A comparative study of the efficacy of the McGrath® X-blade vs the C-MAC Videolaryngoscope in patients with simulated difficult airways

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BACKGROUND AND GOAL OF STUDY

The McGrath X-blade (Aircraft Medical, Covidien LLC, Mansfield, MA) is an angulated blade attachment that is designed to be used with the McGrath MAC videolaryngoscope. There is little literature on the efficacy of X-blade. We compared the McGrath X-blade with the C-MAC videolaryngoscope (Karl Storz, Tuttlingen, Germany) under the condition of a simulated difficult airway, through the use of manual in-line stabilisation. We present the findings of our interim study analysis.

MATERIALS AND METHODS

This is a prospective, patient-blinded, 2-centre, randomised control trial. Ethics approval was obtained from the institutional Domain Specific Review Board.

Patients of ASA physical status I to III, aged 21 to 80 years old, undergoing general anaesthesia requiring tracheal intubation were recruited for this randomised controlled trial. Exclusion criteria include: Patients with history of or predicted difficult airway, gastro-oesophageal reflux disease, patients who decline to participate or lack the mental capacity to give consent. Subject randomisation was performed using a computer-generated table. Device assignment was enclosed in sequentially-numbered, opaque and sealed envelopes.

General anaesthesia with muscle paralysis was performed using IV fentanyl, propofol and rocuronium in a standardised manner. Participants received intubation using either McGrath X-blade (MGX) or the C-MAC (CM) videolaryngoscopy, with manual in-line stabilisation. Primary outcome measured was First Pass Success (FPS). Secondary outcomes included overall successful intubation within 2 attempts or 120 seconds, time to intubation, Cormack and Lehane laryngeal grade obtained and complication rates.

Power calculation and statistical analysis

There are very few studies examining the first pass success of the CMAC videolaryngoscope in patients with cervical spine immobilization. McElwain demonstrated a FPS of 90% with the CMAC in this group of patients¹. Taking a 10% difference in FPS between the X-blade and the CMAC as clinically significant, a sample size of 200 is calculated, with a desired power of 80% and an alpha-error of 0.05 We aim to recruit 105 patients per device group to account for dropouts.

Continuous variables are presented as mean (standard deviation). Categorical variables are summarised using frequency (percentage). The chi-square test or Fisher’s exact test are used for comparison of categorical variables when appropriate. P-value less than 0.05 is considered as statistically significant. All analysis has been done by IBM SPSS Statistics for Windows, Version 22.0.

RESULTS

An interim analysis of 91 participants was performed.

Patient demographics were comparable between both MGX and CM groups (Table 1). Table 2 illustrates the primary and secondary outcomes. First pass success at intubation was 76.9% in the MGX group vs 81.3% in the CM group (p=0.3). Overall success was 88.4% (MGX) vs 91.7% (CM) (p=0.73). The Cormack & Lehane laryngeal grade was superior in the MGX group compared to CM group (Grade I: MGX 55.8% vs CM 25%; Grade II: MGX 44.2% vs CM 47.9%; Grade III: MGX 0% vs CM 7.1%; p<0.001). There was no significant difference in time to intubation [MGX 68.3s (mean 42.2s), CM 55.3 (mean 30.7s); p=0.087] and peri-operative complications between the two groups.

	C-MAC (n=48)	McGrath (n=43)	p value		C-MAC (n=48)	McGrath (n=43)	p value
Gender; %				Intubation success			
Female	16 (33.3%)	17 (39.5%)	0.539	First pass	39 (81.3%)	31 (76.9%)	0.30
Male	32 (66.7%)	26 (60.5%)		Overall	44 (91.7%)	38 (88.4%)	0.730
Age; years	54.6 (15.0)	53.2 (17.3)	0.691	Cormack & Lehane grade			
Weight; kg	68.8 (12.4)	65.1 (14.3)	0.187	I	12 (25)	24 (55.8)	
Height; cm	163.6 (8.1)	162.8 (10.1)	0.721	II	23 (47.9)	19 (44.2)	< 0.01
BMI; kgm ⁻²	25.8 (4.2)	24.3 (3.8)	0.077	III	13 (27.1)	0 (0.0)	
ASA physical status				Time to intubation; s	55.3 (30.7)	68.3 (42.2)	0.087
I	16 (33.3%)	12 (27.9%)	0.86	Perioperative Complications			
II	27 (56.3%)	27 (62.8%)		Destitution < 91%	0 (0.0)	0 (0.0)	
III	5 (10.4%)	4 (9.3%)		Dental/lip/ tongue injury	4 (8.3)	2 (4.7)	0.680
Type of surgery				Pharyngo- laryngeal injury	1 (2.1)	4 (9.3)	0.185
ENT	7 (14.6%)	8 (18.6%)		Blood on laryngoscope	4 (8.3)	3 (7.0)	1.000
General surgery	26 (54.2%)	22 (51.2%)	0.770	Mean arterial pressure increase > 20%	28 (58.3)	32 (74.4)	0.106
Neurosurgery	0 (0.0)	1 (2.3%)		Heart rate increase > 20%	17 (35.4)	13 (30.2)	0.599
Orthopaedics	11 (22.9%)	7 (16.3%)		Sorethroat	15 (31.3)	15 (34.9)	0.414
Urology	4 (8.3%)	5 (11.6%)		Dysphonia	8 (16.7)	7 (16.3)	0.935
Surgical time; mins	161.5 (86.8)	134.8 (103.4)	0.185	Blood-stained secretions	1 (2.1)	3 (7.0)	0.345
Airway assessment							
Mallampati							
I	11 (22.9%)	13 (30.2%)	0.39				
II	35 (72.9%)	26 (60.5%)					
III	2 (4.2%)	4 (9.3%)					
Inter-incisor distance							
≥ 40mm	46 (95.8%)	42 (97.7%)	1.00				
< 40mm	2 (4.2%)	1 (2.3%)					
Thyromental Distance							
≥ 60mm	48 (100%)	42 (97.7%)	0.47				
< 60mm	0 (0%)	1 (2.3%)					
Neck movement							
Full extension	44 (91.7%)	43 (100%)	0.12				
< 50% limited	4 (8.3%)	0 (0%)					

Table 1. Patient demographics. Values are expressed in number (proportion) or mean (SD)

DISCUSSION

Cervical immobilisation reduces mouth opening and neck extension, resulting in more difficult intubating conditions. Similar to the C-MAC D-blade and the GlideScope angulated blade², the X-blade has a 60 degree angulation that allows the user to see “around the corner” to obtain a view of the larynx. Although the X-blade provided better laryngeal view, there was no significant difference in first pass success and time to intubation. Peri-operative complications are also comparable between the 2 devices.

CONCLUSION

Our interim analysis findings demonstrated superior glottic view using the McGrath X-blade, but with no significant improvement in intubation success or time to intubation compared to the C-MAC videolaryngoscope. We await the final results upon completion of the study.

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