



Original Article

## COMPARISON OF EFFICACY AND SAFETY OF C-MAC D-BLADE VIDEOLARYNGOSCOPE AND MACINTOSH LARYNGOSCOPE FOR NASOTRACHEAL INTUBATION IN PATIENTS UNDERGOING HEAD AND NECK SURGERIES, A RANDOMIZED CONTROLLED TRIAL

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### ABSTRACT

**Background:** Nasotracheal intubation (NTI) is frequently required in head and neck surgeries. The conventional Macintosh laryngoscope with Magill's forceps remains standard practice, though video laryngoscopes like the C-MAC D-Blade offers improved glottic visualization and ease of intubation, especially in challenging airways.

**Materials and Methods:** This study was a randomized prospective control study, was conducted on 60 ASA I–II patients aged 18 to 50 years undergoing elective head and neck surgeries requiring NTI. The study was conducted at Government Mohan Kumaramangalam Medical College, over a period of 18 months. The study was conducted after obtaining the informed written consent of the patients.

**Results:** The C-MAC group demonstrated significantly shorter intubation time ( $23.3 \pm 1.92$  sec vs.  $67.2 \pm 2.46$  sec;  $p < 0.001$ ), higher first-attempt success (100% vs. 86.7%), and reduced hemodynamic stress. Ease of intubation was superior with 80% rated as "easy" in the C-MAC group compared to 20% in the Macintosh group. Accessory maneuvers were required in only 3.3% of C-MAC cases versus 66.7% in the Macintosh group. Complications were minimal and comparable in both groups.

**Conclusion:** The C-MAC D-Blade video laryngoscope offers significant advantages over the conventional Macintosh laryngoscope for nasotracheal intubation, including faster intubation, better glottic visualization, improved ease of use, reduced hemodynamic response, and fewer accessory interventions. It is a safer and more efficient tool in airway management, particularly in head and neck surgeries.

**Keywords:** C-MAC D-Blade, Macintosh laryngoscope, video laryngoscopy, nasotracheal intubation, airway management, hemodynamic response.

### INTRODUCTION

Nasotracheal intubation is the process to secure the airway by insertion of an endotracheal tube into the trachea through the nasal cavity while using direct laryngoscopy or video laryngoscopy to visualize the larynx and place the endotracheal tube through a device that provides tracheal access in situations where prolonged ventilation or oral surgery is necessary. Observation of the vocal cords is done by inserting a laryngoscope (e.g. Macintosh or Miller blade) into the mouth[1].

The endotracheal tube is passed through the nose, the nasopharynx, the laryngopharynx under direct visualization by

passing through the epiglottis and via the cords. This method which depends on the expertise of the operator is effective but may be difficult in patients with difficult airways owing to low visibility or anatomy distortion. With Video laryngoscopy, instead, comes the advantage of a laryngoscope having camera (e.g. GlideScope or C-MAC) to offer an increased image of the larynx upon a display and thus offers better visualization of the glottis, particularly in severe cases such as the cervical spine immobility or the obese patient. The nasal tube is also inserted in the nostril but has an advantage of better guidance since the view used is indirect. Both techniques need preparation of the procedure, use of nasal vasoconstrictors (e.g., oxymetazoline) to reduce amount of blood and lube the tube, but video laryngoscopy is usually more successful and safer in difficult airways because of its superior visualization, but needs special equipment and training [2]

