



## Anaesthesiology

## EFFECTS OF C-MAC VIDEO LARYNGOSCOPE AIDED INTUBATION USING D BLADE ON THE PREVALENCE OF A POST-OPERATIVE SORE THROAT

<b>Dr. Jagdeep Sharma</b>	Assistant Professor, Homi Bhabha Cancer Hospital & Research Centre, New Chandigarh
<b>Dr. Anisha Puri</b>	Professor, Department of Anaesthesia, M.M.I.S.R, Maharishi Markandeshwar (deemed to be) university, Mullana
<b>Gurchand Singh</b>	Associate Professor, Department of Otorhinolaryngology, M.M.I.S.R, Maharishi Markandeshwar (deemed to be) university, Mullana
<b>Anita Puri</b>	Associate Professor, Department of Obstetrics and Gynaecology, Government Medical College, Amritsar.

**ABSTRACT** **Background** In this study, we evaluated the prevalence and severity of post operative sore throat (POST), cough, and hoarseness of voice at 2 hours, 6 hours, 12 hours, and 24-hours post-extubation. Severity of the postoperative sore throat was also graded in our study. **Materials And Methods** After obtaining clearance from the Institutional Ethics Committee and written informed consent from the study participants, this hospital-based study was conducted among 130 patients randomised into two groups in the Department of Anaesthesiology, MM Deemed to Be University, Mullana-Ambala, Haryana. Intubation was done with Macintosh laryngoscope in 65 group A patients and with C-MAC video laryngoscope in 65 group B patients. **Results** There was an incidence of post-operative hoarseness of voice after 2 hours, 6 hours, 12 hours, and 24 hours post-extubation among the patients of group A and group B and the difference in the two groups was found to be statistically significant. There was no incidence of post-operative sore throat among the patients of group A and group B after 2 hours, 6 hours, 12 hours, and 24 hours of post-extubation. While the result of POST post-extubation remains significant. **Conclusion** C MAC video laryngoscope helps to reduce the post-operative sore throat (POST), hoarseness, & post-operative cough after endotracheal (ET) tube intubation when opposed to using a standard Macintosh laryngoscope. In patients with predicted or known difficult airway, evidence suggests that C-MAC video laryngoscopes reduce intubation failure and make intubation easier. To increase glottic visibility and decrease the number of laryngoscopies in which the glottis is not visible, C-MAC video laryngoscope was used to help the anaesthetist. C-MAC is a basic intubation system that can be used for both routine airway control and education.

**KEYWORDS :** C-MAC Video Laryngoscope, Aided Intubation, D Blade, Post-Operative Sore Throat

## INTRODUCTION

“POST is the most common side effect in the post-operative period. POST after endotracheal intubation is reported up to 14.4 % - 90 %.<sup>[1,2,3]</sup> The aetiological factors of POST include airway mucosal irritation and inflammation. A study done by Chandler postulated mechanical trauma as a cause of POST and found a positive correlation between mechanical forces and post-operative sore throat.<sup>[4]</sup> Since it decreases aspiration and helps to make the airway secure intubation is considered the gold standard for general anaesthesia. Direct laryngoscopy is the classic technique for tracheal intubation. But pharyngeal, laryngeal, and tracheal axes are to be aligned, which can be difficult to achieve in some patients and may be risky in patients with cervical spine injury. Recently video laryngoscopes have come into being for airway management.<sup>[5,6]</sup>

The C-MAC is a video laryngoscope that has a camera and light source using Macintosh laryngoscope edges of various sizes. It has a camera and light source situated in a place that is recessed from the tip of the edge. This laryngoscope ensures better laryngeal view than direct laryngoscope without any need to align the tracheal, pharyngeal, and laryngeal axes.”<sup>[7,8]</sup> “During direct laryngoscopy, there is an adjustment of the laryngeal pharyngeal & tracheal axes which needs application of force in the upward direction that's transmitted to the laryngoscope handle. This force is transmitted to the arytenoid ligaments of the larynx which harms the mucosa of the airway leading to glottic injury and post-operative sore throat.<sup>[9]</sup> On the other hand, C-MAC video laryngoscope needs smaller head control and the larynx is quickly perceived compared to direct laryngoscopy with Macintosh.”<sup>[10]</sup> Exertion on maxillary incisors is of less force.

