



First Pass Success Rate of Glide scope and Video Laryngoscopy During Endotracheal Intubation; Systematic Review

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Abstract

Background: Due to the urgency, comorbidities, and operator variability, numerous tries are frequently necessary for the severely sick patients undergoing urgent endotracheal intubation by direct laryngoscopy, with a higher risk of complications. In order to determine how many tries are required to position a single-lumen tube correctly during endotracheal intubation between video and direct laryngoscopy, we examined the recently published studies.

Method: This investigation was carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards. An electronic search was conducted through four online databases: PubMed, Scopus, Embase, and the Cochrane Library. As the main result, we looked for English-language publications from 2017 to 2024 that addressed the first pass success rate for video laryngoscopy or Glide scope.

Result: Six research total-five randomized controlled trials and one retrospective cohort-were included in our review. Airtraq laryngoscope, McGrath, Pentax-Airway Scope, and King VISION are some of the glidescope or video laryngoscopy techniques that are employed. For direct method, the majority of the listed research used Macintosh. Most of the included studies found that first pass success rate was more in VL compared to DL. Most of the included investigations found that the safety outcomes for VL and DL were similar.

Conclusion: Endotracheal intubation required fewer tries when VL was used in place of DL.

Keywords: Video Laryngoscopy; Glidescope; Direct Laryngoscopy; Endotracheal Intubation; First Pass Success Rate

Introduction

The most widely used video laryngoscope (VL) is the GlideScope model. GlideScope has been linked to better glottic visualization when compared to direct laryngoscopy (DL); however, endotracheal intubation (ETI) success using the GlideScope has not been shown to be higher than that of the conventional laryngoscope [1-3]. While ETI is almost always successful in the end, about 8% of patients need more than one attempt at ETI [4]. Recurring attempts at ETI can lead to hemodynamic and respiratory problems, such as aspiration, regurgitation, hypoxemia, airway damage, and even cardiac arrest [5-7].

DL can make it challenging to see the glottis and vocal cords, but when structures are visible, passing a tube is typically simple. Introduced in 2001, VL has the potential to enhance airway visibility, but it has also been linked to unsuccessful and protracted efforts at ETI [8-10]. For instance, in a trial involving 371 patients in the intensive care unit, VL was linked to a higher frequency of severe life-threatening complications-such as death, severe cardiovascular collapse, severe hypoxemia and cardiac arrest-than direct laryngoscopy (2.8% of patients). Additionally, VL failed to improve first-attempt ETI success [10]. On the other hand, better glottis visibility and better first-pass success using VL have been found in other trials [11-13]. It is uncertain to what degree VL could make ETI easier for patients in standard clinical practice.

That is why this systematic review examined recent studies discussing the number of attempts needed to properly position a single-lumen tube during ETI between VL and DL.

Method

The Preferred reporting items for systematic reviews and meta-analyses (PRISMA) criteria were followed in the conduct of this study. Four internet databases-PubMed, Scopus, Embase, and the Cochrane Library-were searched electronically. The following keywords were used in the search that were relevant to the review's subject: Glidoscope; video laryngoscopy; direct laryngoscopy; McGrath; Pentax-Airway Scope; Macintosh; endotracheal intubation; intensive care unit; emergency department; first-pass tracheal intubation; first-pass success rate. We searched for articles published in English in the period from 2017 to 2024 and discussing the first pass success rate for Glidoscope or video laryngoscopy as the primary outcome.

These keywords were connected using a variety of Boolean operators. Furthermore, to find pertinent records, Mesh-terms and other database-specific filters were applied. Additionally, editorials, letters, conference proceedings, and commentary were not included. Following the identification of pertinent records, we screened the titles and abstracts. The preliminary included records were then retrieved and their eligibility was evaluated. The primary endpoint of the clinical trials, both randomized and non-randomized, as well as other interventional research, was the first pass success rate for Glidoscope or video laryngoscopy. Excluded from consideration were studies that employed simulations and educational or technology-based interventions. Additionally, studies that provided insufficient information about the primary outcome were not included in this analysis.