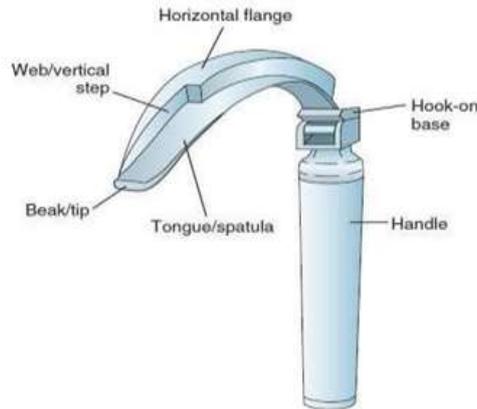
Laryngoscopy originated in the early 19th century when doctors found it difficult to see the larynx with the help of simple instruments such as tongue depressor and candlelight. Laryngoscopy today has turned to be a combination of technology and accuracy where even handheld video as well as the disposable blade coupled with AI-controlled airway apparatus have resulted in enhancing quality and availability in a wide range of clinical contexts [3]

Macintosh laryngoscope is the most widely used instrument in the management of the airway, particularly during endotracheal intubation. Its shape is designed by sir Robert Macintosh in 1941: the blade is curved to raise the tongue and epiglottis and give a clear arrangement of seeing the vocal cords. The laryngoscope has two major components which are the handle and blade. The handle is used as a grip as well as a power source and usually has batteries which provide electricity to a source of light which is placed on the blade. It produces a secure grip due to its ergonomic design, which makes it usable even in one of the most difficult environments [1]

### HANDLE

The handle acts as a source of power and as a grip to the clinician. It is smooth, made of mostly stainless steel or tough plastic and ergonomically textured to give a firm hold during procedures. The battery compartment is located on the inside of the handle. These batteries energize the source of light which is on the blade. On the handle, there are electrical contacts at the top which make contact with similar parts on the blade. The blade is connected in such a way that when this is raised into the open (working) position the circuit is completed and automatically switches on the light. It has no manual-switch, but a mechanical phenomenon, which turns on, while opening the blade, thereby helps in extension of battery life since it uses light and energy only when it is needed. [4,5]





### Parts of laryngoscope

#### BLADE:

Macintosh laryngoscope blade is curved in alignment with the natural anatomy of the airway and plays a significant role in the identification of glottis in the process of intubation. It has some components such as the flange, the web, tongue, tip, and the light source. The tongue runs- out of the designated paths by the wide, sweepy looking surface, which is the **flange**. The **web** links the flange to the tongue on blade and it is this connection that provides the blade with its strength structure and curved aspect. The **tongue** part is positioned on the tongue of patient and aims to the vallecula (the gap between base of the tongue and epiglottis), and raise the epiglottis to visualize the vocal cords.

**Light source** is also present on the blade, traditionally a small bulb but in recent designs an LED or fiberoptic system is common. This light is essential in looking at airway structures. In fiberoptic blades the light is carried by a fiber channel, in the handle, which enhances visibility and facilitates easy sterilization. At the bottom the blade is attached to the handle by a **hinge** or hook. This not merely permits the safe attachment, but also, when the blade is, lifted into position, it completes the electrical circuit thereby powering the light. The design of the McIntosh laryngoscope, which includes a curved blade and effective light source as well as an easy-to-hold handle, has been used as a staple for airway management ever since its introduction several decades ago[5]



### C MAC D blade video laryngoscope

C-MAC D-Blade is a special device used specifically to help perform tracheal intubation of the complicated airway. Karl Storz introduced C-MAC video laryngoscope in 1999 and it was the first Macintosh-type video laryngoscope to be used. It comprised of the good old Macintosh endotracheal blade and availability of the video option and also enabled both direct and indirect laryngoscopy otherwise called as video assisted laryngoscopy. It was subsequently in future years that other features of the C- MAC system were availed which was those of the optics, portability and shapes of the blades in order to meet the different handlings of the clinical environment. The D-Blade (Difficult Airway Blade) is acutely angulated and offers an increased visualization in difficult airway complex conditions which include the cervical spine injury and small mouth opening [4]



**C-MAC video laryngoscope**

## Materials and Methods

### Design:

This study was a randomized prospective control study, which was conducted at Government Mohan Kumaramangalam Medical College. Over a period of 18 months, the study was conducted after obtaining the informed written consent of the patients