## C-MAC Video Laryngoscope

Endotracheal intubation using C-MAC needs less force as there is no need to align the three-axes which may account for lesser airway mucosal damage. Hence, we decided to compare C-MAC video laryngoscope with direct Macintosh laryngoscope for incidence and severity of post-operative sore throat.<sup>[11]</sup> To improve visualization of glottis and the success of oro-tracheal intubation over traditional Macintosh laryngoscope, C-MAC video laryngoscope has an advantage in being a metho. The use of a video laryngoscope tends to minimise the number of unsuccessful attempts of intubations in

patients with complicated airway.<sup>[12]</sup> C-MAC has the added advantage over conventional Macintosh laryngoscope with a shorter handle and video screen in providing real-time display.<sup>[13]</sup>

Also, the numbers of attempts at intubation are greatly reduced with C-MAC video laryngoscope. Visualizing is often difficult in intensive care unit (ICU) due to limitation of airway space, position of the patient and associated co-morbidities.<sup>[14]</sup> Difficult intubation ranges from 10 – 22 % in critically ill patients.<sup>[15]</sup> This is decreased by using a C-MAC video laryngoscope. The risk of hypoxia, oesophageal aspiration and cardiac arrest can be reduced through the use of a C-MAC video laryngoscope.<sup>[16]</sup>

## Aims and Objectives

- To determine the incidence and severity of cough 2 hours, 6 hours, 12 hours and 24-hours post-extubation.
- To assess the incidence and severity of POST 2 hours, 6 hours, 12 hours and 24-hours post-extubation.
- To evaluate the incidence and severity of hoarseness of voice 2 hours, 6 hours, 12 hours, and 24-hours post-extubation.
- To classify the severity of postoperative sore throat.

## MATERIALS AND METHODS

After obtaining clearance from institutional ethics committee and written informed consent from the study participants, this hospital-based study was conducted among 130 patients who presented with two groups where group A 65 patients were intubated with Macintosh laryngoscope and group B 65 patients with C-MAC video laryngoscope, in the Department of Anaesthesiology, MM deemed to be university, Mullana-Ambala, Haryana.

## Inclusion Criteria

1. Patients in the age group of 18 - 50 years.
2. Elective surgery of duration between 0.5 hour and 2 hours done under GA
3. Patients with ASA grades 1 & 2
4. Informed written consents.

## Exclusion Criteria

1. Pregnant patients

2. Patients whose surgery requires more time (2 hours)
3. Difficult airway management (Mallampati 3 and 4)
4. Patients having earlier history of difficult intubation.
5. Patients on steroids and NSAIDs.
6. Respiratory tract disease patients.
7. Use of Ryle's tube or throat pack

**Statistical Methods**

Statistical Package for Social Sciences (SPSS) software was used for analysing data that was entered in MS Excel. Results were presented as tables.

**RESULTS**

	A Group		B Group		P-Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Age	38.95	8.00	38.80	9.20	0.919
Sex (F : M)	35:30	53.8 %:46.2 %	28:37	43.1%:56.9%	0.219
BMI	26.01	2.87	25.00	2.79	0.059
No of intubation attempts	1.14	0.35	1.20	0.44	0.457
MPG [I & II] Mean	21 : 44		27:38		0.276
ASA 1 & 2 Mean	39 : 26		33:32		0.78
Sex Distribution					

Table 1: Demographic Distribution

In both the groups, distribution of age with p-value 0.919, sex with p-value 0.219, number of intubating attempts with p-value 0.457, ASA grade of 1 and 2 with p-value 0.378, BMI with p-value 0.059, and MPG grades [I & II] with p-value 0.276 were comparable while the difference remained non-significant. The demographic variables, distribution of ASA, age, sex, BMI, and Mallampati grade were similar in both the groups. Also, the number of intubation attempts was similar in both the groups.

