receive 5 min of preoxygenation with 100% oxygen by a face mask with a PEEP of 7 cm H_2O or HFNC set at 70 L min^{-1}. Anaesthesia induction was followed by bag-mask ventilation continued until laryngoscopy or HFNC maintained during apnoea and intubation. The primary endpoint was fraction of end tidal oxygen (ETO_2). The secondary endpoints were arterial oxygen partial pressure (Pa_{O_2}) and peripheral capillary oxygen saturation (SpO_2). Measurements were performed at baseline, after 2.5 and 5 min of preoxygenation, and repeated immediately after intubation. Apnoea time was defined as time from last spontaneous breath *vs* time from discontinuation of bag-mask ventilation to confirmation of correct tracheal tube placement in the HFNC and face mask group, respectively.

Nineteen patients were available for statistical analysis. The mean BMI was 42 (2.5) kg m^{-2} in the face mask group (n=8) and 40 (4.3) kg m^{-2} in the HFNC group (n=11) (P=0.23). There was no significant difference in ETO_2 or Pa_{O_2} at any time during preoxygenation, and all patients reached an ETO_2 >0.90 within 5 min. The mean apnoea time was significantly longer (206 [28] *vs* 43 [12] s; P<0.0001) and Pa_{O_2} was lower (38 [12] *vs* 53 [12] kPa; P=0.013) after intubation in the HFNC group. No patient experienced a SpO_2 <100% during intubation. The maximal apnoea time was 264 s owing to a case of unexpected difficult intubation in the HFNC group.

Both HFNC and face mask with PEEP provided effective preoxygenation in the morbidly obese. Despite a significantly longer apnoea time and lower post-intubation Pa_{O_2} compared with bag-mask ventilation, HFNC maintained SpO_2 at 100% throughout the induction and intubation procedure.

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C-MAC VA Video Stylet in clinical practice: an observational study of intubation success

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Rigid scopes are an alternative to flexible fibreoptic scopes for predicted or unpredicted difficult airway management. The semi-rigid C-MAC VS (Video Stylet; Karl Storz, Tuttlingen, Germany) is a rigid video stylet with a flexible tip. Clinical data collected from this new tool are rare; hence, this study aims to gather data from 3000 to 4000 patients undergoing airway management under general anaesthesia in everyday clinical practice to establish oro-tracheal intubation success, the side-effects, and the safety issues of the C-MAC VS. This is a preliminary report of an ongoing observational study.

The Cantonal Ethics Committee, Bern, Switzerland, waived the need for informed consent if the general research consent defined by the Swiss Research Act is available. Patients requiring general anaesthesia, who have given general consent and have at least one predictor of difficult airway management (e.g. Mallampati ≥2, mouth opening <4 cm, thyromental distance <6 cm, head and neck movements <90°, short neck, reduced neck extension, or ENT/maxillofacial surgery) have been and will be included. After induction of general anaesthesia, orotracheal intubation is facilitated with the C-MAC VS. The primary outcome is the first-attempt orotracheal intubation success rate. The secondary outcomes are time of intubation (the moment when the tip of the device passes the patient's lips, until the device is out of the tube), overall success rate, difficulty of intubation, complications during intubation, and technical problems with the device.

So far, 47 patients have been included. The mean BMI was 26 kg m^{-2} (standard deviation, 5) and the age 54 (20) yr. ASA physical status classification distribution was: 1 (17%), 2 (40%), 3 (36%), and 4 (6%). Most (63%) underwent ENT/maxillofacial surgery.

The first attempt at orotracheal intubation was successful in 91%, and in 9% a second attempt was needed (100% overall success rate). The median time (IQR) from the start of intubation was 27 (18–44) s. Time until the first $EtCO_2$ reading was 53 (30–64) s. One patient suffered from bleeding and oedema during intubation, another from hypoxaemia <90% SpO_2. Both had no sequelae on the next day. Thirty-seven ENT patients could be followed up; meanwhile, 33% reported sore throat and 5% hoarseness.

Although the number of patients included in this early preliminary report about oral intubation success rate and complications of the C-MAC VS was small, the intubation success rate was surprisingly high. Time to successful intubation and complication rates seem comparable with the results of studies using intubation stylets such as the Levitian or the Bonfils.[1]

Funding

Karl Storz (C-MAC VS).

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Training on three-dimensional airway models improves confidence in managing a cannot intubate-cannot oxygenate situation

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Cannot intubate, cannot oxygenate (CICO) events are rare, extremely stressful, and potentially catastrophic. Anaesthetic airway emergency preparedness is crucial, and this includes skills in performing an emergency front-of-neck access in a CICO crisis. However, anaesthetists may not be familiar or confident in performing emergency cricothyrotomies owing to the rarity of these situations. In view of this, we initiated a refresher training course in a tertiary Asian hospital, on managing CICO crises using three-dimensional airway models.