### Participants:

A total of 60 patients of ASA physical status 1 and 2 who needed nasotracheal intubation in elective head and neck surgeries under general anesthesia treated during the study period. Patients were selected with the following inclusion and exclusion criteria. Inclusion criteria comprise, Individual of either gender, age 18-50 Years, patient undergoing head and neck surgeries, ASA physical status 1-2. Exclusion criteria comprise, Anticipated Difficult Endotracheal Intubation (Mallampati score 4), nasopharyngeal abnormality or surgery, ischemic heart disease, patients who received radiation over neck or oral cavity, patients with anticipated difficult intubation with restricted mouth opening or tongue protrusion, hypertensives on rate controlling medications, hyperthyroids.

### Study procedure:

#### Conduct of anaesthesia

#### Groups

GROUP C MAC: Nasotracheal Intubation with C MAC D Blade video laryngoscope

GROUP MACINTOSH: Nasotracheal Intubation with Macintosh laryngoscope using Magill's forceps.

#### Pre anesthetic preparation

Routine tests such as complete blood counts, blood urea, serum creatinine, random blood sugar analysis, chest radiograph, and ECG was done

#### Monitoring

- A. NON INVASIVE BLOOD PRESSURE
- B. SPO<sub>2</sub>
- C. HEART RATE
- D. ETCO<sub>2</sub>
- E. ECG

The study participants were ASA I and ASA II patients aged between 18 and 50 years belonging to both sexes who were under the elective surgery of the head and neck requiring a nasotracheal intubation procedure under general anesthesia.

#### Premedication

All the subjects would be premedicated on an intramuscular injection of Inj. Glycopyrrolate 0.2 mg, thirty minutes before the procedure. Also the nasal cavity of both groups were prepared topically, whereby xylometazoline 0.05% drops were put into both nostrils two times. When the patient arrived in the operating room, baseline heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, and Spo<sub>2</sub> was recorded. NIBP, Pulse oximetry, ECG, and intravenous line were placed with the help of 18 G IV cannula. Both groups received Inj. Midazolam 1mg and Inj Fentanyl

2 mcg/kg. Three minutes of preoxygenation with 100 percent oxygen was ensured to the patients.

#### **Induction –**

Inj. Propofol at the dose of 1.5-2.5 mg./kg for patients of both groups.

#### **Muscle relaxant**

The muscle relaxant to be used in both of these groups is Injection Vecuronium of 0.1 mg/kg dosage. After a 3-minute wait, the patient will then be put through intubation.

#### **Intubation**

An endotracheal tube of appropriate diameter was chosen and one of the nostrils was selected to insert the tube. In the MACINTOSH group, the tube was inserted into one of the nostrils, the Macintosh laryngoscope was inserted into the mouth and Magill's forceps is used to achieve intubation. In the CMAC group, after getting a proper view of the larynx with the video laryngoscopy, the tube was directed at the opening of the glottis and further moved into the trachea to intubate successfully.

Heart rate (HR) and mean arterial pressures (MAP) will be measured prior to induction, following induction, right after intubation, and subsequently at 1 minute, 3 minutes, 5 minutes, and 10 minutes post-intubation. The total number of intubation attempts, the Mallampatti classification of patients, the glottic view assessed by the Cormack-Lehane grading, the occurrence of mucosal or soft tissue injury indicated by blood on the laryngoscope blade or tube, and any instances of esophageal intubation will be recorded. If oxygen saturation drops below 95%, the intubation attempt will be stopped. Patients will then receive mask ventilation with 100% oxygen until their saturation returns to 100%.

