

Comparison of Macintosh laryngoscope and C-MAC video laryngoscope for intubation in lateral position

Ravi Bhat, Channabasavaraj S. Sanickop, Manjunath C. Patil, Vijay S. Umrani, Mallikarjun G. Dhorigol

Department of Anaesthesia, JN Medical College, KLE University, Belgaum, Karnataka, India

Abstract

Background and Aims: Endotracheal intubation is conventionally performed when the patient is in supine position. It may be required to secure airway in laterally positioned patient. Tracheal intubation in lateral position seems to be difficult because the laryngeal view is compromised. Hence, C-MAC video laryngoscope (Karl Storz, Germany), a newer device using a modified macintosh blade may be useful for intubation in lateral position.

Material and Methods: A total of 100 American Society of Anesthesiologists Grade I and II patients, randomly allotted to C-MAC or direct laryngoscopy group. Patients with difficult airway were excluded. After induction of anesthesia, patient was put in right-lateral position and intubation was carried out by consultant who is well-versed in using C-MAC laryngoscope. Time for intubation, number of attempts, Modified Cormack – Lehane grade, mucosal injury, and external laryngeal manipulation applied were noted.

Statistical Analysis: Demographics and baseline airway assessments were analyzed using summary statistics. Unpaired *t*-test was used to assess intubation time. Number of attempts, esophageal intubation, dental injury, mucosal injury, use of stylet, and application of external laryngeal manipulation were analyzed using Chi-square test.

Results: Overall intubation success rate was 100%. The time taken in C-MAC group was 24.8 ± 8.5 s and in direct group was 33.8 ± 9.12 s. The number of intubation attempts was not significant. Cormack – Lehane grade was better with C-MAC laryngoscope. Mucosal injury and use of external laryngeal manipulation was more in direct group.

Conclusion: C-MAC is better than Macintosh laryngoscope for intubation in lateral position.

Key words: Airway management, endotracheal intubation, macintosh laryngoscope

Introduction

As an anesthesiologist, we must be skilled in airway management to cope with sudden loss of airway patency due to airway obstruction or serious cardiopulmonary compromise. It may be in operation room or outside operation room. It may be required to ensure patency of the airway in the lateral position in certain circumstances. Some patients who require airway

support need to be tracheally intubated with an endotracheal tube to maintain airway patency as soon as possible. Previous studies have shown that tracheal intubation in lateral position can be difficult.^[1,2] Several studies have shown successful ventilation in lateral position with the laryngeal mask airway,^[3] ventilation and intubation in the lateral position with the intubating laryngeal mask airway^[4] with and without the aid of a lightwand,^[5] intubation with the lightwand,^[6] and fiberoptic intubation.^[7] However, newer videolaryngoscopes like C-MAC have not been formally evaluated for tracheal intubation in laterally positioned patient. We compared C-MAC video laryngoscope and macintosh laryngoscope for tracheal intubation in lateral position.

The C-MAC video laryngoscope is a new video laryngoscope using a modified Macintosh blade, which may be a useful alternative both for routine and difficult airway management and for educational purposes. The C-MAC videolaryngoscope has an original Macintosh steel blade shape with a closed blade design with no edges and gaps for hygienic traps and is now

Address for correspondence: Dr. Ravi Bhat,
Department of Anaesthesia, JN Medical College, KLE University, KLE
Prabhakar Kore Hospital, Belgaum - 590 010, Karnataka, India.
E-mail: kakkodravi@yahoo.co.in

Access this article online	
Quick Response Code:	Website: www.joacp.org
	DOI: 10.4103/0970-9185.155221

available in four sizes (2, 3, and 4 and D – blade for difficult airway). The C-MAC blade is flattened, resulting in a very slim blade profile (maximum 14 mm), and the edges are slanted to avoid damage to the mouth and teeth. C-MAC incorporates the smallest possible (2-mm) digital camera and a high-power light-emitting diode, located laterally in the distal third of the blade. Thus, reduced image quality due to damaged optical fibers, need for white color balance and focusing, and immobility due to external light source were eliminated. The view obtained, includes the tip of the blade and therefore, allows visual guidance of the tip of the blade into the vallecula. A color image is displayed on a lightweight, portable high-resolution liquid crystal display monitor.^[8]

Material and Methods

With approval of the Institutional Ethical Committee and written informed consent, we enrolled 100 patients scheduled for various surgical procedures requiring (flow diagram) tracheal intubation. Patients were aged 18 years or older and were American Society of Anesthesiologists physical Status I, II, or III. Patients were randomly allocated to C-MAC or direct group by computer generated table of random numbers. Exclusion criteria were an increased risk of pulmonary aspiration, cervical spine pathology, or anticipated airway difficulties (i.e., Mallampati Grade 4 or thyromental distance <6 cm).

