Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

expressed in heart, lungs, kidneys, and intestines, thereby providing a multimodal entry point for the virus to infiltrate the body. Preliminary unpublished data indicate that ACE-2 receptor concentrations are higher in adipose tissue in comparison with lung tissue, suggesting that adipose tissue might be vulnerable to SARS-CoV-2 infection (preprint data available from https://www.preprints.org/manuscript/202002.0315/v1). This presents a risk for adverse outcomes for obese patients with more adipose tissue and a greater number of ACE-2 receptors in comparison with their non-obese counterparts.

Alterations of adipose tissue distribution and function linked to obesity have been shown to promote production of pro-inflammatory cytokines and induce chronic systemic inflammation.[7] Increased production and release of cytokines further exacerbates activation of kinase receptors, triggering a positive feedback loop of inflammation and metabolic dysfunction. Amongst obese patients with COVID-19, this heightened inflammatory response may put them at greater risk for a cytokine storm, an over-response of the immune system characterised by uncontrolled release and attack of cytokines on the body's own tissues and organs. Although obesity-specific clinical data are lacking, general findings provide evidence supporting the cytokine storm concept with COVID-19 non-survivors having significantly higher concentrations of interleukin-6, a pro-inflammatory cytokine that regulates homeostasis and inflammation, compared with survivors.[8] Research will need to explore these mechanisms in the context of the obesity paradox, the epidemiologically observed inverse relationship between obesity and mortality amongst select medical and surgical populations (interestingly, with surgery being a pro-inflammatory event).[9]

Furthermore, it is well documented that elevated concentrations of inflammatory biomarkers amongst obese patients are linked to increased risk of co-morbidities, including cardiovascular disease, diabetes mellitus, metabolic syndrome, and liver disease.[7] The presence of these co-morbidities in COVID-19 patients has been shown to be associated with greater vulnerability to multi-organ injuries.[10] Ultimately, many patients die from complications that stem from these underlying illnesses, providing yet another reason for clinicians to be hyper vigilant when treating and monitoring obese patients with COVID-19.

As research surrounding COVID-19 continues to evolve, it is crucial to consider obesity as a potential risk factor for adverse outcomes. A better understanding of the pathophysiological contributors linking obesity with severe-to-critical COVID-19 disease will not only help inform medical management of obese patients, but also aid in the development of successful therapeutics to prevent and treat COVID-19.

Declarations of interest

The authors declare that they have no conflicts of interest.

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Videolaryngoscopy for tracheal intubation in patients with COVID-19

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Keywords: airway management; COVID-19; intubation box; laryngoscope; simulation; tracheal intubation; videolaryngoscopy

Editor—During airway management of patient with coronavirus disease 2019 (COVID-19), some authors and guidelines recommend use of a box or tent that covers the head as a part of personal protective equipment (PPE).[1–4] A major problem is that wearing eye goggles and a face shield, and operating within an aerosol box can make tracheal intubation difficult.[4] Guidelines and expert recommendations[2,5] recommend use of a videolaryngoscope for the initial attempt at tracheal intubation to minimise the time required to intubate the trachea. Different videolaryngoscopes might perform differently in this setting and work.[6,7]

Requirements for a suitable videolaryngoscope include a high success rate of tracheal intubation even in patients with a difficult airway, short intubation time, an introducer (e.g. stylet or gum elastic bougie) is not required, and the device can be disposed of or appropriately disinfected after use. Available videolaryngoscopes with a tube guide that satisfy these requirements include the Airtraq® (Prodol, Vizcaya, Spain), Airwayscope® (Hoya, Tokyo, Japan), and Kingvison® (Ambu, Copenhagen, Denmark). An additional advantage of these videolaryngoscopes is that there is no need to insert a tracheal tube stylet, such that a breathing system filter can be connected to the tracheal tube before intubation, thus minimising the spread of viral particles (Fig 1).

To determine whether these videolarygoscopes are no less effective than other types of laryngoscopes, we carried out a small randomised simulation trial. Eight anaesthetists with more than 3 yr of clinical experience provided written informed consent to participate. The study included the following five laryngoscopes: Airtraq® AVANT (with a size 3 blade, without a video monitor attached), Airwayscope® S-100 (with the standard P blade), Kingvison® (with a Kingvison® aBlade), McGrath® (Aircraft Medical Ltd, Edinburgh, UK, with size 3 MAC blade), and Macintosh laryngoscope (Penlon, Oxford, UK; with blade 3). To simulate tracheal intubation in a patient with COVID-19, we used an intubation simulator manikin (TruCorp AirSim®; TruCorp Ltd, Belfast, Northern Ireland, UK) with an aerosol box® (Minowa Co., Osaka, Japan) placed over the manikin head (Fig 1). Each participant had previously performed more than 20 patient intubations with each device. They then received a demonstration of the five laryngoscopes by one of the investigators, and then practiced at least 10 times for each device on a manikin without wearing PPE. In a computer-generated randomised order, each participant wearing PPE (N95 mask respirator, disposable gown, face shield, double gloves) attempted to intubate the trachea. A cuffed tracheal tube of 7.0 mm internal diameter was used; a stylet formed in the shape of each blade was used for the McGrath® and Macintosh laryngoscopes, but not for the other videolaryngoscopes. Attending staff removed the stylet (if used) and connected the breathing system to the tracheal tube. For the Airtraq®, the Airwayscope®, and the Kingvison®, a heat and moisture exchanger was already attached to the tracheal tube.