#### **Sample size calculation:**

$$N = \frac{\{u\sqrt{[\pi_1(1 - \pi_1) + \pi_0(1 - \pi_0)]} + v\sqrt{[2\bar{\pi}(1 - \bar{\pi})]}\}^2}{(\pi_0 - \pi_1)^2}$$
$$\bar{\pi} = \frac{\pi_0 + \pi_1}{2}$$

$N$  = Sample size

$\pi_1$  = Proportion of outcome in intervention group = 0.7

$\pi_0$  = Proportion of outcome in control group = 0.4

$U$  = one-sided percentage point of the normal distribution corresponding to 100% - the power = 80%,  $u = 0.84$

$V$  = Percentage point of the normal distribution corresponding to the (one-sided) significance level for significance level = 5%,  $v = 1.645$

The required sample size as per the above-mentioned calculation was 30 in each group.

#### **Data analysis:**

Data will be analyzed using an Intention to Treat (ITT) approach. Initially, all baseline characteristics will be compared between the two groups to determine any significant differences in these variables across the study groups. Following this, the primary and secondary outcome variables will be compared between the two groups to evaluate the intervention's efficacy and safety.

## RESULTS

**Table 1: Table indicating Time to Intubation (TTI) –INTUBATION TIME between the two groups.**

Group	Mean TTI	SD	P value
C -MAC	23.33	1.92	<0.001
Macintosh	67.23	2.46	
Denoting the mean attempts between the two groups.			
Group	Mean Attempts	SD	P value
C -MAC	1.00	0.00	<0.001
Macintosh	1.13	0.35	

C-MAC group has much lower mean TTI (23.33 seconds) of nasotracheal intubation than that of Macintosh group (67.23 seconds,  $p < 0.001$ ) showing better effectivity level.

The C-MAC group has completed first-attempt success (mean = 1.00) and it had a small decrease in the number of attempts to attain first-attempt success in the Macintosh group (mean = 1.13,  $p < 0.001$ ), results that reflect the success of the C-MAC by the fact that it elicits functioning with the first attempt compared to its counterpart (Macintosh).

**Table 2 : Heart Rate - Immediate Post Intubation between the two groups.**

Group	Mean HR	SD	P value
C -MAC	76.03	2.54	<0.001
Macintosh	79.27	2.23	
Heart rate -1 minute post intubation between the two groups.			
Group	Mean HR	SD	P value
C -MAC	74.87	2.39	<0.001
Macintosh	77.37	2.10	

The increase in HR immediately post-intubation was much lower in the C-MAC group (76.03 bpm vs. 79.27 bpm,  $p < 0.001$ ) indicating lower hemodynamic distress in the C-MAC population as compared to the Macintosh population.

The C-MAC group at 1 minute after intubation has a much lower mean HR (74.87 bpm vs. 77.37 bpm,  $p < 0.001$ ) and it is, therefore, less hemodynamically responsive than Macintosh group.

**Table 3: Heart rate- 3 Minutes Post-Intubation between the two groups.**

Group	Mean HR	SD	P value
C-MAC	73.77	2.31	<0.001
Macintosh	76.23	2.04	
Heart Rate - 5 Minutes Post-Intubation between the two groups.			
Group	Mean HR	SD	P value
C-MAC	72.77	2.22	<0.001
Macintosh	74.87	1.96	

The C-MAC group continues to exhibit a considerably smaller mean HR 3 minutes after intubation (73.77 bpm vs. 76.23 bpm,  $p < 0.001$ ), which proves its lower hemodynamic effect once again.

As compared with Macintosh, at 5 min after intubation, the C-MAC group still demonstrates significantly lower mean HR (72.77 bpm vs. 74.87 bpm,  $p < 0.001$ ), which means that the reduction in HR elevation is delayed longer than with Macintosh.

**Table 4: MAP - Immediate Post-Intubation between the two groups.**

Group	Mean MAP	SD	P value
C-MAC	96.03	2.65	<0.001
Macintosh	100.67	2.80	
MAP - 1 Minute Post-Intubation between the two groups.			
Group	Mean MAP	SD	P value
C-MAC	93.97	2.52	<0.001
Macintosh	97.87	2.59	

The C-MAC group has also much smaller MAP elevation right after the intubation (96.03 mmHg vs. 100.67 mmHg,  $p < 0.001$ ), which highlights a lower degree of hemodynamic stress than in the Macintosh group.