Investigations	Group A		Group B		Z	P-Value
	Mean	SD	Mean	SD		
RFT (urea)	22.32	10.06	20.01	5.92	-1.379	0.168
LFT (Bilirubin total)	0.79	1.15	1.62	7.87	-0.037	0.970
Direct	0.32	0.71	0.18	0.19	-1.372	0.170
Haemogram	14.84	12.43	13.37	1.65	-0.415	0.678
Blood sugar	107.54	33.16	105.30	32.84	-0.170	0.865
Investigations						

Table 2

Distribution among investigations (RFT (urea) with a p-value of 0.168, LFT (bilirubin total with a p-value of 0.970 and bilirubin direct with a p-value of 0.170), haemogram with a p-value of 0.678, blood sugar with a p-value of 0.865) remained non-significant between the groups.

Incidence of Post-operative Coughs	Group A	Group B	P - Value
After 2 hours of post extubation	15	5	0.015
After 6 hours of post extubation	14	4	0.011
After 12 hours of post extubation	9	1	0.017
After 24 hours of post extubation	7	0	0.013
Post Extubation Cough			

Table 3

15 patients of group A and 5 patients of group B had an incidence of post-operative cough after 2 hours of post-extubation with a p-value of 0.015 while the result was statistically significant among both the groups.

14 patients of group A and 4 patients of group B had an incidence of postoperative cough after 6 hours of post-extubation, with a p-value of 0.011 while the result was found to be statistically significant among the two groups. After 12 hours of post-extubation, 9 patients of group A and 1 patient of group B had an incidence of post-operative cough with a p-value of 0.017 while the result was found to be statistically significant among the two groups.

After 24 hours of post-extubation, 7 patients of group A had an incidence of post-operative cough, but none of the patients from group B had an incidence of post-operative cough with an overall p-value of 0.013 while result among the two groups was found to be statistically significant.

After 2 hours post-extubation there was an incidence of post-operative hoarseness of voice among 54 patients from group A and 39 patients from group B and the difference was found to be statistically significant in the two groups with a p-value of 0.006.

After 6 hours post-extubation there was an incidence of post-operative hoarseness of voice among 35 patients from group A and 22 patients from group B and the difference was found to be statistically significant in the two groups with a p-value of 0.033.

After 12 hours post-extubation there was an incidence of post-operative hoarseness of voice among 26 patients from group A and 13 patients from group B and the difference was found to be statistically significant in the two groups with a p-value of 0.021.

After 24 hours post-extubation an incidence of post-operative hoarseness of voice was seen among 19 patients from group A and 2 patients from group B and the difference was found to be statistically significant in the two groups with a p-value of 0.0001.

Incidence of POST	Grading	Group A	Group B	P-Value
After 2 hours of post extubation	0 (No sore throat)	14	29	0.018
	1 (Mild)	45	33	
	2 (Moderate)	6	3	
After 6 hours of post extubation	0 (No sore throat)	32	44	0.039
	1 (Mild)	30	21	
	2 (Moderate)	3	0	
After 12 hours of post extubation	0 (No sore throat)	44	59	0.002
	1 (Mild)	21	6	
After 24 hours of post extubation	0 (No sore throat)	47	62	0.001
	1 (Mild)	18	3	

Table 5: Incidence of Postoperative Sore Throat

Table 5

There was no incidence of post-operative sore throat after 2 hours of post-extubation among 14 patients of group A and 29 patients of group B. But 45 patients of group A and 33 patients of group B had mild post-operative sore throat with a sore throat grade of 1. Also, there was an incidence of post-operative sore throat grade 2 among 6 patients of group A and 3 patients from group B while the result at 2 hours of POST post-extubation remains significant with a p-value of 0.018.

There was no incidence of post-operative sore throat after 6 hours of post-extubation, among 32 patients of group A and 44 patients of group B. But mild post-operative sore throat of grade 1 was present in 30 patients of group A and 21 patients of group B. Only 3 patients of group A had a prevalence of post-operative sore throat grade 2 (moderate) while the result at 6 hours of POST post-extubation remains significant with a p-value of 0.039.

There was no incidence of post-operative sore throat among 44 patients of group A and 59 patients of group B after 12 hours of post-extubation. But 21 patients of group A and 6 patients of group B had mild post-operative sore throat with a sore throat grade of 1 while the result at 12 hours of POST post-extubation remains significant with a p-value of 0.002.

There was no incidence of post-operative sore throat among 47 patients of group A and 62 patients of group B after 24 hours of post-extubation. But 18 patients of group A and 3 patients of group B had mild post-operative sore throat with a sore throat grade of 1 while the result at 6 hours of POST post-extubation remains significant with a p-value of 0.001.

