

# A comparison of the suction laryngoscope and the Macintosh laryngoscope in emergency medical technicians: a manikin model of severe airway haemorrhage

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## ABSTRACT

The use of a suction laryngoscope that enables simultaneous suction and laryngoscopy was evaluated. 34 emergency medical technicians intubated the trachea of a manikin with simulated upper airway haemorrhage using the suction laryngoscope and the Macintosh laryngoscope, in random order. When using the suction laryngoscope, the number of oesophageal intubations was lower (3/34 vs 11/34;  $p=0.021$ ) and the time taken to intubation was shorter (mean (SD) 50 (15) vs 58 (27) s;  $p=0.041$ ). In cases of airway haemorrhage, the use of the suction laryngoscope might be beneficial.

## INTRODUCTION

In severe upper airway haemorrhage, ongoing flow of fluid re-obstructs the view of the glottis when the laryngoscopist tries to alternate from suctioning to intubation. Therefore, a suction laryngoscope was developed which enables simultaneous suctioning and laryngoscopy with one hand, rendering the other hand free for tracheal intubation.<sup>1</sup>

We compared the suction laryngoscope and the Macintosh laryngoscope used by emergency medical technicians (EMTs) in a manikin model of severe airway haemorrhage. In the absence of a physician, these EMTs are allowed to perform tracheal intubation in Germany. The main study endpoints were the number of oesophageal intubations and the time taken to intubation.

## METHODS

In a resuscitation manikin (Economy Adult Airway Management Trainer, Simulaids, Woodstock, New York, USA), we simulated upper airway haemorrhage with black coffee running into the nasopharynx via tubes fixed in the nostrils.<sup>2</sup> In this scenario, we compared the suction laryngoscope (figure 1) with a Macintosh laryngoscope (both size 3). Our suction laryngoscope<sup>1</sup> consists of a Macintosh laryngoscope blade with a stainless steel guide tube fixed at its lingual surface, through which a suction catheter is inserted.

After explaining how to use the suction laryngoscope, 34 EMTs intubated the manikin's trachea with the suction laryngoscope or with a standard Macintosh laryngoscope, in random order. Both groups used the same tracheal tube (8.5 mm), the same suction catheters (Seidel Medizin, 20 French,

Buchendorf, Germany) and the same vacuum source (0.8 bar). The time taken to intubation, the number of successful versus unsuccessful intubation attempts and previously performed tracheal intubations during the past 12 months were recorded. Ease of use of each device was scored.

## Statistical analysis

Sample size was calculated based on a previous study evaluating physicians.<sup>2</sup> We estimated a sample size of  $n=31$  in order to show statistically significant differences between the groups at a two sided  $\alpha$  level of 0.05 with 80% statistical power. Statistical analysis was performed using SPSS 15.0 statistical package (SPSS). Duration of intubation attempts was analysed using the paired sample Student's *t* test and intubation success was analysed using the McNemar test. Wilcoxon test was used to compare the ratings of ease of use between the devices. Two sided *p* values  $<0.05$  were considered statistically significant.

## RESULTS

When using the suction laryngoscope, the number of oesophageal intubations was lower (3/34 (9%) vs 11/34 (32%);  $p=0.021$ ) (figure 2) and the time taken to intubation was shorter (mean (SD) 50 (15) vs 58 (27) s;  $p=0.041$ ) compared with the Macintosh laryngoscope. The suction laryngoscope was scored as easier to use (median (IQR) (range) 1 (0–2) (0–4) vs 6 (5–8) (2–10);  $p=0.000$ ). The number of performed tracheal intubations (mean (SD)) performed during the past 12 months was 1.0 (1.8).

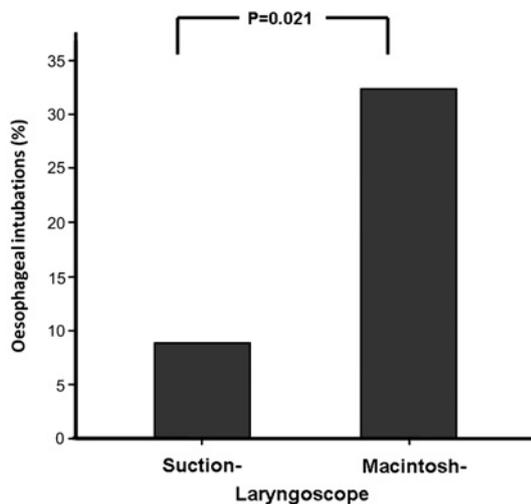
## DISCUSSION

Tracheal intubation was faster and the number of oesophageal intubations was reduced when using the suction laryngoscope. Nevertheless, at 9%, the number of oesophageal intubations in the suction laryngoscope group was still high. However, the coffee flow intubation conditions were extremely difficult. Furthermore, with approximately one tracheal intubation in a patient per year, the clinical experience of our volunteers was insufficient. Low clinical practice<sup>3, 4</sup> and high failure rates<sup>5–7</sup> are consistent with other reports, and airway management training, including real life intubations, must be improved.

The main limitation of our study is that further clinical assessment should follow. Also, we used



**Figure 1** The suction laryngoscope with a 20 French suction catheter inserted through the adjustable stainless steel guide tube.



**Figure 2** Oesophageal intubations (% of intubation attempts) using the suction laryngoscope or the Macintosh laryngoscope.

black coffee, and situations with particles such as blood clots or vomitus require further testing. Moreover, there are other possibilities for handling upper airway bleeding scenarios. The successful use of the Combitube<sup>7 8</sup> and the laryngeal mask<sup>8 9</sup> have been described, and there are other suction laryngoscopes<sup>10</sup> that should be evaluated.

In conclusion, in cases of airway haemorrhage, the use of the suction laryngoscope might be beneficial.

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