One minute after intubation, the average MAP (93.97 mmHg versus 97.87 mmHg,  $p < 0.001$ ) shows that the C-MAC group maintains a lower blood pressure increase response when compared to the conventional intubation group.

**Table 5: MAP - 3 Minutes Post-Intubation between the two groups.**

Group	Mean MAP	SD	P value
C-MAC	91.69	2.42	<0.001
Macintosh	95.77	2.48	

<b>MAP - 5 Minutes Post-Intubation between the two groups.</b>			
Group	Mean MAP	SD	P value
C-MAC	90.33	2.22	<0.001
Macintosh	93.87	2.40	

C-MAC group has considerably lower mean value of MAP at 3 minutes after intubation (91.69 mmHg vs. 95.77 mmHg,  $p < 0.001$ ) in favor of less hemodynamic effects.

The C-MAC group has a significantly reduced mean MAP at 5-minute post-intubation, (90.33 mmHg vs. 93.87 mmHg,  $p < 0.001$ ), which is evidence of late decreased elevation of blood pressure.

**Table 6: EASE OF INTUBATION (NIDS Score) comparison between the two groups.**

Category	C MAC(n=30)	Macintosh(n=30)	P value
0(Easy)	24(80%)	6(20.0%)	<0.001
1(Slightly Difficult)	6(20.0%)	10(33.3%)	
2(Moderately Difficult)	0(0.0%)	9(30.0%)	
3(Difficult)	0(0.0%)	5(16.7%)	

<b>ACCESSORY MANEUVERS between the two groups.</b>			
Category	C MAC(n=30)	Macintosh(n=30)	P value
None	29(96.7%)	10(33.3%)	<0.001
ELM	1(3.3%)	15(50.0%)	
Magill forceps	0(0.0%)	5(16.7%)	

Intubation among those in the C-MAC group was much easier because 80 percent succeeded in easy to intubate (Nasal Intubation Difficulty Score / NIDS=0) as opposed to 20 percent among those in the Macintosh group ( $p < 0.001$ ). There were more moderate (30 percent) and difficult (16.7 percent) intubations by the Macintosh group, whereas, the C-MAC is easier to use.

The C-MAC group needed majorly fewer accessory maneuvers (96.7% none as compared to 33.3% none in Macintosh,  $p < 0.001$ ) and Macintosh required ELM (50%) and Magill forceps (16.7%) more regularly which showed that the procedure under C-MAC was simple

**Table 7: Denoting the COMPLICATIONS between the two groups.**

Group	C MAC(n=30)	Macintosh(n=30)	P value
None	29(96.7%)	29(96.7%)	1.000
Mucosal trauma	1(3.3%)	1(3.3%)	

<b>Denoting the ESOPHAGEAL INTUBATION between the two groups.</b>			
Group	C MAC(n=30)	Macintosh(n=30)	P value
No	30(100.0%)	26(86.7%)	0.112
Yes	0(0.0%)	4(13.3%)	

There was a low incidence of complications in both groups having the same incidence (one case of mucosal trauma in each group, 96.7 percent no complications,  $p = 1.000$ ), with similar safety profiles in terms of complications.

The C-MAC Group did not suffer any esophageal intubations, and esophageal intubations were found in 4 (13.3%) patients using the Macintosh laryngoscope ( $p = 0.112$ ). Though the trend is not significant, esophageal intubation is likely to be avoided during C- MAC use.