**DISCUSSION**

POST is considered to be the most common complication following ET tube insertion which the patients find distressing. The rate of occurrence differs, but they may be as high as 90 %. Airway trauma during laryngoscopy and mucosal damage caused by the ET tube causes POST. Few more that maybe responsible are as follows: Intubation without muscle relaxants, double-lumen tubes if used, high cuff pressures, size of ETT, cuff pressure if exceeds, number of attempts, type of surgeries,<sup>[17-19]</sup> muscle relaxant type, smoking habit.<sup>[20-23]</sup>

Some of the common adverse events affecting almost half of the patients after GA are POST, hoarseness, and cough according to the finding of this thesis. Although the symptoms can last several days post-operatively, they are most common in the early post-operative period. POST causes discomfort in both men and women.

According to our key findings the overall incidence of POST was higher with MCL than with C-MAC video laryngoscope. There was a decreased incidence of POST after 12 hours and 24 hours respectively as emphasized by our study.

In a systematic review by S.R. Lewis et al. the C-MAC video laryngoscope reduces the airway trauma and failure of intubation due to improved peri-laryngeal views. However, it was found to not affect several intubation attempts and respiratory complications. So, for difficult intubations, C-MAC should be preferred as a primary instrument in airway cart.

The findings of other authors like Pulak Tosh, Dilesh Kadapamannil et al. are consistent with our findings and with the findings of Erol Cavus et al. did study on C-MAC versus Macintosh laryngoscope on 150 patients.

The impact of C MAC video laryngoscope assisted intubations with D blade on postoperative sore throat incidence and severity was studied by Pulak Tosh, Dilesh Kadapamannil et al on 130 patients undergoing short elective laparoscopic surgeries. They found that the number of patients with symptoms of POST, hoarseness and post-operative cough was more in group of Macintosh as in Group V. Also, it was found significantly lower at 2 hours, 6 hours, 12 hours, and 24 hours. While the severity of post-operative sore throat showed slight decrease in both the groups in comparison to the use of a standard Macintosh laryngoscope. Also, in the study by Pulak Tosh et al. the number of patients requiring rescue therapy post-extubation was more with conventional laryngoscopy when compared to C-MAC video laryngoscope.

During routine induction of general anaesthesia on 150 patients (ASA I-III) the reading was found on them and there was no difference of glottic view between Macintosh laryngoscope and C-MAC video laryngoscope as studied by Erol Cavus, Carsten Thee et al. However, when compared to C-MAC video laryngoscope the worst glottic view was seen only with a direct laryngoscope.

To decrease the incidence of POST, Gurchand Singh Anisha Puri studied POST on adult patients after ET insertion in-ear surgeries using intravenous dexamethasone pre-operatively. In adult patient's minimal sore throat was found after the use of dexamethasone. There was a significant decrease in the incidence of sore throat in patients by the use of dexamethasone 0.2 mg/kg IV before endotracheal intubation.

The main advantages of our study were the adequate sample size and that we did a comparative observation between Macintosh laryngoscope and C-MAC video laryngoscope to understand the basic mechanism of sore throat post-operatively, and with under-vision ETT insertion, it reduces to a great extent. However, if we had another arm of patients with prophylaxis in the form of intravenous or nebulised dexamethasone given before intubation, we could have seen the amount of difference it creates between the two groups.

## CONCLUSION

C MAC video laryngoscope helps to reduce the post-operative sore throat (POST), hoarseness, & post-operative cough after ET tube intubation when opposed to using a standard Macintosh laryngoscope. In patients with predicted or known difficult airway, evidence suggests that C-MAC video laryngoscopes reduce intubation failure and make intubation easier. To increase glottic visibility and decrease the number of laryngoscopies in which the glottis is not visible, the C-MAC video laryngoscope is used to help the anaesthetist. C-MAC is a basic intubation system that can be used for both routine airway control and education. To validate these results, more research on patients with difficult airways is required, and should focus on possible factors to reduce the incidence of post-operative sore throat. Nevertheless, the results were statistically significant.

