

Learning curves of the Glidescope®, the McGrath® and the Airtraq® laryngoscopes in "normal airways": a manikin study

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Background and Goal of Study

- Indirect laryngoscopes (video and optical) were developed to facilitate intubation in case of difficult direct laryngoscopy. In the past few years, several devices have been introduced but few have been compared in terms of their learning curves, efficacy, and usability.
- 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).
- Using a manikin with normal airways we compared the learning curves, the efficacy, and the easiness of use of these devices with the traditional Macintosh blade (MI), using subjects familiar with the latter but novice with indirect laryngoscopes.

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 (> 50 laryngoscopies) but novice with the other devices.
- Starting with the MI, participants intubated the Laerdal SimMan® (with normal airway setting) 5 times in a row with each laryngoscope. The sequence of use of the GVL, MGL and AOL was randomized. Before using a new device, a didactic presentation and a demonstration were provided. Constructive feedback was also given by a single instructor between each attempt.
- Outcome measures were: duration of intubation attempt, Modified Cormack grades (I, IIa, IIb, III, IV)¹, difficulty of use (0 extremely easy to 100 extremely difficult) and severity of dental pressure (0=none, 1=mild, 2=moderate, 3=severe)².
- Data were analyzed using Friedman (overall), Wilcoxon signed rank (post-hoc), or Kruskal-Wallis (inter-professions comparisons) tests.

Results

- The duration of the five intubation attempts with each device are graphically displayed in Figure 1 and comparisons are detailed in Table 1.
- The AOL had the most favorable learning curve and mirrored the MI after only two attempts.
- The GVL and MGL had steep learning curves but after five attempts differences persisted in time taken to intubate when compared with the MI and the AOL.
- Modified Cormack grades, severity of dental pressure and difficulty of use differed between the devices (Table 1).
- Post-hoc analysis indicated that indirect laryngoscopes provided better laryngeal exposure and potentially less dental trauma compared with direct laryngoscopy.
- With the MI, staff anaesthesiologists obtained better laryngeal views ($P = 0.013$) and shorter intubation times ($P = 0.004$) compared with nurses and residents.
- Laryngeal exposure with indirect laryngoscopes was not influenced by the participants' position, however, intubation times differed for the MGL ($P = 0.001$; staff and residents faster than nurses) and for the AOL ($P = 0.022$; staff faster than nurses).

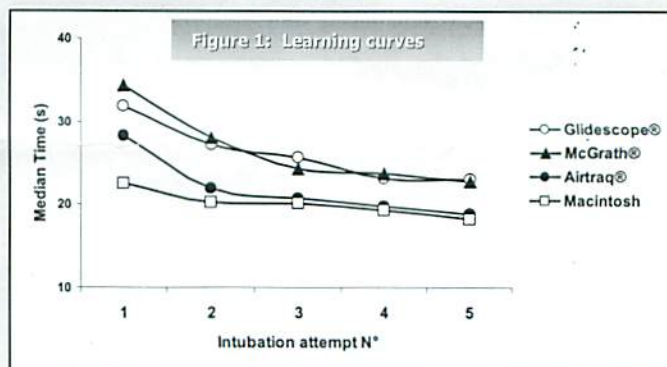


Table 1

Endpoints	Macintosh	Glidescope	McGrath	Airtraq	P (overall)
Duration of intubation (s)	1 22.6 (15-53.7)	31.9 (19.8-94.9) *	34.4 (19-91.7) *	28.3 (16.6-44.2) * † †	< 0.001
Attempt No:	2 20.3 (14-36.2)	27.2 (15.8-39.6) *	28.1 (15.8-64.9) *	22 (13.3-52.4) † †	< 0.001
	3 20.1 (14.6-33)	25.6 (14.9-41.2) *	24.4 (17.2-46.3) *	20.7 (12.1-39.1) † †	< 0.001
	4 19.3 (13.3-60)	23.2 (15.8-37.7) *	23.8 (16.5-40.6) *	19.9 (11.1-36.3) † †	< 0.001
	5 18.3 (13.6-36.3)	23 (12.6-42.4) *	22.8 (15.3-36.9) *	18.9 (10.9-38) † †	< 0.001
Modified Cormack I/IIa/IIb/III (n = 300)	62/35/2.5/0.5	79/21/0/0 *	97/3/0/0 † †	99/3/0/0 † †	< 0.001
Dental pressure (n = 300)	1.8 ± 0.6	1.7 ± 0.5 *	0.7 ± 0.6 † †	0.7 ± 0.5 † †	< 0.001
Difficulty of use (0-100)	16 ± 17	27 ± 18 *	22 ± 17	19 ± 15 ◊	= 0.014
Favorite laryngoscope (%)	27	17	31	25	= 0.42

N = 60 unless otherwise specified. Data reported as median (range), mean ± SD, or %. * = P<0.001 compared with Macintosh. † = P<0.001 compared with Glidescope. † † = P<0.001 compared with McGrath. † † † = P<0.05 compared with McGrath. ◊ = P<0.05 compared with Glidescope

Conclusions

- Intubation skills with indirect laryngoscopes were rapidly acquired and only minor differences were observed between professional groups.
- The AOL displayed the most favorable learning curve, probably reflecting a difference in endotracheal tube placement: guiding channel technique for the AOL versus steering technique for the GVL and the MGL.
- Compared with the MI, indirect laryngoscopes provided better laryngeal views and potentially less dental trauma. Regarding these outcomes, the GVL appeared slightly less efficient than the MGL and the AOL.
- In conclusions, the AOL and, to a lesser extent, the MGL and the GVL are easy to learn and appear to provide advantages over the MI. However, further comparative studies are needed in simulated difficult airways as well as in patients with or without difficult airway.

References

- 1) Yentis SM et al. Anaesthesia 1998;53:1041-4.
- 2) Maharaj CH et al. Anaesthesia 2006;61:469-77.

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