

## Comparison of Direct vs Indirect Laryngoscopic View by C-Mac Videolaryngoscope

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### Abstract

*Introduction:* Previous studies have hypothesized that in routine patients undergoing surgery, the conventional C-MAC video laryngoscope compared to direct laryngoscopy can improve the rate of glottis view significantly. The C-MAC platform is to our knowledge the only Video Laryngoscope that allows the clinician to perform both direct and indirect laryngoscopy with the same blade and can be used as its own control. *Aim:* To compare laryngoscopic view by direct and indirect laryngoscope. *Materials and Methods:* Following ethical approval and sample size estimates 65 consecutive patients undergoing surgery under general anaesthesia were studied. First direct laryngoscopy was performed using conventional C-MAC and the best view obtained was graded by the first anaesthesiologist without looking at the video monitor. A second anaesthesiologist blinded to the laryngeal view obtained under direct laryngoscopy graded the laryngeal view on the video monitor, this was considered as indirect view. Parameters observed were modified Cormack Lehane grading of which grade 1 and 2a were defined easy views, grade 2b and 3a as restricted views and grade 3b and 4 were graded as difficult views. BURP (Backward Upward Right Pressure) manneuvre and intubating aids were used when required and were noted down. *Results and Discussion:* Easy views were 20 (30.8%) in direct and 47 (72.3%) in indirect. Restricted views were 41 (63%) in direct and 18 (27.7%) in indirect. Difficult views were 4 (6%) in direct and nil in indirect. These were statistically significant with p value <0.01. Indirect view coincided well with Mallampatti grading than direct view. BURP was applied more in direct view than indirect view. *Conclusions:* C-MAC by improving laryngoscopic view becomes an important tool in both anticipated and unanticipated difficult airway. It serves as both an innovation for difficult airway management and as a powerful teaching tool.

**Keywords:** C-MAC, Direct view, Indirect view, Video laryngoscope

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### Introduction

Direct laryngoscopy using Macintosh laryngoscope is the sole method used by anesthesiologists to insert an endotracheal tube into the trachea for resuscitation and airway

management. Difficult intubations during Macintosh laryngoscopy led to the search for a bigger and better angle of view laryngoscopes. This led to the development of devices using video assistance for laryngoscopy. Of late, video laryngoscopy has played an increasingly important

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role in the management of patients with anticipated difficult intubation and unanticipated difficult or failed endotracheal intubation [1-2].

In the last decades Videolaryngoscopes (VL) are developed by integrating conventional laryngoscopes to camera systems and have overcome visualization problems in difficult airway cases. Videolaryngoscopes (VL) allow indirect view of the laryngeal structures without the necessity of alignment of the oral, pharyngeal, and laryngeal axes. Hence, laryngoscopy performed using a VL will provide superior views compared to direct laryngoscopy in both normal and difficult intubation situations [3].

The C-MAC is a portable video laryngoscope featuring standard Macintosh blade designs with a complementary metal oxide semiconductor video chip at the tip of the blade that extends a 60° optical axis in the vertical plane to a video display monitor. This was developed initially by Karl Storz Endoscopy, Inc., Tuttlingen, Germany and it became commercially available in March 2009. This C-MAC platform is to our knowledge the only VL that allows the clinician to perform both direct and indirect laryngoscopy with the same blade. Therefore, it serves as both an innovation for difficult airway management and as a powerful teaching tool [4-5]. Not many studies have been done comparing C-Mac as its own control for direct and indirect view. Hence this study comparing direct vs indirect view by c-mac video laryngoscope.

#### *Aims and Objectives of tStudy*

*Aim:* To compare laryngoscopic view by direct and indirect laryngoscope

#### **Objectives**

*Primary:* To compare Cormack Lehane view by direct and indirect laryngoscope using C-Mac.

