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LETTER TO THE EDITOR

# Videolaryngoscopy Versus Direct Laryngoscopy for Patients with Obesity Requiring Tracheal Intubation: a Meta-analysis

Michele Carron[1] · Federico Linassi[2] · Giovanna Iepparielloo[3]

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To the Editor,

Obesity is associated with clinical features that may increase difficulty in airway management [1]. The availability of appropriate airway equipment is recommended to improve the visualization of the larynx and thereby facilitate tracheal intubation [1–3]. Two meta-analyses showed an overall advantage of videolaryngoscope without tracheal tube guide versus Macintosh laryngoscope for tracheal intubation in adult patients [2, 3]. However, they failed to show clearly the differences among the types of videolaryngoscope without tracheal tube guide commonly used in patients without [2] and with obesity [3]. To address this aspect in patients with obesity, a meta-analysis of available controlled studies was conducted based on the PRISMA methodology.

Two authors (GI and FL), with the help of a third author (MC) in case of discrepancies, independently conducted English-language literature searches of PubMed, Scopus, Web of Science, and the Cochrane Library to identify randomized controlled trials (RCTs) comparing videolaryngoscope without tracheal tube guide to Macintosh laryngoscope for tracheal intubation in adult patients with obesity [2, 3]. The terms "laryngoscopy," "videolaryngoscopy," "laryngoscope," or "videolaryngoscope" and "obesity" or "obese" were combined [2, 3]. After screening the titles and abstracts, the authors assessed the full texts of potentially relevant articles to determine whether they were eligible for the meta-analysis according to the end points. The end points were as follows: optimal glottic visualization, successful intubation, and intubation time.

The meta-analysis was performed within a frequentist framework, computing relative risk (RR) and 95% confidence interval (CI) for binary outcome data and mean difference (MD) and 95% CI for continuous outcome data. When necessary, the mean and standard deviation were estimated from the median and interquartile range, according to Wan et al. [4].

The following were considered: the number of patients treated with the videolaryngoscope without tracheal tube guide (experimental group) or the Macintosh laryngoscope (control group), Cormack–Lehane grade 1 of laryngoscopic view, first-attempt intubation success rate, intubation success (or intubation failure defined as need to switch intubation device) rate, and intubation time.

Meta-analyses were performed using both random- and fixed-effect models. The Mantel–Haenszel method was used to calculate fixed-effect estimates for dichotomous data. When calculating RRs, 0.5 was added to the frequencies of all studies with zero events. The random-effect model was computed with inverse-variance weighting using the DerSimonian and Laird method to account for heterogeneity. Heterogeneity across studies was tested using the $I^2$ statistic. $I^2 > 50\%$ was considered substantial. A random-effect model was considered most appropriate and therefore used in subsequent analyses. Computations were performed using R (Schwarzer, G.; meta: General Package for Meta-Analysis; R package version 3.4.0 [2017-04-21]).

Of the 1023 reports initially identified, eight RCTs involving a total of 968 patients were eligible for meta-analysis [5–12]. Of these, three RCTs reported the use of the McGrath videolaryngoscope [5–7], three RCTs the C-MAC videolaryngoscope [5, 9, 10], and four RCTs the GlideScope videolaryngoscope [5, 8, 11, 12]. The studies showed a low risk of bias for random allocation and sequence generation [5–12], allocation concealment [5–11], and measurement of the outcome [5–12]. All studies showed high risk of bias for blinding [5–12].

Compared with Macintosh laryngoscopy, videolaryngoscopy showed an overall higher likelihood of optimal glottic

