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Comparison of Hemodynamic Response between Inexpensive Video Laryngoscope and McCoy Blade Laryngoscope Aided Endotracheal Intubation: An Inexpensive Digital Tool

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Abstract: ***Background and aim: Laryngoscopy and tracheal intubation are known to evoke the stress responses, Thus, use of different types of laryngoscope blades can help decreasing these responses. The aim of the study was to assess the effect of using McCoy blade laryngoscope and inexpensive video laryngoscope in endotracheal intubation. Methodology: This study included 50 patients, who were divided into 2 groups of 25 each. In group A patients McCoy laryngoscope were used. In group B Inexpensive video laryngoscope were used. Parameters like heart rate (HR), and mean arterial pressure (MAP) were recordedat the baseline, post induction, just after tracheal intubation and at 1, 3, 5 and 10 min post intubation. Any episode of heamodynamic instability was noted. Result: The increase in mean arterial pressure and heart rate was less with Inexpensive video laryngoscope when compared to the McCoy laryngoscope. Themean arterial pressure and heart rate increased after intubation in all groups but returned to baseline within 5 min after intubation in each group. Statistically significant, post laryngoscopy values noted in McCoy group. Conclusion: This study shows that the Inexpensive video laryngoscope require less laryngeal manipulations and force required during intubation, thereby reducing thepotential for haemodynamic variation.***

Keywords: McCoy blade laryngoscope, Inexpensive video laryngoscope

1. Introduction

Laryngoscopy and tracheal intubation are known to evoke the stress responses, in the form of tachycardia, systemic hypertension, arrhythmias [(1),] and increased intracranial pressure exposing the patient to unwanted risk [(2).] These responses are more marked in treated and untreated hypertensive patients [(3).]

It has been observed that amount of forces exerted during laryngoscopy is the key determinant for mechanical stimulation of supraglottic region and stretch receptors present in the respiratory tract, while endotracheal intubation and cuff inflation contributing little additional stimulation [(4 - 6).] Thus, use of different types of laryngoscope blades can help decreasing these responses.

The Digital Revolution has brought new technology to the practice of tracheal intubation. Inspite of all the technological advancements the cost of these devices are a major drawback, they are expensive. So to overcome that and to provide technology at an affordable cost we came across an article - Inexpensive video - laryngoscopy guided intubation using a personal android mobile. A custom device easily assembled using an USB endoscopic camera, a conventional Macintosh laryngoscope blade size 4, and a smartphone (also in computer).

This endoscopy is a true plug and play driver installed, convenient detection equipment and a 5.5 mm camera head a new electronic detection product, which can capture the image, to the android phone and computer in real time video and photo, storage, printing or upload to the internet. The inspection camera makes use of optoelectronic technology to investigate hard to reach area. The main advantages are small in size and the diameter is only 5.5 mm with high resolution imaging, waterproof camera, waterproof wire endoscope with a 5.5 mm camera head high resolution with 6 LED light is adjustable for photo shooting and video recording. Waterproof level: 67 photo shooting and video recording. Pixel: 300k resolution: 640 x 480 capture resolution: up to 1024 x 720 (vga), 30 ftps. Wide visual view angle: 67degrees and Focal distance: 3cm.

Aim

To determine the effect of using McCoy blade laryngoscope and inexpensive video laryngoscope in endotracheal intubation.

Objectives

- To determine the Hemodynamic Response Between Inexpensive Video Laryngoscope And McCoy Blade Laryngoscope Aided Endotracheal Intubation.
- To determine time required to intubate patient with Inexpensive Video Laryngoscope And McCoy Blade Laryngoscope.

2. Review of Literature

LuqmanMuhamed M et al (2017) [7] conducted a study to compared between Custom Made Video Laryngoscope And Macintosh Laryngoscope Aided Endotracheal Intubation. A Simple And Inexpensive Digital Tool. In their study they took 50 patients divide in two group each undergoing elective surgery requiring tracheal intubation. They done cases under general anaesthesia and do intubation with Macintosh Laryngoscope in Group B and with Custom Made Video Laryngoscope in Group A and observe the effect of using both the blades. Results The overall duration of successful tracheal intubation was shorter in the custom made video laryngoscope group 26.92 (± 5.03) seconds versus 40.64 (± 5.7) seconds in the Macintosh group, statistically significant (p - value <0.001). Overall successful tracheal intubation was 100% (25 patients) in the Video laryngoscope group and (25 patients) in the Macintosh group.1 st attempt was 88% in video laryngoscope compared to 64% in curved blade.12% required a second attempt in video laryngoscope while 36% in Macintosh group. They concluded that the time to intubation with the custom made video laryngoscope was less when compared with Macintosh laryngoscopes.