#### *Secondary*

1. To compare Mallampatti with Cormack Lehane view by direct and indirect laryngoscope
2. External laryngeal manneuvre(BURP) required
3. Use of aids for intubation like stylet, bougie

#### **Materials and Methods**

Study was conducted after approval from the

Institutional Review Board (IRB) and CTRI Trial Registration: Trial REF/2018/02/017656. Oral and written informed consent was obtained from 60 adult patients satisfying the inclusion criteria who required general anaesthesia for elective surgery with tracheal tube placement.

*Inclusion criteria* were: age between 18-80 years, American Society of Anaesthesiologist (ASA) score I-III and Mallampatti class I-III.

*Exclusion criteria:* history of a difficult airway or potential risks factors for difficult laryngoscopy and intubation (morbidly obese patients with BMI  $\geq 40$  kg/m<sup>2</sup>, mouth opening < 3 cm, and restricted neck movement).

After routine general anaesthesia, First direct laryngoscopy was performed using conventional C-MAC laryngoscope and the best view obtained was graded by the first anaesthesiologist without looking at the video monitor. A second anaesthesiologist blinded to the laryngeal view obtained under direct laryngoscopy graded the laryngeal view on the video monitor, this was considered as indirect view. Oral Endotracheal intubation using Ring-Adair-Elwyn (RAE) tracheal tubes was then attempted under video-aided visualization. The tubes were not reinforced with a stylet.

Parameters observed were modified Cormack Lehane grading of which grade 1 and 2a were defined good views. 2b, 3a, 3b and 4 were graded as poor views. BURP (Backward Upward Right Pressure) manneuvre and intubating aids (stylet and bougie) were used when required and were noted down. Cormack Lehane grading was compared with that of Modified Mallampatti grading to anticipate difficult airway. Modified Mallampatti (MMT) grading 1 and 2 considered Easy and grade 3 as restricted and 4 considered Difficult.

#### *Modified Cormack Lehane grading*

Laryngeal views	Cormack and Lehane	Modification	Grading
Most of cords visible	1	1	Easy
Posterior cord visible	2	2a	Easy
Only arytenoids visible	2	2b	Restricted
Epiglottis visible and liftable	3	3a	Restricted
Epiglottis adherent to pharynx	3	3b	Difficult
No laryngeal structures seen	4	4	Difficult

*Statistical Analysis*

*Statistical Methods:* Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. Sample size calculate based on Cattono et al. [2] study, which showed twenty-percent of direct first cases compared to 0% of indirect first cases showed an improvement in airway view score by at least two classes on the second laryngoscopy expecting similar results of improved views on indirect laryngoscopy sample size of 60 patients were required for this study.

Chi-square/Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric

Setting for Qualitative data analysis. Fisher exact test was used when cell samples are very small.

*Significant figures*

+ Suggestive significance (p value: 0.05<p<0.10)

\* Moderately significant (p value: 0.01<p ≤ 0.05)

\*\* Strongly significant (p value: p≤0.01)

*Statistical software:* The Statistical software namely SPSS 18.0, and R environment ver. 3.2.2 were used for the analysis of the data. Microsoft word and Excel data sheet was used to generate graphs, tables etc.

**Results and Discussion**

The mean age group of the study population was 38.20 ± 12.26 yrs. Out of 65 patients 33 were females and 32 were males. The mean weight was 63.1 ± 6.9 kgs. The mean height was 165.1 ± 7.23 cms. Most of the patients belonged to ASA1 or 2. All these were statistically not significant.

When patients are grouped as easy, restricted and difficult view and compared direct versus indirect view category the results are:

Table shows number of easy, restricted and difficult view in direct view and indirect view. This is statistically significant with p value < 0.001

No patients had grade 4 in either of the views.

Only 1 had 3A view in indirect view no patients had grade 3B or grade 4 in indirect view.

Burp was required to get the best possible view in 26 patients in direct view and 18 patients in indirect view. This was not statistically significant with p value being > 0.05.

Stylets in 20 patients and Bouige in 2 patients were used as additional gadgets for intubation.

