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APPARATUS

The LMA CTrach™ in airway resuscitation: six case reports

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Summary

We report six patients with unexpected difficult airways who underwent tracheal intubation using the Laryngeal Mask Airway CTrach™. All these patients had failed orotracheal intubation using direct laryngoscopy and gum elastic bougie placement. Fibreoptic bronchoscopy failed in two of these patients due to blood and secretions in the airway. This report describes the successful use of this new intubating laryngeal mask in these cases, all of whom were intubated on the first attempt with this new device.

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The intubating laryngeal mask (ILMA, The Laryngeal Mask Company, Jersey, UK) is an established supraglottic airway designed to facilitate ventilation and blind (or guided) tracheal intubation, in anticipated or unexpected difficult airway situations [1]. One of its advantages is the ability to provide ventilation between intubation attempts. However, intubation through the ILMA is not always successful on the first attempt for reasons that are not always clear [1]. That uncertainty may limit its use as a first-line airway salvage device, especially when intubation is imperative.

The LMA CTrach™ (CTrach, The Laryngeal Mask Company) was introduced for clinical use in 2005. The CTrach is functionally identical to the ILMA but has integrated fibreoptics that provide a view of the larynx and allows visualisation of the tracheal tube (ETT) as it is advanced through the vocal cords. A battery-powered monitor is attached to the CTrach via a magnetic-latch connector.

In the first year after the CTrach became available in our department, there were six unexpected difficult airway cases for which the CTrach was used as a rescue-airway device. This report provides details of the use of the CTrach in these six cases, all of whom were intubated on the first attempt with this new device.

Case reports

With IRB approval, we prospectively collected CTrach insertion data from April 2005 to March 2006. During this period, the senior author (AG) who had placed (or supervised) more than 200 CTrach insertions, was called during the induction of anaesthesia to assist in the management of six patients with unexpected difficult airways. The average age of these patients was 42 years (range 23–67), there were three males and three females, the mean weight was 91 kg (range 67–130), and the mean height was 170 cm (range 160–183). Three patients had Mallampati class 2 and three had class 3 airways [2]. One patient had a thyromental distance less than 6 cm [3], and one patient had a thick neck (circumference 68 cm) [4]. None of the patients had a history of supraglottic pathology or radiation therapy to the head or neck, and none was at risk for aspiration.

In each of these cases, the primary anaesthetist reported that there had been difficult laryngoscopy (where it was not possible to visualise any portion of the vocal cords after several attempts at conventional laryngoscopy) followed by failed blind intubation after up to three attempts [5], including using the gum elastic bougie. Fibreoptic bronchoscopy also failed in two patients, due

to the presence of blood and secretions in the airway. Facemask ventilation was adequate in all patients. One author (AG) performed all the CTrach insertions. All the patients had been induced with propofol (2–3 $mg.kg^{-1}$), and had also received rocuronium (0.5–1 $mg.kg^{-1}$). The oral cavity was suctioned immediately before the CTrach was inserted. Each patient's head was placed in the neutral position, and the device was prepared as recommended by the manufacturer [6]. Size 4 CTrach was used for women and size 5 for men. After insertion, ventilation was attempted and adequate ventilation was defined as achieving adequate chest excursion with a tight seal (oropharyngeal leak pressure > 20 cmH_2O), and the appearance of exhaled carbon dioxide. Intubation was attempted after the vocal cords were seen on the CTrach monitor. If there was no initial vocal cord view, the following manoeuvres were performed sequentially [6]: up–down manoeuvre (slowly withdrawing the inflated CTrach from the pharynx up to 6 cm while watching the monitor and then re-inserting); performing a jaw thrust, then inserting the CTrach more deeply. Silicone tracheal tubes (The Laryngeal Mask Company) were used (sizes 7 and 8 mm internal diameter for women and men, respectively). During intubation, the 'Chandy manoeuvre' was performed (using the CTrach handle to lift the cuff away from the posterior pharyngeal wall) [6, 7], and fine hand adjustments were used to centre the vocal cords on the monitor. The CTrach was then removed leaving the ETT in place as described by the manufacturer.