Patients were premedicated with tab alprozolam 0.5 mg and ranitidine 150 mg at bed time and 6.00 am morning, after they fulfilled inclusion criteria.

Anesthesia was induced with patients lying in the supine position with fentanyl 2 µg/kg and thiopentone 5 mg/kg. Succinylcholine 2 mg/kg was given for neuromuscular blockade. After adequate muscle relaxation, patients were placed in right-lateral position. Head was supported with a firm pillow of 6 cm height. For patients in C-MAC group, trachea was

intubated using C-MAC video laryngoscope by consultant anesthesiologist, who is well-versed with the use of C-MAC laryngoscope. In direct group, intubation was done using Macintosh laryngoscope blade by the same anesthesiologist.

In each group, tracheal intubation was considered as a failure if not accomplished within three attempts. Any single insertion of the laryngoscope past the patient’s lips was considered an intubation attempt. If intubation failed, the trachea was intubated after turning the patient to supine position. The investigator, who did intubation in this study, had previously performed about 50 intubations using C-MAC video laryngoscope in supine position, but none in lateral position.

The following outcomes were recorded by an unblinded observer:

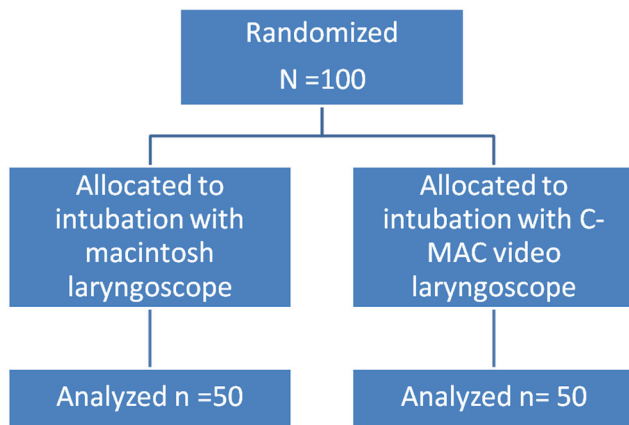
1. Overall intubation success rate;
2. Number of intubation attempts;
3. Modified Cormack – Lehane score: Visualization of the laryngeal inlet was assessed according to the classification of Cormack – Lehane;
4. Intubation time (defined as the time from picking up the laryngoscope to confirmation of tracheal intubation by capnography);
5. Frequency of esophageal intubation; Optimizing maneuvers were the external manipulation of the larynx, use of stylet.
6. Mucosal trauma (i.e., blood detected on the device);
7. Lip or dental injury; and
8. Desaturation (SpO₂ <95%).

When > 1 intubation attempt was required, time from picking up the laryngoscope for the first intubation attempt until confirmation of successful intubation by capnography was considered to be the total intubation time.

The randomized groups were descriptively compared for demographics and baseline airway assessments using summary statistics, such as mean and standard deviation, median and quartiles, or frequency, respectively, for symmetric continuous variables, skewed continuous variables, and categorical variables. All data were analyzed using SPSS for Windows version 17. Chicago, Inc., software. Unpaired *t*-test was used to assess intubation time. Number of attempts, esophageal intubation, dental injury, mucosal injury, use of stylet, and application of external laryngeal manipulation were analyzed using Chi-square test. *P* < 0.05 was considered as statistically significant.

Results

Demographics and baseline airway assessments among the groups were comparable [Table 1].



Flow diagram of patient distribution

Mean age was 36.92 ± 15.1 years in direct group and 37.02 ± 15.13 years in C-MAC group. Mean weight in direct group was 50.54 ± 8.46 kg and 48.8 ± 7.90 kg in C-MAC group. Modified Mallampatti grade as assessed using Chi-square test was comparable between the groups. Mouth opening (mean) was 4.8 cm in direct group and 4.7 cm in C-MAC group.

The time taken for intubation time was 33.8 ± 9.12 s (mean) in direct group and 24.8 ± 8.56 s in C-MAC group ($P = 0.001$). Seven patients (14%) in direct group required >1 attempts at intubation whereas three patients (6%) required second attempt in C-MAC group [Table 2]. Modified Cormack – Lehane score for laryngeal view one (CL-I) was 62% in C-MAC group and 36% in direct group. Overall intubation success was similar in both the groups but 94% patients in C-MAC group were intubated in first attempt whereas only 84% in direct group. External laryngeal manipulation was applied in 10 patients in direct group versus 5 in C-MAC group. Stylet was used in 10 patients in direct group versus 2 in C-MAC group which was statistically significant.