Modified Mallampatti (MMT) grading 1 and 2 considered Easy and grade 3 as restricted and 4 considered Difficult.

Out of 65 patients 52 patients had easy MMT grading, 13 had restricted grading and none had difficult grading. In direct view out of 65 patients, 20 patients had easy view, 41 patients had restricted view and 4 patients had poor view. In indirect view 47 patients had easy view, 18 had restricted views and none had poor view. This is statistically significant with p value of <0.001.

**Discussion**

Video laryngoscopy, especially with blades that simulate the common design of a Macintosh blade, is replacing direct laryngoscopy because of the ability for others to see and teach, and potentially reduce complications while maintaining common skills [6].

Our study showed improved CL grade in indirect view when compared to direct view. In patients having restricted view in direct view about 65% patients had easy views in indirect view. All patients belonging to difficult view in direct view were found to have restricted view. This indicates that indirect view improves the CL grading thereby facilitating easier intubation and avoiding untoward incidents. These results are inconsistent with the study done by cattano et al. [2] where they found to have improved CL view in indirect view. They did cross over study once with direct view as first and other indirect view as first.

Jain et al. [8] found that CMAC videolaryngoscope provided a higher proportion of MCL Grade I visualizations compared to McCoy laryngoscope, which was inconsistent with our study. In our

Table 1:

Direct	Indirect			Total	p value
	Easy	Restricted	Difficult		
Easy	20 (30.8%)	0 (0%)	0 (0%)	20 (30.8%)	>0.05
Restricted	27 (41.5%)	14 (21.5%)	0 (0%)	41 (63.1%)	<0.001
Difficult	0(0%)	4 (6.2%)	0 (0%)	4 (6.2%)	<0.001
Total	47 (72.3%)	18 (27.7%)	0 (0%)	65 (100%)	

study we did single attempt at laryngoscopy and documented both direct and indirect views at once. We had real time control of direct and indirect view with a single laryngoscopy attempt. In our study we anticipated difficult airway by comparing Mallampatti grading to laryngoscopic views. Indirect view correlates well with Mallampatti grading than the direct view. It would help us in preparing the airway and anticipating the problems of difficult intubation. Video laryngoscopes are helpful in unanticipated difficult airway when compared to direct laryngoscopes. Thus helpful in easy intubation. Burp was used more often in direct view than indirect view. Improved view was seen more in indirect view when burp was applied. Signifying indirect view gives a better view than direct view, requiring less of external laryngeal manneuvre. This result was in consistent with that of John et al. [9] and Jain et al. [8].

Stylets were used in 20 patients and 2 patients required bougie, indicating when C-MAC was used for intubation, the success rate of intubation increases significantly avoiding the untoward complications related to hypoxia. These results were inconsistent with that of Michael et al. study [4].

Many have expressed concern about using VL as first approach at laryngoscopy as this may result in the erosion of operators' DL skills. C-MAC being a combination of DL/VL device, it is perfectly positioned to address this dilemma. C-MAC can be used as DL initially and, if unsuccessful can easily be transitioned to VL by utilizing the video monitor [9]. Salama et al. [10] have concluded that C-MAC Video laryngoscope as compared to traditional flexible fiberoptic laryngoscopy has become a good alternative in terms of better visualization of laryngeal structures in shorter time and lesser intubation attempts.

### Conclusion

C-MAC video laryngoscope improves the Cormack Lehane grading view when compared to direct view. C-MAC by improving laryngoscopic view becomes an important tool in both anticipated and unanticipated difficult airway. C-MAC laryngoscope view correlates well with Mallampatti grading and avoids unanticipated difficult airway. C-MAC laryngoscope is associated with lesser external laryngeal manipulations and lesser usage of intubating aids.

To conclude C-MAC can be used as a first line of choice of laryngoscope for endotracheal intubation in routine clinical practices. It serves as both an

innovation for difficult airway management and as a powerful teaching tool.

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