CTrach insertion and ventilation were successful on the first attempt in all six patients. An immediate vocal cord view was seen in two patients. In the other four patients, the epiglottis appeared downfolded on the epiglottic elevating bar, which blocked the view of the vocal cords. The up–down manoeuvre resulted in a view of the vocal cords in these four patients, and intubation was successful on the first attempt in all six patients after the vocal cord view was centred on the monitor. There were no complications of CTrach use, and all patients were subsequently informed of their difficult airway status.

Discussion

This is the first reported series of the CTrach being used as a 'rescue airway.' Of note, the cause for failure of fibreoptic bronchoscopy in two patients was due to blood and secretions on the lens, leading one to assume that the CTrach would have failed for the same reason. However, the oropharynx was suctioned immediately before the CTrach was inserted and a vocal cord view was seen in all. It is possible that the cuff of the CTrach tamponaded the source of the bleeding, functioned as a throat pack, or simply isolated the larynx from the source of the bleeding, keeping the blood external to the lens of the CTrach. In all cases, the vocal cord image was centred on the monitor before attempting intubation, and all had a resulting first-pass intubation. Several recently published CTrach evaluations in normal patients reported a near 100% first-pass intubation success rate when the vocal cords could be seen and centred on the monitor [8, 9]. In addition, there are several brief reports of successful CTrach intubation in patients with anticipated difficult airways [10, 11].

The up–down manoeuvre was required in four of these six patients to obtain a view of the vocal cords. This manoeuvre, previously thought to reposition a downfolded epiglottis, was confirmed during CTrach use [12, 13]. The incidence of epiglottic downfolding with the ILMA has been reported to be as high as 88% [14], and it may be a common cause of failed ILMA intubation. We recommend the routine performance of this manoeuvre with the ILMA and with the CTrach (when there is no initial vocal cord view). Performing the 'Chandy manoeuvre' during intubation helped guide the tracheal tube toward the laryngeal inlet, preventing its displacement toward the oesophagus [13].

Ferson *et al.*, in his report on the use of the ILMA in 254 patients with difficult airways, reported 111 cases in which rigid laryngoscopy and intubation both failed, and intubation was then attempted with the ILMA [1]. The investigators, advanced users of the ILMA, performed all the insertions in this paper. Blind first-attempt intubation in these cases was only 65.2%, but within five attempts, it reached 92%. In seven patients, blind intubation failed, but intubation was successful with a fibreoptic bronchoscopy through the ILMA. As in our series, all the patients were successfully ventilated. Our case reports indicate that the CTrach has potential to increase first-pass intubation success in airway resuscitation.

It is likely that fibreoptic bronchoscopy-assisted intubation through the ILMA would also have been successful in our cases; however, the CTrach is more portable and may be prepared more expeditiously, especially by the solo operator. Fibreoptic bronchoscopy-assisted intubation through the ILMA is usually performed with the use of a sealing diaphragm adaptor, which can be unwieldy and may not allow the viewer to witness the passage of the ETT into the larynx.

Awake fibreoptic intubation is currently the standard approach for managing patients with anticipated difficult intubation. However, in unanticipated difficult intubation the CTrach may offer an advantage over fibreoptic bronchoscopy – the ability to ventilate the patient while surveying the anatomy. If intubation is not successful, the presence of an effective airway can be lifesaving. The CTrach gives the operator time to optimise the laryngeal view and the patient's physiological parameters before

attempting intubation [8]. Numerous reports have confirmed the effectiveness of the ILMA in patients with known or anticipated difficult tracheal intubation [1, 15, 16]. The ILMA has been used in these situations, and the CTrach is now a useful addition. Although the CTrach does not offer as clear an image as practitioners have been accustomed to with other fibreroptic products, the ability to see and centre the laryngeal structures on the monitor screen is usually sufficient for successful first-pass intubation [8, 9].

The Difficult Airway Society recently published guidelines for management of the unanticipated difficult airway, which feature the ILMA (or LMA) for the secondary tracheal intubation plan [17]. The CTrach may now be considered for inclusion as well, as it is an improved version of the ILMA and, without the monitor attached, functions exactly like the ILMA. We believe, and other reports suggest [8, 9], that an experienced user of the ILMA would need 15–20 uses of the CTrach to become familiar with its nuances and comfortable with its use. Since our evaluation was completed, a newer generation CTrach has been introduced with a blue epiglottic elevating bar (to reduce glare), and claims from the manufacturer of improved optics and durability.

In summary, this is the first reported series of the successful use of the CTrach in cases of unanticipated difficult intubation.

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