Aggarwal H et al (2019) [8] conducted a study to determine the Hemodynamic Response to Orotracheal Intubation: Comparison between Macintosh, McCoy, and C - MAC Video Laryngoscope. One hundred and fifty patients with normal airways undergoing elective general anesthesia were randomly allocated to undergo intubation using either Macintosh (Group A), McCoy (Group B), or C - MAC video laryngoscope (Group C). Hemodynamic changes associated with intubation were recorded immediately before and after laryngoscopy and intubation, every minute for 5 min and at 10 min after intubation by an independent observer. The time taken to perform endotracheal intubation and Cormack and Lehane score were also noted in all three groups. Results: Hemodynamic response after intubation was least in Group B (McCoy) as compared to Group A (Macintosh) and Group C (C - Mac) (P = 0.001). Ninety - two percentage patients were in Cormack and Lehane score Class I in Group C in comparison to 52% in Group A and 48% in Group B (P = 0.000). Time for intubation taken in Group A, Group B, and Group C was 15.53 ± 1.53 min, 18.65 ± 0.44 min, and 22.82 ± 1.323 min, respectively (P = 0.000). They concluded that the McCoy laryngoscope provided better attenuation of hemodynamic responses to laryngoscopy and intubation than the Macintosh and C - Mac video laryngoscope whereas more appearance of Cormack and Lehane score Class I was seen with the C - MAC video laryngoscope. Furthermore, the time taken to perform endotracheal intubation was the longest with the C - MAC video laryngoscope.

Seo et al (2020) [9] conducted a study on Comparison of C - MAC D - blade videolaryngoscope and McCoy laryngoscope efficacy for nasotracheal intubation in simulated cervical spinal injury: a prospective randomized comparative study. l. Ninety - five patients requiring NTI were included in data analysis: McCoy group (group M, n = 47) or C - MAC D - Blade videolaryngoscope group (group C, n = 48). A Philadelphia neck collar was applied before anesthetic induction to immobilize the cervical spine. Single experienced anesthesiologist performed NTI. The primary outcome was duration of intubation divided by three steps: nose to oropharynx; oropharynx into glottic inlet; and glottic inlet to trachea. Secondary outcomes included glottic view as percentage of glottis opening (POGO) score and Cormack - Lehance (CL) grade, modified nasal intubation - difficulty scale (NIDS) rating, hemodynamic changes before and after intubation, and complications. Results: Total intubation duration was significantly shorter in group C (39.5 ± 11.4 s) compared to group M (48.1 ± 13.9 s). Group C required significantly less time for glottic visualization and endotracheal tube placement in the trachea. More patients in group C had CL grade I and higher POGO scores (P < 0.001, for both measures). No difficulty in NTI (modified NIDS = 0) was more in group C than group M. Hemodynamic changes and incidence of complications were comparable between groups. They concluded that the C - MAC D - Blade videolaryngoscope had significant benefits for intubation time and difficulty compared to the McCoy laryngoscopy during NTI. The C - MAC DBladevideolaryngoscope provided for better glottic visualization and it took less time to advance the nasotracheal tube from the oropharynx to the glottic inlet with this device.

3. Methodology

Study design: prospective, randomized, comparative study.

Study location: the study was conducted in Jhalawar Medical College, Jhalawar, Rajasthan.

Inclusion criteria

1) Patients scheduled for elective surgery.
2) Age between 25 and 60 years of both the sexes.
3) Patients with the American Society of Anesthesiologists (ASA) physical status Classes I and II.

Exclusion criteria

1) Patients with thyromental distance <6 cm
2) Mallampati Grade ≥ III
3) Body mass index (BMI) more than 30
4) Patients with the ASA physical status Classes ≥ III
5) Pregnant women.

Sampling

After approval from Ethical Committee and written informed consent, 50 adult ASA grade I - II patients undergoing elective surgery requiring tracheal intubation as part of anaesthesia were selected. They were randomly assigned to two groups based on the device used for laryngoscopy by lottery method.

Laryngoscopy and intubations were performed by an anesthesiologist who was familiar and trained with intubation
using McCoy Blade laryngoscope and Inexpensive Laryngoscope.