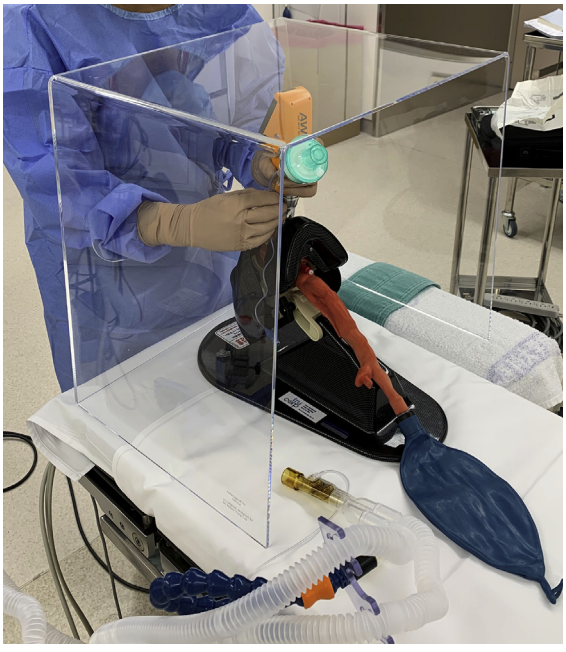

Fig 1. Insertion of a tracheal tube (with a breathing system filter attached) using a videolarygnoscope with a tube guide (Airwayscope®) for a patient with COVID-19.

Time to intubate the trachea (defined as time from placing the tip of the blade between the upper and lower incisors to confirming successful lung ventilation) was measured for each attempt. The attempt was judged to have failed if tracheal intubation required >120 s. Friedman's two-way analysis of variance was used to compare intubation time, and if $P>0.05$, 95% confidence intervals (CIs) for paired median difference between a videolaryngoscope and a Macintosh laryngoscope were calculated. A sample size of 8 was calculated based on an expectation that intubation time is faster for the Airwayscope® than for the Macintosh laryngoscope on 90% of occasions (as a cross-over design), with a power of 0.8, and $P=0.05$. Statistical analysis was performed by using SPSS version 24 (IBM Corp., Armonk, NY, USA), with manual calculations for the 95% CIs for the median differences.[8]

Tracheal intubation was successful except for one attempt with the Airtraq®. Intubation time was shorter for the Airwayscope® than for the Macintosh laryngoscope (median difference [95% CI for paired median difference]: −8 [−13, −3] s), and shorter for the McGrath® than for the Macintosh laryngoscope (−7 [−12, −3] s) (Table 1).

Using simulating of tracheal intubation in a patient with COVID-19 disease, the Airwayscope® and McGrath® laryngoscopes were more effective than the other laryngoscopes. Although the Airtraq® is appealing as a single-use device, wearing goggles and a face shield and using the box made it difficult to see the glottis through the eyepiece of the device. Therefore, when this device is to be used a camera monitor needs to be attached to the eyepiece. The Airwayscope®, which has been shown to be effective with a difficult airway,[9] can be disinfected after use by immersing the whole device

Table 1 Time to intubate the trachea and success rate. Times are expressed as median [IQR] (range) in seconds. *P<0.05 compared with the Macintosh laryngoscope.

	Time to intubate the trachea	Success rate (%)	Median difference [95% CI for median difference]
Macintosh laryngoscope	27 [25, 31] (24–34)	100	-
Airwayscope® s-100	19 [18, 22] (15–39) *	100	-8 [-13, -3]
Airtraq® AVANT	30 [25, 41] (19–120)	85.7	3 [-5, 16]
Kingvision®	24 [21, 29] (14–40)	100	-3 [-11, 12]
McGrath®	20 [19, 22] (18–26) *	100	-7 [-12, -3]

into disinfectant solution. The blade of the Kingvison® is disposable, but its display cannot be immersed in liquid and thus can only be disinfected by an alcohol wipe.

In conclusion, our simulation study indicates that different videolaryngoscopes perform differently depending on the circumstances. Despite the small numbers, the Airwayscope® provided shorter intubation times compared with other laryngoscopes for tracheal intubation in simulation of patients with COVID-19.

Declarations of interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bja.2020.06.002.

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Emergency tracheal intubation in patients with COVID-19: is it any different? Comment on *Br J Anaesth* 2020; 125: e28–e37

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