Our objectives were to provide an update on the CICO algorithm recommended by the Royal Perth Hospital,[1] and to give a refresher on CICO techniques. At the end of the training, participants were expected to be able to use the CICO algorithm to aid decision-making, critique the use of various jet oxygenation devices, proficiently perform CICO rescue airway techniques and recognise the potential pitfalls of each technique. We modified and printed three-dimensional (3D) cricothyrotomy models, based on a free-of-charge download from the website www.airwaycollaboration.org. Four training

sessions were conducted from March to July 2019, in which a short lecture and a live demonstration were given, followed by hands-on practice by the participants. The participants were trained on cannula cricothyrotomy with Melker conversion, jet oxygenation through cannula cricothyrotomy, and scalpel–bougie cricothyrotomy. All participants were given a pre- and post-training survey form to complete. Ethics approval was not required as advised by the institutional review board.

Fifty-four anaesthetists participated in the refresher training with years of anaesthetic experience from fewer than five to more than 10. Only one person had previously performed an emergency front-of-neck access. We evaluated their confidence in performing the various CICO techniques before and after the training, on a scale of 1 (not confident at all) to 5 (extremely confident). The results are illustrated in Figure 6. Feedback was favourable and the participants were keen for such CICO refresher sessions to be conducted regularly.

Although CICO crises are rare, it is crucial that anaesthetists maintain the knowledge, decision-making, and procedural skill sets to perform emergency cricothyroidotomies quickly and safely. Moving forward, we aim to enhance the training using different airway models to simulate difficult airway anatomy, and to integrate it with simulation software providing real-time dynamic changes in oxygen saturation to make the scenarios more realistic.

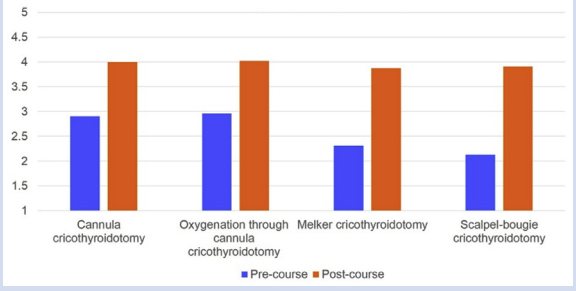

Fig. 6 Pre- and post-course confidence levels in performing emergency cricothyroidotomy.

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Randomised comparison of the clinical performance of Ambu Auragain and Teleflex LMA Protector

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This study was designed as a prospective randomised clinical study comparing two supraglottic airway (SGA) devices, the Ambu Auragain and the Teleflex LMA Protector, in elective patients with normal airway anatomy. Device characteristics evaluated were SGA insertion, functionality of SGA as a ventilatory device and as an intubation conduit, functionality of the gastric drainage channel, and oropharyngeal leak pressure (OLP). Additionally, a fibreoptic assessment, utilising the Ambu aScope 3 Slim, of the glottic view via the SGA device and signs of airway morbidity were investigated. The primary outcome was successful SGA insertion on first attempt, whereas secondary aims were SGA insertion time, number of insertion attempts, ease of SGA insertion, rate of successful ventilation and intubation (by using the SGA as an intubation conduit), anatomical fit of SGA (displacement, bloodstaining), and fibreoptic assessment of the glottic view via the SGA device.

Patients included in this study were adult surgical candidates, ASA 1–3, age >18 yr, Mallampati I–III, BMI $\leq$ 30 kg m^{-2}. The exclusion criteria included: ASA 4–5, age <18 yr, surgery in the prone position, planned operating time >4 h, high risk of regurgitation, exhibition of respiratory tract pathology, or preoperative sore throat. Once informed consent was obtained (IRB #2017-0449), the randomisation process was performed using an institutional software, CORe (Clinical Oncology Research System).

In total, 53 patients were included in this study. The overall success rate of device insertion on the first attempt was 92%. The success rate was higher in the Ambu Auragain group than in the LMA Protector group (96% *vs* 88%, respectively; difference=0.09; 95% confidence interval [CI] [−0.06, 0.23]; $P = 0.260$). All patients in the Ambu Auragain group exhibited a POGO score of 100%, whereas patients in the LMA Protector group achieved a POGO score of 83% ($P = 0.046$ Fisher's exact test). There was no significant difference in the time to place the tracheal tube (~90 s for both groups) or reported ease of use. Passage of a 16F gastric tube was significantly easier in the Ambu Auragain group (P=0.01; 100% *vs* 86% in LMA Protector group); there were six failures and one gastric tube passage with resistance in the LMA Protector group.

This study showed that both the Ambu Auragain and the LMA Protector have a high successful first attempt placement success rate. In general, the Ambu Auragain had better performance scores and fewer adverse events, as compared with the LMA Protector. Future study is warranted in a larger patient population and in patients at higher risk for difficult airway management.

Does infrared red intubation system improve the fibreoptic intubation conditions? A randomised control trial

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National Audit Project 4 (NAP4) identified cases where fibreoptic intubation (FOI) was indicated but not performed, and recommended that this technique be used more widely by anaesthetists.[1] The infrared red intubation system (IRRIS) is a small device which is placed in front of the neck and emits infrared light through the cricothyroid membrane that can be seen in the glottis by a fibreoptic camera. Kristensen and colleagues[2] performed a small retrospective case series in patients with difficult airways and found the device was of assistance in performing FOI. The Difficult Airway Society has developed an