In group A patients McCoy laryngoscope were used.
In group B inexpensive video laryngoscope were used.

Materials Required
Anaesthesia machine,
Premedication drugs (midazolam, glycopyrrolate, fentanyl),
Induction drugs (propofol, ketamine),
Scoline,
Atracurium,
Tramadol,
Neostigmine,
Laryngoscope (mccoy& inexpensive video laryngoscope),
Smartphone.
Emergency drugs and emergency equipment will be kept ready like laryngoscopes, Bain circuit, endotracheal tubes.

Preanaaesthetic Assessment:
All patients in this study were subjected to detailed pre anaesthetic evaluation which include:
1) Complete medical and surgical history of past and present including any known drug allergy or any other complaint.
2) Previous history of operation and complication occurred.
3) Complete general physical examination of
   - Airway from the point of difficult airway.
   - Back examination.
   - Pallor for anaemia.
4) Vital parameters like BP, pulse, temperature and respiratory rate, weight of the patient, height of the patient.
5) Systemic examination:
   - Cardiovascular system
   - Respiratory system
   - Central nervous system.
   - Abdominal examination.

Investigations:
1) Haematological – Hb%, TLC, DLC, BT, CT.
2) Blood urea, serum creatinine.
3) Liver function test (S. Bilirubin, SGOT, SGPT)
4) Serum electrolytes.
5) Fasting /random blood sugar.
6) ECG.
7) COVID - 19 test (RT - PCR).

4. Procedure

Each patient were checked for adequate Nil by mouth status for atleast 6 - 8 hr. Patient's written informed consent and PAC were checked. Intravenous access with 18 - gauge i. v. cannula was secured in both the forearm. Baseline vital parameter like BP, pulse rate, SpO_2, respiratory rate were documented. All patients was pre - medicated with Inj. Ondansetron 0.1mg/kg, Inj midazolam 0.02mg/kg, Injglycopyrrolate 0.005mg/kg, injection fentanyl 1 - 2microgm/kg. Patients was preoxygenation with 100% O2 for three minutes, induction with propofol 2mg/kg i. v. neuromuscular blockade was achieved by using succinylcholine 2 mg/kg. Laryngoscopy was performed one min after succinylcholine administration and intubation was carried out depending on the group to which the patient was assigned. After achieving best possible view of the glottis, Cormack - Lehane grading [4] (grade 1 - 4) and the percentage of glottic opening (POGO) scoring was done. The endotracheal cuffed tube of appropriate size (7.0 and 8.0mm internal diameter for women and men, respectively) was introduced into the trachea under direct vision. After laryngoscopy and intubation the breathing circuit was connected. Proper ventilation was confirmed by chest auscultation and capnography. Once the intubation was complete, lungs were mechanically ventilated during the procedure and anaesthesia was maintained using nitrous oxide with oxygen and sevoflurane (1.5 - 2 %). The incidence of oesophageal intubation, mucosal trauma, orodental injury was recorded. The heamodynamic variables like heart rate (HR), ECG, oxygen saturation (SpO2), and mean arterial pressure (MAP) were recorded at the baseline, post induction, just after tracheal intubation and at 1, 3, 5 and 10 min post intubation. Any episode of heamodynamic instability was noted. After completion of surgery patient were reverse back with anticholinergic and anticholinesterase drugs. After completion of surgery patient will be shifted to post - operative ward.

Statistical Tests:
Statistical analysis was done by chi - square test and Analysis of variance (ANOVA). The qualitative data between two groups were compared using the Chi - square test. Normally distributed data was compared using analysis of variance (ANOVA). P value < 0.05 was considered statistically significant.

5. Result

The groups were similar with respect to demographic data and ASA physical status.

Table 1: Demographic data, mallampatti assessment

Parameters	Group A	Group B
Male: Female	12:13	15:10
Age (mean±SD)	36.28±12.46	38.96±8.66
MP Grade I/II	14-Nov	13-Dec
Weight (mean±SD)	63.46±7.47	64±9.45

Table 2: ASA grading

ASA Grade	Group A	Group B
I	21 (84%)	18 (72%)
II	4 (16%)	7 (28%)