## DISCUSSION

### Comparing the time taken for intubation in the groups

Compared to Macintosh (67.23 seconds, SD 2.46), the mean TTI was significantly shorter in the C-MAC group (23.33 seconds, SD 1.92), and had also a very significant p-value- value ( $<0.001$ ). The difference that measures almost threefold makes it clear that the C-MAC D-Blade videolaryngoscope is more effective in faster nasotracheal intubation. The video technology of the C-MAC allows magnified view and clear sight of the glottis enabling faster alignment of the tube especially on the complex head and neck surgery patient anatomy. Conversely, the Macintosh laryngoscope depends on direct line-of-sight visualization that may be difficult during nasotracheal intubation since it is carried out through the nasal route accompanied by the possibility of anatomical distortion. The reduced TTI by C-MAC is in line with our results determined by Hazarika et al. (2018) that an average TTI of about 25 seconds and 60 to 70 seconds for C-MAC and Macintosh, respectively, were recorded in similar environments. The low SD of both the groups (1.92 and 2.46) supports the fact of equal performance within each group and supports the reliability of the C-MAC benefit.

### Comparing the intubation attempts in the groups

The C-MAC group had a mean of 1.00 attempts (SD 0.00) or 100 percent success on the first attempt whereas the Macintosh had a mean of 1.13 attempts (SD 0.35) with a significant p-value ( $<0.001$ ). There is a zero SD in the C-MAC group because all patients succeeded on the first trial but in the Macintosh group 4 patients (13.3%) were required to go through multiple attempts which translates to the greater mean and SD. This distinction shows that C-MAC will have better visualization and will be more maneuverable which can most likely allow the tubes to be precisely placed at the initial attempt.

### Comparing the heart rate changes in the groups

The means of the HR at baseline were comparable with C-MAC (71.07 bpm SD 1.98) and Macintosh (71.23 bpm SD 1.46) with a p-value 0.826, which is not significant. This similarity provides similar pre-intubation hemodynamic states, eliminating baseline HR as a biasing factor and verifying the nonequivalence of the randomized study, as observed in such trials as Hazarika et al. (2018). At immediately post-intubation, the C-MAC group showed lower mean HR (76.03 bpm, SD 2.54) than the Macintosh (79.27 bpm, SD 2.23,  $p < 0.001$ ),

and the increase in the mean HR levels at immediately post-intubation was less than in the Macintosh (approximately 5 bpm vs. approximately 8 bpm). This disparity is seen as diminished sympathetic activation when using the C-MAC that is attributable to its more rapid acceleration to intubation (23.33 vs. 67.23 seconds) and a 100 percent success rate of a first-attempt intubation with minimal airway manipulation. The trend remains the same at 1 minute (C-MAC: 74.87 bpm, SD 2.39; Macintosh: 77.37 bpm, SD 2.10;  $p < 0.001$ ), 3 minutes (C-MAC: 73.77 bpm, SD 2.31; Macintosh: 76.23 bpm, SD 2.04;  $p < 0.001$ ) and 5-minute (C-MAC: 72.77 bpm, SD 2.22; Macintosh: 74.87 bpm, SD 1.96;  $p < 0.001$ ) post-intubation, when C-MAC generally demonstrates lower HR, which regains the near-baseline values faster than Macintosh, which should experience heightened HR due to the long or excessive struggling with intubation.

HR after 10 min of intubation returns to the initial level in the both groups (C-MAC: 71.07 bpm, SD 1.98; Macintosh: 71.23 bpm, SD 1.46;  $p = 0.826$ ), which manifested in the removal of the stress associated with intubation under stable anesthesia, and can be observed in the ASA I/II group of patients. SD values were low at all the time points indicating homogeneous responses among the groups. The decreased HR during the first 5 min measured by C-MAC corresponds to the findings of Hazarika et al. (2018), stating that the videolaryngoscopy gives the possibility of reducing hemodynamic stress through an enhanced glottic view and an efficient procedure. The decrease in HR using C-MAC clinically as the HR in the immediate, and 5 minutes after intubation decreases implies a decreased level of cardiovascular stress, which is of primary importance to patients with cardiovascular comorbidities or going through head and neck treatments where long term stress may increase instances of complications such as ischemia. HR normalization that was performed after 10 minutes confirms that both devices are safe to be used in the long term; however, the earlier stabilization of C-MAC results in a perioperative advantage, as it ensures patient safety in the post-intubation period when conditions are most critical.

