems. Postoperatively, the patients observed did not exhibit any complaints, such as hoarseness or difficulty swallowing. The future routine inhospital use of the LT®evo also enables the training of paramedics under professional supervision on patients, as required by the Pyramid Process and the guideline "Prehospital Airway Management" [2].

The LT®evo in cardiopulmonary resuscitation

The laryngeal tube was adopted at an early stage as an alternative to bag-valve-mask ventilation in prehospital cardiopulmonary resuscitation [3]. The LT®evo also plays a key role in both inhospital and prehospital cardiopulmonary resuscitation. High-quality chest compressions and early defibrillation in the presence of shockable cardiac rhythms remain the cornerstones of cardiopulmonary resuscitation. Securing the airway with a second-generation supraglottic airway device can be performed without interrupting chest compressions. Once the airway has been secured using an SAD, uninterrupted chest compressions are possible, and ventilation should be performed asynchronously with chest compressions in accordance with the ERC guidelines.

Early studies have shown that the use of supraglottic airway devices can significantly reduce the period during which no chest compressions are being performed and, consequently, no blood is circulating in the patient's body (known as "no-flow time" or "hands-off time") [4, 5].

Once the airway has been secured as part of cardiopulmonary resuscitation, the patient should be ventilated at a rate of 10 breaths per minute with a tidal volume of 400 – 600 ml.

How do you use LT®evo correctly?

As with all medical devices, initial and ongoing training in the use of the specific device is essential. Furthermore, a thorough study of the manufacturer's instructions for use is mandatory for users of medical devices under the Medical Devices Operator Ordinance (MPBetreibV) and is strongly recommended [6].

Before using the LT®evo, a visual inspection for damage and a functional check must be carried out. The functional check also includes inspecting the cuffs. To do this, the air is completely evacuated from the cuffs, after which it must be verified that the vacuum is maintained. The LT®evo must be lubricated using a water-based lubricant or artificial saliva. To do this, both cuffs and the side of the SAD facing the palate must be completely coated with lubricant.

It is then advisable to preinsert a gastric tube into the LT®evo, which has also been lubricated beforehand. Attaching a breathing system filter also appears before insertion [7], particularly in emergency medicine.

The user holds the LT®evo in the right hand like a pen, i.e. the thumb rests between the two teeth marks, whilst index and middle finger rest on the opposite side.

The patient's mouth is then opened applying jaw thrust or chin lift and sufficient space is created in the pharynx whilst simultaneously returning the tongue to its original position and holding it there. Various techniques can be used for this, such as lifting the tongue and creating space in the throat with the index finger (› Fig. 3).

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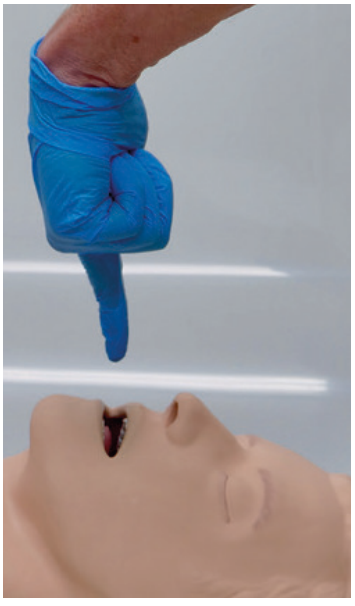
Fig. 2 Fibreoptic intubation using the LT®evo in place

Use of gastric tubes (› Fig. 4)
The insertion of a gastric tube into a second-generation supraglottic airway device is mandatory for the EMS [2]. This serves to monitor the position of the SAD, helps to reduce the risk of regurgitation, and enables better oxygenation. The use of a suction catheter alone is **not** sufficient.



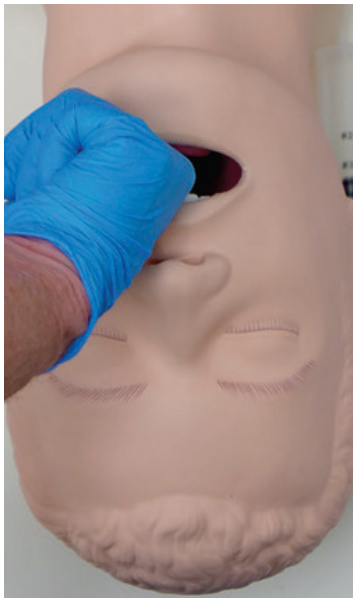


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Fig. 3 Making room in the throat – various insertion techniques

Fig. 4
Suction of stomach content

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The LT®evo is now gently guided along the hard palate until resistance is felt. The patient's incisors should now be positioned in line with the teeth marks. The teeth marks serve as an initial guide for the insertion depth. Once the LT®evo has been positioned, the gastric tube should be advanced until only approx. 20 cm of the gastric tube protrude from the proximal end of the drain tube. If the gastric tube has length marks, advance it to the second mark from the proximal end. If the gastric tube can be advanced without resistance, the LT®evo is assumed to be correctly positioned in the oesophagus (› Fig. 4).

Fig. 5
Cuff pressure monitoring

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The cuffs are now initially inflated with the volume recommended by the manufacturer. For the size 4 LT®evo, this is just 45 ml of air. The cuff pressure must then be checked; under no circumstances should it exceed 60 cmH_2O, and the inflation pressure must now be adjusted to this level. The authors' own clinical observations in the operating theatre have shown that with the LT®evo, even cuff pressures ‹ 50 cmH_2O ensure an adequate seal of the airway. Further data on this will follow at a later date. Continuous monitoring of the artificial airway and ventilation is mandatory; in addition to relying on one's own senses, this naturally includes the use of capnography. In emergency situations, the cuff pressure should always be rechecked following major manipulations of the patient and adjusted correctly if necessary (› Fig. 5).

Conclusion

More than 25 years after the first laryngeal tube was launched, the LT®evo marked a genuine evolution in supraglottic airway devices on the market. The design of the LT®evo, the materials used and other technical features make it a highly attractive supraglottic airway device (SAD) for both inhospital and prehospital use. In particular, its potential applications in routine procedures, where laryngeal mask-type airway devices have previously been used, represent an interesting alternative and can facilitate the clinical training of EMS staff in the use of this new airway device in accordance with recommendations and guidelines. In emergency situations, the LT®evo is a proven tool for securing the airway, both in the hospital and in the prehospital setting.

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Supraglottic ventilation

LT®evo

Anatomical design
Ease of insertion
Optimal sealing mechanism
Efficient ventilation
Gastric access
Tracheal intubation

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