Following the selection of the studies that were included, a data extraction sheet was created to gather information about; Citation, sample size, year of publication, country, groups, method, first pass success rate, main findings and conclusion

Results

We included 6 studies in our review (Figure 1), 5 were randomized controlled trials [10,14-17], and one was retrospective cohort [18]. One study published in 2024 [16], two studies in 2023 [14,15], 2 in 2019 [17,18], and one study in 2017 [10]. Studies was conducted in USA [14,16], one in Germany [15], one in France [10], one in Japan [18], and one in Egypt [17]. Techniques of glidescope or video laryngoscopy used include McGrath, Pentax-Airway Scope, King VISION, and Airtraq laryngoscope. Macintosh for DL was used in most of the included studies (Table 2).

According to Ruetzler K., *et al.* (2024) study ETI failure happened in 0.27% of surgical procedures utilizing VL compared to 4% of surgical procedures using DL and there was no discernible difference in airway or oral damage across VL procedures. In Suzuki K., *et al.*, 2019 [18] and Kriege M., *et al.*, 2023 [15], when using the McGrath technique instead of DL, first-pass ETI success was greater (Table 1). All of the included studies except Lascarrou JB., *et al.* 2017 [10], demonstrate that first-pass ETI success rates was higher in VL when compared with DL.

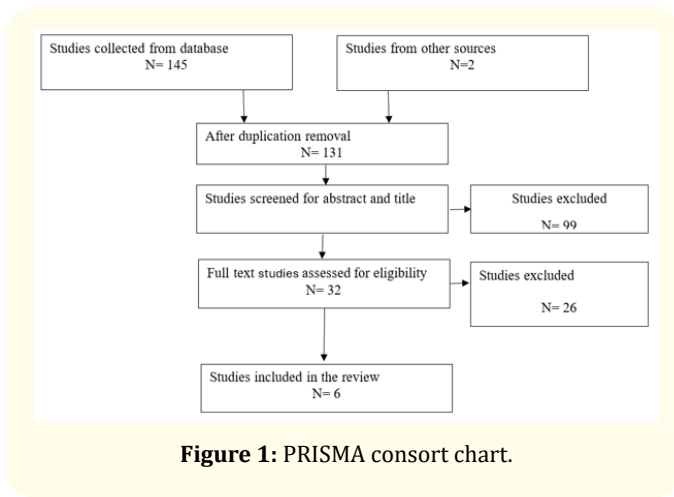


Figure 1: PRISMA consort chart.

Citation	Sample size	Country	Groups	Random-ized (Yes/ No)	Operator	First-pass Success rate
Ruetzler K., <i>et al.</i> 2024 [16]	VL group n = 4413 DL group n = 4016	USA	DL group VL group	Yes	Certified registered nurse, Medical students At- tending anesthesiolo- gist. And Resident, Fellow.	DL = 92.4% VL = 98.3%
Kriege., <i>et al.</i> 2023 [15]	DL group n = 1039 McGrath group n = 1053	Germany	DL McGrath	Yes	Trainees, n = 687 Consultants, n = 352	McGrath 93.7% compared with DL 81.6%
Prekkeret <i>et al.</i> 2023 [14]	VL group n = 705 DL group n = 712	USA	DL group VL group	Yes	Emergency medicine residents and critical care fellows	85.1% in the VL group and 70.8% in DL group
Lascarrou., <i>et al.</i> 2017 [10]	VL group = 186 DL group = 185	France	DL group VL	Yes	Operators with diverse skill levels.	VL = 67.7% DL group = 70.3%
Suzuki., <i>et al.</i> 2019 [18]	Pentax-Airway Scope (n = 82) King VISION (n = 59) McGrath Mac (n = 82) Macintosh (n = 64)	Japan	VL and Macintosh laryn- goscope group	No	expert and non-expert operators	Pentax 78% McGrath 78% King 58% Macintosh 58%
Abdallah., <i>et al.</i> 2019 [17]	Airtraq laryngoscope = 35 Macintosh laryngo- scope = 35	Egypt	Airtraq laryngo- scope Macintosh laryngo- scope	Yes	Anesthesia specialists	Airtraq laryngo- scope = 97.1% Macintosh laryngo- scope = 94.3%

Table 1: Characteristics of the included studies.