There was no failed intubation or dental injury in both the groups [Table 3]. Mucosal injury was significant indirect group (8 patients vs. 1 in C-MAC).

Discussion

Endotracheal intubation in a patient positioned laterally is difficult for anesthesiologists probably because of unfamiliarity of this position. Conventional technique of intubation using macintosh laryngoscope is more difficult because laryngeal view is compromised. We compared tracheal intubation with the C-MAC video laryngoscope in patients placed in lateral position. From our study, we have shown that time taken for intubation using C-MAC was significantly less compared to direct laryngoscope and Modified Cormack – Lehane score for Visualization of the laryngeal inlet was better when C-MAC was used. Overall intubation success rates were similar in both C-MAC and direct groups. Intubation time in our study was little more compared with previous study which is attributable to right-lateral position. Relative difficulty in the right-lateral position was likely attributable to the positioning of the tongue, which (influenced by gravity) has a tendency to slip off the laryngoscope blade, while the blade is inserted from the right side of the tongue.^[9] Besides the deteriorated laryngeal view, limited space between the laryngoscope handle and the tabletop in the right-lateral position would contribute to intubation difficulty if direct laryngoscopy were attempted conventionally, by inserting the tracheal tube from the right corner of the mouth. C-MAC has advantage over

Table 1: Demographic data

Demographic data	Direct (n = 50)	C-MAC (n = 50)	P value
Age (in years) (mean±SD)	36.92±15.1	37.02±15.13	t=0.033 df=98 P=0.974
Sex (male/female)	25/33	33/17	$\chi^2=2.627$ df=1 P=0.105
Weight (in kg) (mean±SD)	50.54±8.46	48.8±7.90	t=1.603 df=98 P=0.291
Modified Mallampatti grade (1/2/3/4)	36/14/0/0	31/19/0/0	$\chi^2=1.131$ df=1 P=0.288
Dentition (partial/full/edentulous)	35/13/2	32/17/1	0.278
Mouth opening (cm)	4.8 (0.6)	4.7 (0.6)	$\chi^2=2.439$ df=1 P=0.118

SD = Standard deviation

Table 2: Intubation data

Intubation data	Direct (n = 50)	C-MAC (n = 50)	P value
Intubation time (s) (mean±SD)	33.8±9.12	24.8±8.56	t=5.085 df=98 P<0.001
Modified Cormack – Lehane score (1/2//3) (n) (%)	18/17/15 (36/34/30)	31/15/4 (62/30/8)	$\chi^2=9.942$ df=2 P=0.007
Number of intubation attempts (1/2/3)	43/7/0	47/3/0	$\chi^2=1.778$ df=2 P=0.182
Successful intubation at first attempt %	86	94	—
Over all intubation success	50	50	—
External laryngeal manipulation (not applied/ applied) (n) (%)	40/10 (20)	45/5 (10)	$\chi^2=1.961$ df=1 P=0.161
Use of stylet (not used/used) (n)	40/10 (20)	48/2 (4)	$\chi^2=6.061$ df=1 P=0.014

SD = Standard deviation

Table 3: Airway complication data

Airway intubation data	Direct (n = 50)	C-MAC (n = 50)	P value
Desaturation	0	0	—
Dental injury	0	0	—
Mucosal injury	8	1	df=1 P=0.03
Esophageal intubation	0	0	—

conventional Macintosh laryngoscope having shorter handle and video screen providing real time display. Laryngeal view is better with C-MAC videolaryngoscope and hence reducing intubation time and also no of attempts at intubation.^[10] In the study by Kaplan *et al.*^[11] Video-assisted laryngoscopy

provides an improved view of the larynx, when compared with direct visualization. This technique may be useful for cases of difficult intubation and reintubation as well as for teaching laryngoscopy and intubation. Furthermore, external laryngeal manipulation can be applied effectively by the assistant as he can visualize on video screen. Patients with anticipated airway difficulties were excluded from our study; this explains why modified Cormack – Lehane Grade 3b or higher scores were not encountered in any of the groups.

In a recent multicenter randomized controlled trial evidenced no difference in performance of awake tracheal intubation between flexible fiberoptic and video laryngoscope.^[12] In emergency situations, the patient's blood or secretions in the airway often complicate intubation attempts, and pharmacological optimization of airway management with adequate sedation and muscle relaxation might not be available. In these situations, the C-MAC may prove less effective than in the current study because the camera view could be compromised by fogging or pharyngeal blood.

