

THE A.P ADVANCE LARYNGOSCOPE VS. GLIDESCOPE RANGER IN A HIGH-FIDELITY SIMULATOR

Jack Hodd¹, Shipra Gupta¹, D. John Doyle¹

1. Outcomes Research, Cleveland Clinic, Cleveland, OH, United States.

2. Department of Anesthesiology, Cleveland Clinic Foundation, Cleveland, OH, United States.



Figure 1: GlideScope Ranger (left) and A.P. Advance Videolaryngoskop (right)

INTRODUCTION

Improvements in video-laryngoscope design may offer advantages for both novice and expert users. The new A.P. Advance (Venner Medical, Singapore) is based upon a standard Macintosh laryngoscope and offers the potential advantage of being intuitive for those familiar with direct laryngoscopy. It also has a novel guiding mechanism to facilitate difficult intubation. We therefore tested the hypothesis that the A.P. Advance (APA) was not inferior to the GlideScope Ranger (GS; Verathon, Bothell, WA, USA). The primary end point was time to intubation. Direct laryngoscopy (DL) was also performed as a control.

METHOD

An ethical waiver was provided by the Institutional Research Ethics Board. Entry criteria for participants required a previous training in DL and a job role which includes performance of tracheal intubation even if infrequent. Previous experience with all devices was recorded. After standardized orientation, training and practice in line with the manufacturer's instructions for the devices, clinicians attempted intubation of a simulated normal and difficult (swollen tongue) laryngoscopy using the Laerdal Sim Man 3G high-fidelity Mannequin. Objective measurements included time to visualization of the cords, time to tracheal intubation, number of discrete forward advances of the tracheal tube tip onto laryngeal structures and failure to intubate. Subjective measures included operator perception of traumatic intubation (10cm visual analogue score; VAS) and clinician's preference for devices following the evaluation.

In the initial univariate analysis, the Mann-Whitney U test was used for the non-parametric data. Student t-tests were used for the VAS analysis. A Fisher's Exact Test was used for percentage of abandoned procedures and oesophageal intubations. Bonferroni's correction was used.

RESULTS

90 participants were recruited: 28 (31%) had no intubation experience; 32 (36%) had only Mac experience and 30 (33%) had both Mac and GlideScope experience.

The APA was as fast as the Mac in the normal airway and faster than the GlideScope ($P < 0.01$) and faster than the GlideScope and Mac in the difficult airway ($P < 0.01$). Other results summarised in tables.

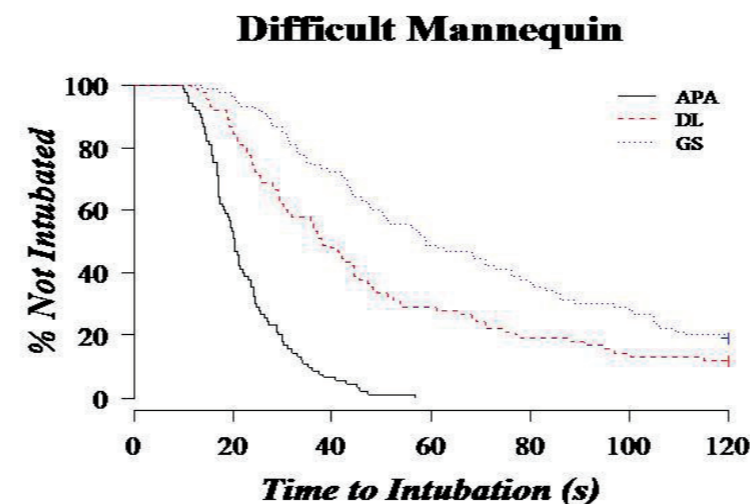
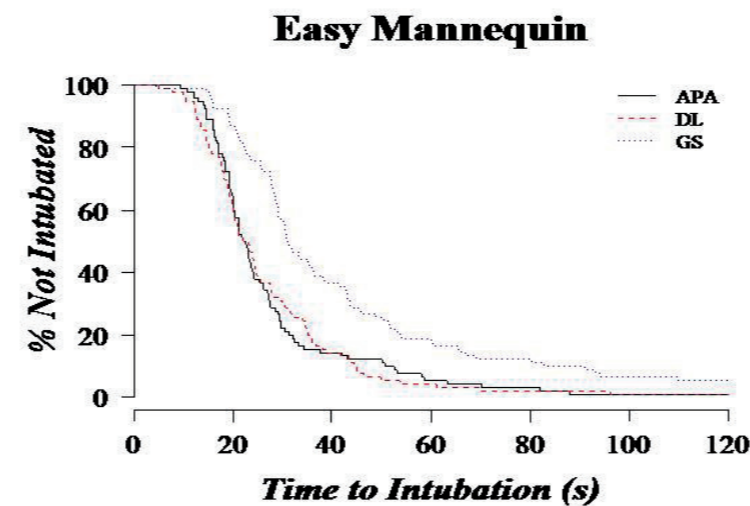