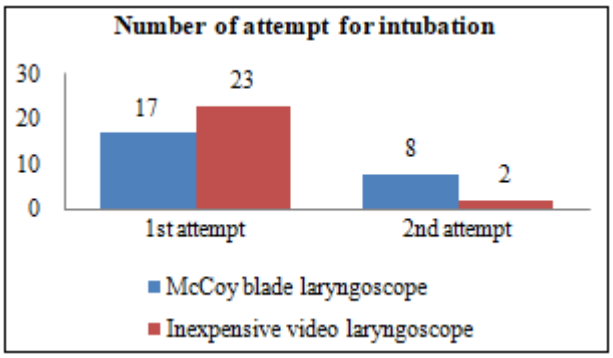
Table 3: Time taken for intubation

	Group A (McCoy Blade)			Group B (Inexpensive Video Laryngoscope)			P - value
	N	Mean	SD	N	Mean	SD	
Intubation time taken (in seconds)	25	35.44	±5.5	25	24.82	±5.43	<0.05

The overall duration of successful tracheal intubation was shorter in the inexpensive video laryngoscope group B 24.82 (± 5.43) seconds versus 35.44 (± 5.5) seconds in the McCoy group A, statistically significant (p - value <0.05). (Table 3)

Table 4: Intubation attempts

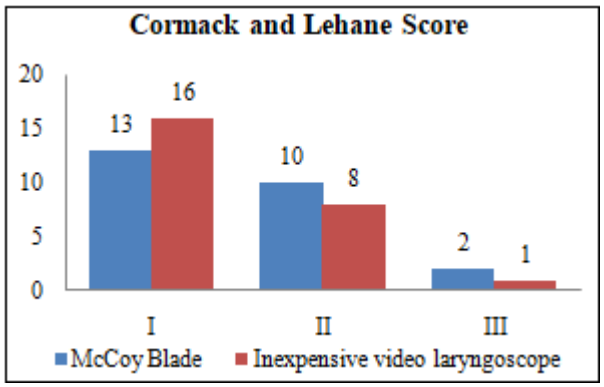
Intubation attempts	Group A (McCoy Blade)	Group B (Inexpensive Video Laryngoscope)	P - Value
1st	17 (68%)	23 (92%)	<0.05
2nd	8 (32%)	2 (8%)	



Overall successful tracheal intubation was 100% (25 patients) in the Inexpensive Video laryngoscope group B and (25 patients) in the McCoy group A.1st attempt was 92% in Group B compared to 68% in Group A. 8% required a second attempt in Group B while 32% in Group A. (table: 4)

Table 5: Cormack and Lehane score

Cormack and Lehane score	Group A (McCoy Blade)	Group B (Inexpensive Video Laryngoscope)	P - Value
I	13 (52%)	16 (64%)	<0.05
II	10 (40%)	8 (25%)	
III	2 (8%)	1 (4%)	



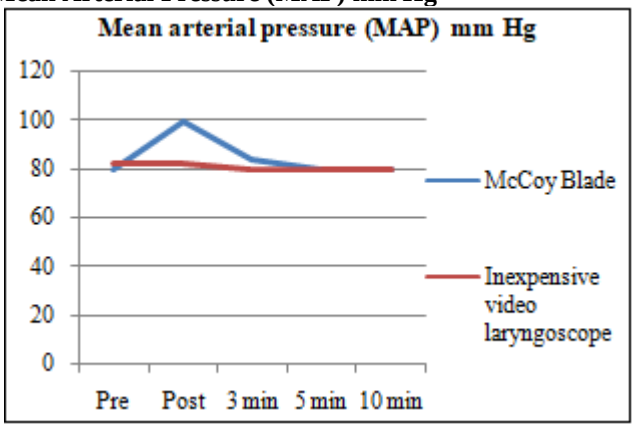
The Cormack - Lehane glottis view were better with Group B compared with the Group A.64% vs 52%. (table 5)

Table 6: POGO Score

POGO Score	Group A (McCoy Blade)	Group B (Inexpensive Video Laryngoscope)	P - value
100%	10 (40%)	14 (56%)	<0.05
50 - 100%	11 (44%)	10 (40%)	
<50%	4 (16%)	1 (4%)	

The POGO scores were better with Group B when compared with the Group A.56% had POGO score of 100% in Group B compared to 40% in the Group A.