VL: Video Laryngoscopy; DL: Direct Laryngoscopy

Citation	Main findings	Conclusion
Ruetzler, <i>et al.</i> 2024 [16]	With an estimated proportional odds ratio for the number of ETI attempts of 0.20, more than one attempt was needed in 1.7% of surgical operations randomized to receive VL compared to 7.6% of surgical procedures randomized to receive DL. With an unadjusted absolute risk difference of -3.7%, ETI failure happened in 0.27% of surgical procedures utilizing VL compared to 4% of surgical procedures using DL. There was no discernible difference in airway or oral damage across VL procedures.	At one US academic medical center, the number of attempts required to achieve ETI was reduced via hyper-angulated VL as opposed to DL.
Kriege, <i>et al.</i> 2023 [15]	When using the McGrath technique instead of DL, first-pass ETI success was greater; the absolute risk reduction (95%CI) was 12.1%. When compared to DL, McGrath’s relative risk of an unsuccessful ETI on the first attempt was 0.34. DL yielded higher rates of Cormack and Lehane grade ≥ 3 than McGrath. There was no discernible variation between the groups’ adverse events related to ETI.	Patients undergoing elective surgery have better success rates with first-pass ETI when using McGrath VL as opposed to DL. For ETI, practitioners might think about utilizing this equipment as their first option.
Prekker, <i>et al.</i> 2023 (14)	Of the 1417 patients that made it into the final analysis, 85.1% of those in the VL group and 70.8% of those in the direct-laryngoscope group were successfully intubated on their first try. Severe complications occurred during ETI in 21.4% of patients in the group using a VL and 20.9% in the group using a direct laryngoscope. The two groups’ safety results, such as aspiration, tooth damage, and esophageal intubation, were comparable.	Compared to the use of a direct laryngoscope, the use of a video laryngoscope yielded a greater rate of successful ETI on the first try.
Lascarrou, <i>et al.</i> 2017 [10]	In the VL and DL groups, the proportion of patients who had a successful first-pass ETI did not differ significantly. Neither did the proportion of first-attempt ETI carried out by non-experts. The median successful ETI time was 3 minutes. VL was not linked to any life-threatening complications; however, in post hoc analysis, it was linked to severe life-threatening complications but not to mild and moderate complications.	When compared to DL, VL resulted in greater rates of serious, life-threatening complications and did not enhance first-pass ETI rates.
Suzuki, <i>et al.</i> 2019 [18]	There were 287 emergency TIs in total. The Pentax, King, McGrath, and Macintosh equipment had first-pass ETI success rates of 78%, 58%, 78%, and 58%, respectively. When it came to the Pentax (87%) and McGrath (78%) instruments, the non-expert operators’ success rates were much greater than the specialists’ for the King (50%) and Macintosh (46%) devices. When compared to the Macintosh laryngoscope, the Pentax and McGrath equipment had considerably higher first-pass ETI success odds following adjustments for challenging airway characteristics, TI indication, and expert versus non-expert operator parameter modifications. But the King instrument was unable to demonstrate any appreciable advantage.	When compared to the Macintosh laryngoscope, the Pentax and McGrath laryngoscopes demonstrated noticeably greater emergency ETI first-pass ETI success rates, particularly for non-expert operators.

<p>Abdallah., <i>et al.</i> 2019 [17]</p>	<p>Compared to Macintosh Group, Airtraq laryngoscope Group had a substantially higher percentage of glottic opening score, a significantly shorter ETI duration, and a faster time to the optimal laryngoscopic view. In Airtraq laryngoscope Group, the first-attempt success rate was 97.1%, whereas in Macintosh Group, it was 94.3%. Compared to Airtraq laryngoscope Group, which had 0% postoperatively, 2.9% of Macintosh Group patients experienced laryngospasm and sore throat. Macintosh Group exhibited significantly higher heart rate, mean arterial pressure, serum epinephrine, and cortisol levels compared to Airtraq laryngoscope Group.</p>	<p>Airtraq provided noticeably better ETI criteria and a reduced stress response to laryngoscopy and ETI when compared to the Macintosh laryngoscope.</p>
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Table 2: Main findings and conclusion.