Figure 2: Kaplan-Meier of time to intubation by simulation difficulty and laryngoscope

DISCUSSION

The APA was superior to GS regarding intubation time (nearly two times as fast and potential for airway injury in normal and difficult airway simulation. Most participants preferred the APA.

Difficulty of Simulation	Normal			Difficult		
	APA	GS	DL	APA	GS	DL
Laryngoscope						
Time to visualization (s)	16 [13,22]	20 [16,23]	16 [12,25]	13 [10,16]	21 [17,30]	29 [19,51]
Time to declared intubation (s)	22 [18,29]	31 [26,50]	23 [18,34]	20 [17,27]	59 [36,105]	38 [24,69]
Time to Deliver Tube (Time from visualization to declared intubation)	6 [4,9]	12 [6,29]	6 [4,9]	7 [4,10]	36 [12,69]	7 [4,14]
Percentage with multiple attempts	6 (7%)	19 (21%)	9 (10%)	6 (7%)	56 (62%)	12 (13%)
Number of discrete forward advances into the laryngeal structure	0 [0,1]	1 [0,3]	0 [0,0]	0 [0,1]	3 [2,6]	0 [0,0]
C & L grade						
(1) Full view of glottis obtained	51 (57%)	56 (62%)	17 (19%)	63 (70%)	35 (39%)	4 (4%)
(2) Only posterior commissure of glottis was viewed	39 (43%)	34 (38%)	63 (70%)	26 (29%)	50 (56%)	29 (32%)
(3) Only the epiglottis was viewed	0 (0%)	0 (0%)	10 (11%)	1 (1%)	5 (6%)	30 (33%)
(4) Not even the epiglottis was viewed	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	27 (30%)
Percentage of Glottic Opening (POGO) score	80 [60, 80]	80 [60,100]	60 [40,60]	80 [80,100]	60 [40,80]	20 [0,40]

Difficulty of Simulation	Normal			Difficult		
	APA	GS	DL	APA	GS	DL
Abandoned procedures	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3%)	10 (11%)
Oesophageal intubations	0 (0%)	0 (0%)	2 (2%)	0 (0%)	5 (6%)	22 (24%)
Time >120s	1 (1%)	5 (6%)	1 (1%)	0 (0%)	17 (19%)	11 (12%)
>3 Attempts at intubation	1 (1%)	3 (3%)	1 (1%)	0 (0%)	22 (24%)	0 (0%)
Totals	1 (1%)	5 (6%)	3 (3%)	0 (0%)	30 (33%)	33 (37%)

Comparison of All Three Laryngoscopes	Macintosh Direct		Laryngoscope
	AP Advance	GlideScope Ranger	
Damage Score (VAS)	1.1 [0.5,2.8]	3.6 [1.9,5.4]	4.8 [2.6,7.4]
Ranking of Devices			
For Normal Airway	1 [1,2]	2 [2,3]	2 [1,3]
For Difficult Airway	1 [1,1]	2 [2,3]	3 [2,3]
Participants' choice of one device	74 (82%)	7 (8%)	9 (10%)

Comparison of Videolaryngoscopes	Preference		Favors AP Advance
	Favors GlideScope Ranger	No Preference	
Light Source	8 (9%)	61 (68%)	21 (23%)
Picture Quality	11 (12%)	44 (49%)	35 (39%)
Portability	1 (1%)	9 (10%)	80 (89%)
Position of Screen	6 (7%)	4 (4%)	80 (89%)

Figure 3: Details of failures and user preferences as median [quartiles] or N (%)

KEY POINTS

- In an univariate analysis, the APA is as fast as the Macintosh in Normal Airways and faster than the GlideScope in difficult airways
- APA causes less damage than GlideScope or Mac
- Participants preferred the APA