

# Evaluation of the Glidescope®, the McGrath® and the Airtraq® laryngoscopes in simulated difficult airways: a randomized controlled comparison.

Savoldelli GL, Waeber JL, Abegg C, Baeriswyl V, Clergue F, Schiffer E

## Background and Goal of Study

- Difficult direct laryngoscopy has an incidence of 1.5 to 8.5% and is associated with intubation difficulties, morbidity, and mortality.<sup>1</sup> Several new video and optical laryngoscopes may help in these situations.
- Three indirect laryngoscopes are becoming popular: the Glidescope® (GVL) (Verathon Inc., Bothell, USA), the McGrath® (MVL) (Aircraft Medical Ltd, Edinburgh, UK) and the Airtraq® laryngoscopes (AOL) (Airtraq®, Prodol Meditec S.A., Vizcaya, Spain). Few studies have assessed their relative efficacy.
- Using a manikin, we compared the efficacy and the easiness of use Glidescope (GVL), the McGrath (MVL), the Airtraq (AOL) and the Macintosh (MI) laryngoscopes in 3 difficult airway scenarios.

## Materials and Methods

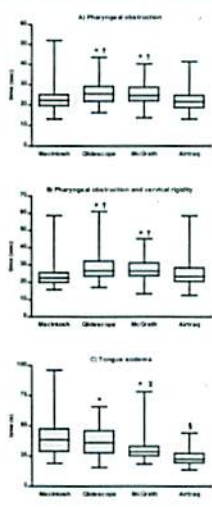
- After IRB approval, 60 anaesthetists (20 staff, 20 residents, and 20 nurses) participated in this randomized study. All participants were experienced with the MI but novice with the other devices.
- After standardized training (didactic presentation, demonstration and hands-on practice), the participants intubated the Laerdal SimMan® manikin with each laryngoscope in 3 different scenarios: **1) Pharyngeal obstruction, 2) Pharyngeal obstruction and cervical rigidity and 3) Tongue Oedema.**
- The sequence of use of the devices was randomized.
- Outcome measures were: duration of intubation attempt, Modified Cormack grades (I, IIa, IIb, III, IV)<sup>2</sup>, difficulty of use (0 extremely easy to 100 extremely difficult) and severity of dental pressure (0=none, 1=mild, 2=moderate, 3=severe)<sup>3</sup>.
- Data were analyzed using Friedman (overall), Wilcoxon signed rank (post-hoc), or Kruskal-Wallis (inter-professions comparisons) tests.

## Results

- No intubation failure was observed in scenario 1 and 2.
- In scenario 3, intubation failures occurred with the MI (37%), the GVL (2%) and the AOL (2%).
- No failure was observed with the MGL.

• Figure 1 summarizes the TTI with each device in each scenario.

Figure 1: Box plot representing the time taken to successfully intubate the manikin



- In scenario 1 and 2, TTI with MI and AOL did not differ. Both were faster than MGL and GVL. MGL and GVL did not differ.
- \* P<0.01 compared with MI
- † P<0.01 compared with AOL
- In scenario 3, TTI were highly different; Intubation was the fastest with AOL, followed by MGL, GVL, and was the slowest with MI.
- \* P<0.01 compared with MI
- ‡ P<0.01 compared with GVL
- § P<0.01 compared with MI, GVL and AOL

• Modified Cormack-Lehane grade views (MCL) distributions for each scenario and for each device are shown in Figure 2.

• In comparison to the traditional MI blade, indirect laryngoscopes provide better laryngeal exposure in all difficult airway scenarios. (\* P<0.001 compared with MI)

• The AOL and the MGL provided better laryngeal exposure compared with the GVL. († P<0.001 compared with GVL)

• The use of indirect laryngoscopes provided spectacular improvement in the tongue oedema scenario.

• Table 1 summarizes other study endpoints.

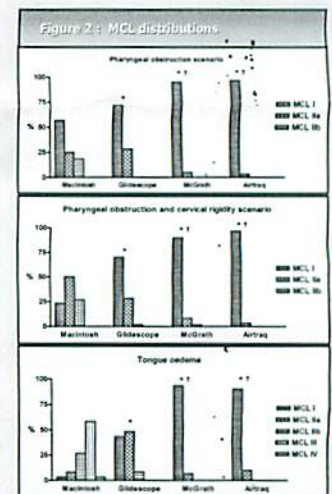


Table 1

Scenario	Endpoint	Macintosh	Glidescope	McGrath	Airtraq	P (overall)
1) Pharyngeal obstruction	Dental trauma	2.2 ± 0.6	1.7 ± 0.8*	0.9 ± 0.5*†	0.8 ± 0.4*†	< 0.001
	Difficulty of use (0-100)	29 ± 23	24 ± 17	20 ± 15*‡	18 ± 12*‡	= 0.03
	Favorite laryngoscope (%)	12	23	32	33	= 0.07
2) Pharyngeal obstruction and cervical rigidity	Dental trauma	2.8 ± 0.5	2.1 ± 0.6*	1.5 ± 0.5*†	1.3 ± 0.5*†§	< 0.001
	Difficulty of use (0-100)	35 ± 25	28 ± 18	24 ± 18*	32 ± 22*	< 0.01
	Favorite laryngoscope (%)	12	23	43	22	< 0.01
3) Tongue oedema	Dental trauma	3 ± 0	2.4 ± 0.6*	1.4 ± 0.7*†	1.0 ± 0.5*†§	< 0.001
	Difficulty of use (0-100)	72 ± 26	48 ± 23*	25 ± 18*†	23 ± 18*†	< 0.001
	Favorite laryngoscope (%)	2	2	46	46	< 0.001

\* P<0.05, † P<0.01, ‡ P<0.001, § P<0.05, compared with Glidescope, ¶ P<0.01 compared with McGrath.

## Conclusions

- In comparison to the traditional Macintosh blade, indirect laryngoscopes provide better intubating conditions and facilitate tracheal intubation.
- Compared with the MI, all indirect laryngoscopes provided better laryngeal exposure in all difficult airway scenarios. However, compared with the GVL, the AOL and MGL improved laryngeal view to a greater extent.
- Indirect laryngoscopes also appear to produce less dental trauma and are easier to use than the Macintosh even when used by practitioners experienced with the latter. These advantages increased with the level of difficulty of the scenario and were more pronounced in the "tongue oedema" scenario.
- Similar comparative studies on real patients are needed to further delineate the advantages and the limitations of indirect laryngoscopes and to better define their place in airway management strategies.

## References

- 1) Crosby ET et al. Can J Anaesth 1998; 45(7): 757
- 2) Yentis SM et al. Anaesthesia 1998;53:1041-4.
- 3) Maharaj CH et al. Anaesthesia 2006;61:469-77.

## Acknowledgements

We would like to thank the Department of Anaesthesia for his financial support; the staff, residents and nurses for their participation in the study; and the simulation centre coordinator, José Manuel Garcia, for his priceless logistical support.