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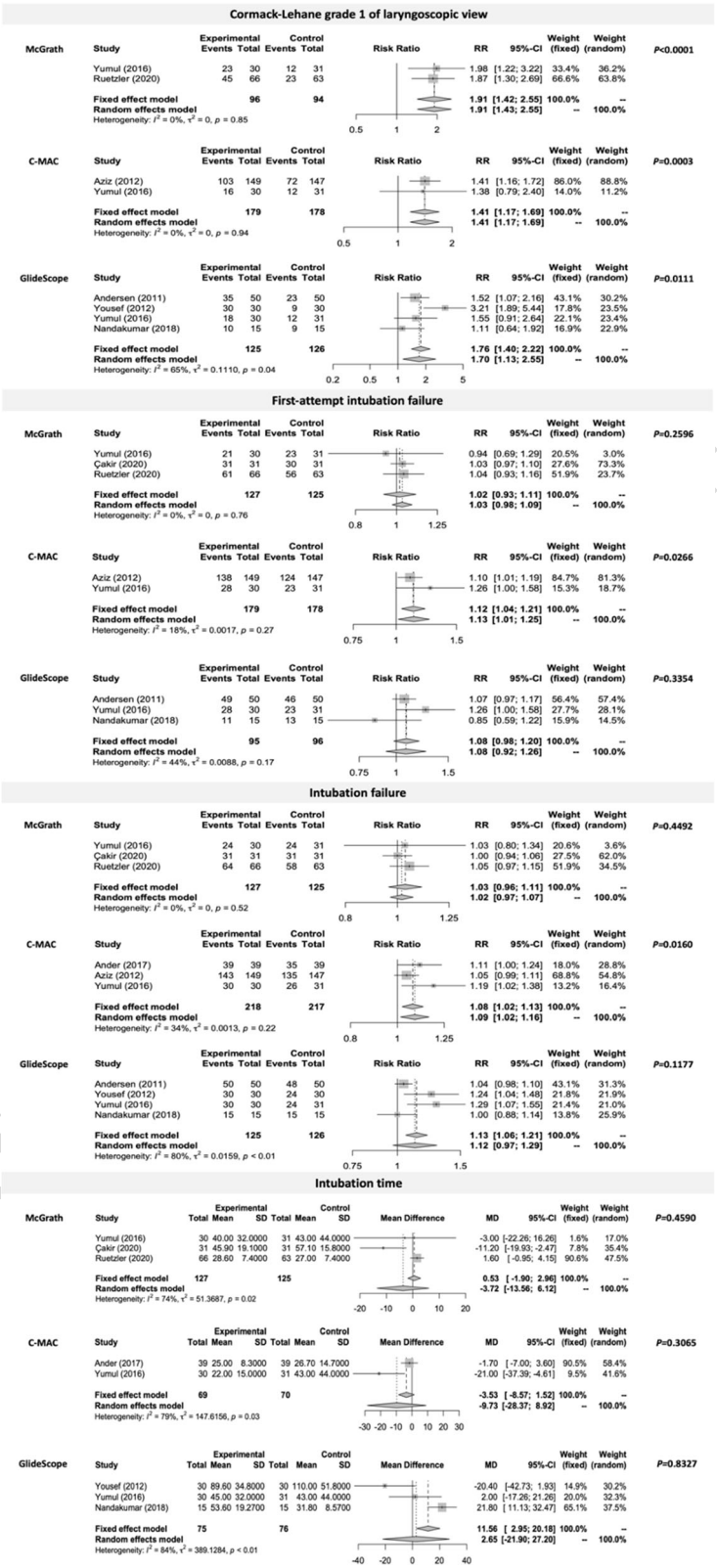


**Fig. 1** Forest plots representing the results of a meta-analysis of data from English-language randomized controlled trials (RCTs) comparing videolaryngoscopy to direct laryngoscopy for tracheal intubation in patients with obesity. A systematic review with meta-analysis was conducted based on the PRISMA methodology. PubMed, Google Scholar, Scopus, Web of Science, and Cochrane Library were searched in January 2021 to identify RCTs comparing videolaryngoscopes without tracheal tube guide to Macintosh laryngoscope for tracheal intubation in adult patients with obesity. The terms "laryngoscopy" OR "videolaryngoscopy" OR "laryngoscope" OR "videolaryngoscope" AND "obesity" OR "obese" were combined [2, 3]. Among videolaryngoscopes without tracheal tube guide, C-MAC, but not McGrath and GlideScope, showed to reduce the likelihood of intubation failure in patients with obesity

visualization (relative risk [RR]: 1.63; 95% confidence interval [CI]: 1.35, 1.97; $p < 0.0001$; $I^2 = 41.0\%$), first-attempt intubation success (RR: 1.06; 95% CI: 1.01, 1.11; $p = 0.0078$; $I^2 = 16.8\%$), intubation success (RR: 1.06; 95% CI: 1.02, 1.11; $p = 0.0036$; $I^2 = 50.3\%$), and lower intubation time (MD: − 1.78 s; 95% CI: − 8.82, 5.26; $p = 0.6204$; $I^2 = 79.2\%$).

In the subgroup analysis, compared with Macintosh laryngoscope, videolaryngoscope without tracheal tube guide (McGrath, C-MAC, GlideScope) showed to significantly improve glottic visualization (Fig. 1). However, despite an overall favorable trend, only the use of C-MAC resulted to a significantly higher likelihood of first-attempt intubation success and lower likelihood of intubation failure in patients with obesity (Fig. 1). No videolaryngoscope without tracheal tube guide showed to impact significantly on intubation time (Fig. 1).

The meta-analysis has some limitations. First, the impossibility to blind personnel to the type of laryngoscope used may have favored a high level of performance bias, owing to the potential for user preference [2]. Second, the paucity of data available and the considerable heterogeneity across studies may have affected the outcomes.

In conclusion, the results seem to support an overall advantage of videolaryngoscopy compared with Macintosh laryngoscopy for tracheal intubation in patients with obesity, confirming some findings observed in patients without obesity [3]. More specifically, the advantage seems evident for the C-MAC videolaryngoscope more than the McGrath and GlideScope videolaryngoscopes in patients with obesity. However, further studies are necessary to draw definitive conclusions about the superiority of all types of videolaryngoscope without tracheal tube guide over the Macintosh laryngoscope in patients with obesity.

**Author Contribution** Michele Carron: conceptualization, methodology, validation, formal analysis, data curation, writing—original draft preparation, writing—review and editing.

Federico Linassi: investigation, data curation, writing—review and editing.

Giovanna Iepparielllo: investigation, data curation, writing—review and editing.

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## Declarations

**Ethical Approval Statement** This article does not contain any studies with human participants or animals performed by any of the authors.

**Informed Consent Statement** Informed consent does not apply.

**Conflict of Interest** The authors declare no competing interests.

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