## REFERENCES

- [1] Puri A, Ghosh SK, Singh G et al. Gargling with ketamine pre-operatively decreases postoperative sore after endotracheal intubation in middle ear surgeries: Aprospective randomized control study. Indian J Otolaryngol Head Neck Surg 2022.
- [2] Najafi A. Postoperative sore throat after laryngoscopy with Macintosh or Glidescope video laryngoscope blade in normal airway patients. AnesthPain Med 2014;4(1):e15136.
- [3] Lee JY. Incidence and risk factors of POST after endotracheal intubation in Korean patients. J IntMed Res 2017;45(2):744-52.
- [4] Chandler M. Tracheal intubation and sore throat: a mechanical explanation. Anaesthesia 2022;57(2):155-61.
- [5] Aziz M, Brambrink A. The Storz C-MAC video laryngoscope description of a new

- device, case report, & briefcase series. J ClinAnesth 2011;23(2):149-52.
- [6] Hirabayashi Y. Airway scope: initial clinical experience with novice personnel. Can J Anesth 2007;54:160-61.
- [7] Cooper RM. Complications associated with the use of the glidescope video laryngoscope. Can J Anesth 2007;54(1):54-7.
- [8] Hirabayashi Y. Pharyngeal injury related to glidescope video laryngoscope. Otolaryngol Head Neck Surg 2007;137(1):175-6.
- [9] Aqil M. A study of stress response to endotracheal intubation comparing glidescope and flexible fiberoptic bronchoscope. Pak J Med Sci 2014;30(5):1001-6.
- [10] Aqil M, Khan MU, Hussain A, Khokhar RS, Mansoor S, Alzahrani T. Routine use of glidescope and Macintosh laryngoscope by trainee anaesthetists. J Coll Physicians Surg Pak 2016;26(4):245-9.
- [11] Russel T. Measurement of forces applied during Macintosh direct laryngoscopy compared with Glidescope® video laryngoscopy. Anaesthesia 2012;67(6):626-31.
- [12] Jaber S, Amraoui J, Lefrant JY, Arich C, Cohendy R, Landreau L, et al. Clinical practice and risk factors for immediate complications of endotracheal intubation in the intensive care unit: a prospective, multiple-center study. Crit Care Med 2006;34(9):2355-61.
- [13] Martin LD, Mhyre JM, Shanks AM, Tremper KK, Khetarpal S. 3,423 emergency tracheal intubations at a university hospital: airway outcomes and complications. Anesthesiology 2011;114(1):42-8.
- [14] Lavery GG, McCloskey BV. The difficult airway in adult critical care. Crit Care Med 2008;7(36):2163-73.
- [15] Noppens RR, Werner C, Piepho T. Indirect laryngoscopy: alternatives to securing the airway. Anaesthetist 2010;59(2):149-61.
- [16] Cavus E, Callies A, Doerges V, Heller G, Merz S, Rösch P, Steinfath M, Helm M. The C-MAC videolaryngoscope for prehospital emergency intubation: a prospective, multicentre, observational study. Emerg Med J 2011;28(8):650-3.
- [17] El-Boghdady K, Bailey CR, Wiles MD. Postoperative sore throat: a systematic review. Anaesthesia 2016;71(6):706-17.
- [18] Yamanaka H, Hayashi Y, Watanabe Y, Uematu H, Mashimo T. Prolonged hoarseness and arytenoid cartilage dislocation after tracheal intubation. Br J Anaesth 2009;103(3):452-5.
- [19] Edomwonyi NP, Ekwere IT, Omo E, Rupasingha A. Postoperative throat complications after tracheal intubation. Ann Afr Med 2006;5(1):28-32.
- [20] Stout DM, Bishop MJ, Dwerstee JF, Cullen BF. Correlation of endotracheal tube size with sore throat and hoarseness following general anesthesia. Anesthesiology 1987;67(3):419-21.
- [21] Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth 2002;88(4):582-4.
- [22] Combes X, Schauliege F, Peyrouset O, Motamed K, Kirov K, Dhoneur G, et al. Intracuff pressure and tracheal morbidity: influence of filling cuff with saline during nitrous oxide anesthesia. Anesthesiology 2001;95(5):1120-4.
- [23] Minamiguchi MA, Tanaka Y, Kitagawa K, Inoue S, Kawaguchi MA, Kiritani T. Evaluation of factors associated with postoperative sore throat. Masui 2014;63(4):4015.