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Original Contribution

Comparison of three video laryngoscopy devices to direct laryngoscopy for intubating obese patients: a randomized controlled trial☆,☆☆

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Abstract

Study objective: To compare three different video laryngoscope devices (VL) to standard direct laryngoscopy (DL) for tracheal intubation of obese patients undergoing bariatric surgery. Hypothesis: VL (vs DL) would reduce the time required to achieve successful tracheal intubation and improve the glottic view.

Design: Prospective, randomized and controlled.

Setting: Preoperative/operating rooms and postanesthesia care unit.

Patients: One hundred twenty-one obese patients (ASA physical status I-III), aged 18 to 80 years, body mass index (BMI) >30 kg/m^2 undergoing elective bariatric surgery.

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Intervention: Patients were prospectively randomized assigned to one of 4 different airway devices for tracheal intubation: standard Macintosh (Mac) blade (DL); Video-Mac VL; Glide Scope VL; or McGrath VL.
Measurements: After performing a preoperative airway evaluation, patients underwent a standardized induction sequence. The glottic view was graded using the Cormack Lehane and percentage of glottic opening (POGO) scoring systems at the time of tracheal intubation. Times from the blade entering the patient's mouth to obtaining a glottic view, placement of the tracheal tube, and confirmation of an end-tidal CO_2 waveform were recorded. In addition, intubation attempts, adjuvant airway devices, hemodynamic changes, adverse events, and any airway-related trauma were recorded.
Main results: All three VL devices provided improved glottic views compared to standard DL ($p < 0.05$). Video-Mac VL and McGrath also significantly reduced the time required to obtain the glottic view. Video-Mac VL significantly reduced the time required for successful placement of the tracheal tube (vs DL and the others VL device groups). The Video-Mac and GlideScope required fewer intubation attempts ($P< .05$) and less frequent use of ancillary intubating devices compared to DL and the McGrath VL.
Conclusion: Video-Mac and GlideScope required fewer intubation attempts than standard DL and the McGrath device. The Video-Mac also significantly reduced the time needed to secure the airway and improved the glottic view compared to standard DL.

1. Introduction

More than two-thirds of adults in the United States are overweight or obese, and an increasing percentage are morbidly obese [1]. Patients with a body mass index (BMI) over 40 (or BMI of 35 with one additional co-morbidity) are considered candidates for bariatric surgery [2]. Although many would agree that obesity *per se* is not a risk factor for difficult intubation [3], there are many well known obesity-related challenges in airway management including difficulty with mask ventilation, more frequent and rapid oxygen desaturation, increased oxygen consumption, and increased sensitivity to the respiratory depressant effects of anesthetic and analgesic drugs [4]. However, other authors maintain that difficult or failed intubation in obese patients is more common than patients who are not obese [5]. For example, Shiga et al [6] reported the incidence of difficult intubation in the obese population with a BMI of greater than 30 was 15.8% compared to 5.8% in the general population; while Juvin et al [5] reported 15.5% compared to 2.2%. Others [5,7] suggest that it is more difficult to perform tracheal intubation or obtain a clear view of the glottis in morbidly obese patients.

Recent publications have reported the superiority of video-laryngoscopy (VL) over direct laryngoscopy (DL) with respect to obtaining the glottic view, less associated local airway trauma, and maintaining oxygen desaturation when used for intubation of obese patients [2,4,8–10]. However, other studies report an increased intubation time and higher intubation failure rates with VL compared to standard DL [11,12]. We hypothesized that use of VL devices would decrease intubation time and improve the glottic view compared to standard DL. The secondary objective was to determine if there were any significant differences among the three VL devices and DL with respect to adverse events.

2. Materials and methods

After obtaining IRB approval at Cedars Sinai Medical Center in Los Angeles (IRB Protocol: Pro00019199, Clinical trials registration http://www.clinicaltrials.gov NCT01114945 April 2010), consenting patients satisfying the inclusion criteria were enrolled from May 2010 to February 2012. The inclusion criteria were as follows: participants scheduled for elective bariatric surgery and, 18–80 years of age with a BMI >30 kg/m^2. Exclusion criteria included patients with a history of facial abnormalities, previous oral-pharyngeal cancer or reconstructive surgery, cervical spine injury, patients who required an awake fiber optic intubation, emergency operations, severe mental disorder, pregnant patients, and those with a history of a difficult intubation. This study complied with all 25 items on the Consort 2010 checklist (Appendix I).

After obtaining written informed consent, 121 obese patients undergoing bariatric surgery (e.g., laparoscopic gastric band placement, laparoscopic Roux-EN-Y gastric bypass laparoscopic) requiring general endotracheal anesthesia were randomly assigned to one of 4 study groups using a 1:1 allocation ratio using Minitab 12 computer software. The 4 intubating device groups included: Group 1 (Control): DL utilizing a standardized Macintosh (Mac) blade; Group 2: Video-Mac video laryngoscope (VL); Group 3: GlideScope VL (GlideScope GVL and Cobalt-Reusable); and Group 4: McGrath VL (Series 5). Blade size 3 or 4 was utilized in the 4 intubating device groups, and determined by the attending