Discussion

Our goal in doing this systematic review was to look at recent research on the number of tries required between VL and DL to position a single-lumen tube correctly during ETI. We infer that fewer tries were required to complete the ETI when VL was used in place of DL. For first-pass ETI, patients undergoing elective surgery have better success rates when VL is used instead of DL. Practitioners ought to think about starting with VL when it comes to ETI. When compared to the Macintosh laryngoscope, the Pentax and McGrath laryngoscopes demonstrated noticeably higher first-pass ETI success rates for emergency ETI, particularly for non-expert users.

According to Kriege., *et al.* (2023) trial of patients with seemingly healthy airways who were randomized to receive VL vs. DL for surgical procedures showed improved outcomes with VL: Compared to 18% with DL, only 6% with VL required numerous attempts at intubation [18]. Even though Ruetzler., *et al.* (2024) [16] trial was not limited to patients with apparent good airway health and few ETI attempts were performed by attending anesthesiologists, multiple attempts were needed in almost three times as many patients with each device as in Kriege., *et al.* (2023). Ruetzler., *et al.* trial’s requirement for multiple intubation efforts was roughly in line with a large review which found that 9% of patients receiving DL required multiple ETI attempts [19].

On the other hand, a meta-analysis conducted in 2022 on more than 60 studies revealed a small rise in the number of initial intubation attempts that were successful when using hyper-angulated VL [20]. But a major portion of the meta-analysis was derived from tiny trials. The advantage may have been

underestimated in certain trials due to poor familiarity with VL and hyper-angulated blades, even if all doctors were likely familiar with DL.

According to most of the included studies [14-16], the two groups’ safety outcomes, such as aspiration, tooth damage, and esophageal intubation, were comparable. Compared to Airtraq laryngoscope Group, which had 0% postoperative complications, 2.9% of Macintosh Group patients experienced laryngospasm and sore throat. Macintosh Group exhibited significantly higher mean arterial pressure, heart rate, cortisol levels and serum epinephrine, compared to Airtraq laryngoscope Group [17].

The majority of the included studies showed that each group’s airway damage were comparable. Patients who have difficulty with laryngoscopy or intubation are more prone to experience airway injury; this is especially true for those who need several, frequently progressively strained attempts at the procedure. As a result, it is impossible to definitively link harm to any one technology, however there is no proof that using a VL raised the chance of airway damage.

Commercially accessible VL come in a variety of designs, and blade composition varies widely. A hyper-angulated shape that facilitates vision of anterior airway features is used in some designs of VL blades, while other designs are mostly based on the shape of Macintosh blade [21,22]. Although hyper-angulated blades often offer superior views of the glottis, the vocal cords can occasionally prevent the passage of ETI [21]. Because of this, stylets are frequently needed when utilizing hyper-angulated blades, however direct visualization techniques may typically be used to

intubate a patient without a stylet. As a result, all VL-assisted ETIs were performed with a stylet, as advised by the manufacturer; however, clinicians were free to choose whether or not to use a stylet during DL.

Several randomized trials and large observation studies indicated that frequent intubation attempts promote problems such as aspiration, hypoxemia, airway damage, and even mortality. These findings suggest that the improvement found with VL may have therapeutic significance [23,24].

Conclusion

When using VL instead of DL, fewer attempts were needed to accomplish ETI. When employing VL rather than DL for first-pass ETI, patients undergoing elective surgery have higher success rates. Practitioners may consider using VL as their first choice for ETI. The Pentax and McGrath laryngoscopes showed significantly higher first-pass ETI success rates for emergency ETI when compared to the Macintosh laryngoscope, especially for non-expert operators.

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