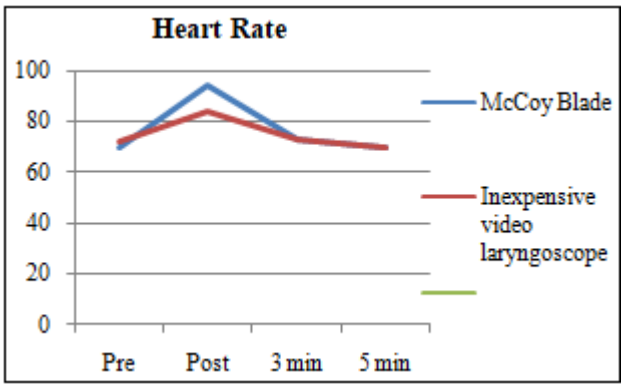
Mean Arterial Pressure (MAP) mm Hg



The increase in mean arterial pressure was less with Inexpensive video laryngoscope when compared to the McCoy laryngoscope.

The mean arterial pressure increased after intubation in all groups but returned to baseline within 5 min after intubation in each group. Statistically significant, post laryngoscopy values noted in McCoy group.

Heart Rate



The effects of laryngoscopy on heart rate were transient. Statistically significant, post laryngoscopy values noted in McCoy group. The heart rate increased after intubation in both groups but returned to base line within 5 min after intubation.

But the increase in heart rate was less with Inexpensive video laryngoscope.

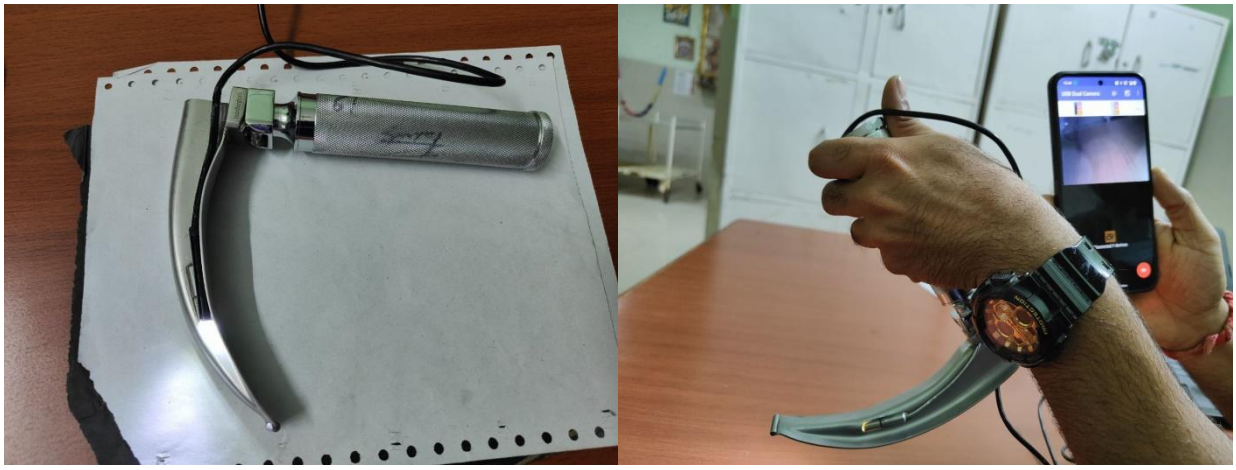


Image 1: Setting the inexpensive video laryngoscope.
LED lights whose intensity are adjustable.
Connected with smartphone.

Image 2: Vocal cord visualisation with inexpensive video laryngoscope and sucessfully intubated.

6. Discussion

In the present study the inexpensive video laryngoscope reduced the intubation time as compare to McCoy blade laryngoscope, and hemodynamic variable show less variation with inexpensive video laryngoscope.

The heart rate increased after intubation in both groups butreturned to base line within 5 min after intubation. But the increase in heart rate was less with Inexpensive video laryngoscope.

The mean arterial pressure increased after intubation in all groups but returned to baseline within 5 min after intubation in each group. Statistically significant, post laryngoscopy values noted in McCoy group.

The Cormack - Lehane glottis view were better with Group B compared with the Group A.64% vs 52%. (table 5).

1st attempt was 92% in Group B compared to 68% in Group A.8% required a second attempt in Group B while 32% in Group A. (table: 4)

7. Conclusion

In this study, the time to intubation with the inexpensive video laryngoscope was less when compared with McCoy laryngoscopes.

With the Inexpensive video laryngoscope less laryngeal manipulations and force required during intubation, thereby reducing the potential for haemodynamic variation.

8. Future Scope

With advance development and enhanced technology video laryngoscope are the needed for difficult intubation as they are more helpful with less hemodynamic fluctuation.

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