Our study did not include patients with difficult airway. There is no difference in overall success in intubation between C-MAC and Macintosh laryngoscope.

In summary, direct laryngoscopy is more difficult in lateral position. The C-MAC video laryngoscope offers high success rates in lateral position and intubation can be accomplished in less time. The current study concludes that C-MAC takes less time compared to Macintosh for intubations in lateral position. The C-MAC video laryngoscope thus seems to be an effective approach for endotracheal intubation in lateral position. However further studies are needed in patients with difficult airways.

References

- McCaul CL, Harney D, Ryan M, Moran C, Kavanagh BJ, Boylan JF. Airway management in the lateral position: A randomized controlled trial. *Anesth Analg* 2005;101:1221-5.
- Khan MF, Khan FA, Minai FN. Airway management and hemodynamic response to laryngoscopy and intubation in supine and left lateral positions. *Middle East J Anesthesiol* 2010;20:795-802.
- Panwar M, Bharadwaj A, Chauhan G, Kalita D. Intubating laryngeal mask airway as an independent ventilatory and intubation device. A comparison between supine, right lateral and left lateral. *Korean J Anesthesiol* 2013;65:306-11.
- Biswas BK, Agarwal B, Bhattacharyya P, Badhani UK, Bhattarai B. Intubating laryngeal mask for airway management in lateral decubitus state: Comparative study of right and left lateral positions. *Br J Anaesth* 2005;95:715-8.
- Dimitriou V, Voyagis GS, Iatrou C, Brimacombe J. Flexible lightwand-guided intubation using the intubating laryngeal mask airway in the supine, right, and left lateral positions in healthy patients by experienced users. *Anesth Analg* 2003;96:896-8.
- Cheng KI, Chu KS, Chau SW, Ying SL, Hsu HT, Chang YL, et al. Lightwand-assisted intubation of patients in the lateral decubitus position. *Anesth Analg* 2004;99:279-83.
- Adachi YU, Satomoto M, Higuchi H. Fiberoptic orotracheal intubation in the left semilateral position. *Anesth Analg* 2002;94:477-8.
- Cavus E, Kieckhafer J, Doerges V, Moeller T, Thee C, Wagner K. The C-MAC videolaryngoscope: First experiences with a new device for videolaryngoscopy-guided intubation. *Anesth Analg* 2010;110:473-7.
- Komatsu R, Kamata K, You J, Sessler DI, Kasuya Y. Airway scope for tracheal intubation in the lateral position. *Anesth Analg* 2011;112:868-74.
- Stroumpoulis K, Pagoulatou A, Violari M, Ikonomou I, Kalantzi N, Kastrinaki K, et al. Videolaryngoscopy in the management of the difficult airway: A comparison with the Macintosh blade. *Eur J Anaesthesiol* 2009;26:218-22.
- Kaplan MB, Hagberg CA, Ward DS, Brambrink A, Chhibber AK, Heidegger T, et al. Comparison of direct and video-assisted views of the larynx during routine intubation. *J Clin Anesth* 2006;18:357-62.
- Rosenstock CV, Thøgersen B, Afshari A, Christensen AL, Eriksen C, Gätke MR. Awake fiberoptic or awake video laryngoscopic tracheal intubation in patients with anticipated difficult airway management: A randomized clinical trial. *Anesthesiology* 2012;116:1210-6.

How to cite this article: Bhat R, Sanickop CS, Patil MC, Umrani VS, Dhorigol MG. Comparison of Macintosh laryngoscope and C-MAC video laryngoscope for intubation in lateral position. *J Anaesthesiol Clin Pharmacol* 2015;31:226-9.
Source of Support: Nil, **Conflict of Interest:** None declared.

Staying in touch with the journal

1) Table of Contents (TOC) email alert

Receive an email alert containing the TOC when a new complete issue of the journal is made available online. To register for TOC alerts go to www.joacp.org/signup.asp.

2) RSS feeds

Really Simple Syndication (RSS) helps you to get alerts on new publication right on your desktop without going to the journal's website. You need a software (e.g. RSSReader, Feed Demon, FeedReader, My Yahoo!, NewsGator and NewzCrawler) to get advantage of this tool. RSS feeds can also be read through FireFox or Microsoft Outlook 2007. Once any of these small (and mostly free) software is installed, add www.joacp.org/rssfeed.asp as one of the feeds.