### Comparing the mean arterial pressure changes in the groups

The data collected on the comparison of the C-MAC D-Blade videolaryngoscope and the Macintosh laryngoscope on nasotracheal intubation in 30 patients per group, under the age of 50 years (between 20 and 50 years) and with ASA I and ASA II status, indicates the existence of statistically significant differences in the hemodynamic responses: at baseline; immediately after the intubation; 1, 3, 5, and 10 minutes after the intubation. It can be seen that compared with the standard care, analysis with mean MAP, standard deviation (SD), and p- value of a two-parted t-test collisionness ( $p < 0.05$  is significant) shows that the C-MAC is more beneficial in lowering cardiovascular stress during and after intubation with studies such as Hazarika et al. (2018).

At the 1-minute/immediately after intubation, the C-MAC group had a reduced mean MAP of 96.03 mmHg (SD 2.65) to 100.67 mmHg (SD 2.80) in the Macintosh group ( $p < 0.001$ ), and a lesser increase from the baseline (10.92 mmHg)

compared to the Macintosh group (11.67 mmHg). It is less sympathetic stimulation that results in reduced MAP increase with C-MAC, probably because of the shorter time taken to intubate (23.33 vs. 67.23 seconds) and all first-attempt intubations. At 1 minute, 3 minutes and 5 minutes after the intubation, the tendency remains intact (at 1 minute: C-MAC: 93.97 mmHg, SD 2.52; Macintosh: 97.87 mmHg, SD 2.59;  $p < 0.001$ ; at 3 minutes: C-MAC: 91.69 mmHg, SD 2.42; Macintosh: 95.77 mmHg, SD 2.48;  $p < 0.001$ ). The MAP of the C-MAC group is reaching the baseline faster compared to the Macintosh group, where they maintain higher values, known as increased hemodynamic stress due to the time-consuming or more traumatic intubation.

In a nutshell, use of C-MAC D-Blade videolaryngoscope compared to Macintosh laryngoscope decreases MAP rises ( $p < 0.001$ ) during the period immediately after intubation to 5 min, which underlines the efficacy of the videolaryngoscope in decreasing hemodynamic stress due to its increased and less harmful speed of intubation.

#### **Comparing the ease of intubation in the groups**

Intubation was much easier in the C-MAC group with 80 percent easy (NIDS=0) and 20 percent in the Macintosh group ( $p < 0.001$ ). In Mac, the percentage slightly difficult, moderately difficult, and difficult intubation was 33.3, 30, and 16.7, respectively and in C-MAC, there was none of the moderately hard or difficult intubation. This vivid contrast illuminates on the better visualization and handling of C-MAC that makes the placement of the tube easier during nasotracheal intubation. The direct laryngoscopy technique used by the Macintosh is normally hampered with greater strain in gaining glottic entrance and in the nasal tract, increasing the NIDS scores. The given discoveries correlate with those of Hazarika et al. (2018) that described overall superior intubation conditions with C-MAC owing to its video technology.

#### **Comparing the use of accessory maneuvers intubation attempts in the groups**

The C-MAC group had far fewer accessory maneuvers (96.7 % none vs. 33.3 % none in Macintosh,  $p < 0.001$ ). The Macintosh group needed a lot of external laryngeal manipulation (ELM, 50%), Magill forceps (16.7%), which is consistent with the difficulties of a direct process in the nasotracheal intubation process

#### **CONCLUSION**

C-MAC D-Blade video laryngoscopy is the better method of nasotracheal intubation as it involves better glottic visualization, faster intubation, easier positioning, and improved physiological condition than conventional direct laryngoscopy with Macintosh blade.

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