USE OF VIDEO LARYNGOSCOPE DURING INTUBATION IN PATIENTS WITH NON DIFFICULT AIRWAY

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ABSTRACT

Endotracheal intubation using laryngoscope which is an important skill required for all anesthesiologist in day to day practice is considered as gold standard for airway management. Various methods can be used for endotracheal intubation of which direct laryngoscopy is most commonly used and video laryngoscopy is an alternative. The success rate of tracheal intubation in cases of difficult airways has increased dramatically with the use of video laryngoscopes and improvements in the degree of glottic exposure. Hence this study aims to evaluate the laryngoscopic view, ease of intubation and haemodynamic changes during intubation using video laryngoscope in patients with non difficult airway. This interventional study was conducted in fifty nine patients of ASA I or II, ≥18 yrs of age with Mallampati grade I or II, mouth opening >3 cms, thyromental distance >6.5 cms of either sex planned for elective surgery under general anesthesia. General anesthesia was induced with similar doses for all the patients and intubated using video laryngoscope. Cormack-Lehane grade, intubation time, number of attempts for intubation and haemodynamic parameters were recorded. In this study, all patients had grade I type of laryngeal view during laryngoscopy and the mean time required for intubation was 18.93±7.08 sec. Out of 59 patients, 58 (98.3%) were intubated in single attempt and there was no significant haemodynamic changes during laryngoscopy with video laryngoscope. Hence, the result of this study concluded that endotracheal intubation using video laryngoscope provides good laryngoscopic view, better intubating condition for the ease of intubation without significant haemodynamic changes, thus considering worth for intubation of non difficult airway.

KEYWORDS

Video laryngoscope, Cormack-Lehane grade, intubation, non difficult airway

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INTRODUCTION

Endotracheal intubation using laryngoscope which is an important skill for anesthesiologist in day to day practice[1] is considered as gold standard for airway management.[2] The ability to perform endotracheal intubation safely and effectively is really important as respiratory compromise is responsible for 75.0% of American Society of Anesthesiologist (ASA) closed claim analysis.[3]

Intubation is the process of inserting a tube, called an endotracheal tube (ET), through the mouth and then into the airway to provide oxygen and inhaled anesthetics agents to lungs. In operation theatre intubation is required to secure airway after induction of anesthesia using neuromuscular paralysis and also to provide positive pressure ventilation.[4] Short-term endotracheal intubation is routinely used for many surgical procedures and long-term intubation is used in critical care areas. Various methods can be used for endotracheal intubation of which direct laryngoscopy is most commonly used and video laryngoscopy is an alternative.[5]

Laryngoscopy is associated with sympathetic stimulation and adverse effect in physiological systems.[6] The laryngotracheal stimulation can lead to sympathoadrenal stimulation, that causes increase in plasma catecholamine concentration, which leads to hemodynamic responses. The frequently associated hemodynamic responses are increase in heart rate and blood pressure.[7]

Intubation is traditionally performed with a laryngoscope, a device that lifts the tongue to allow a direct view of the vocal cords. This is known as direct laryngoscopy.[4] Since the invention of Macintosh and Miller laryngoscope blades in 1940s, direct laryngoscopy has been considered as gold standard to facilitate tracheal intubation with visualization of glottic entrance.[1,2] While performing direct laryngoscopy, an attempt is made to straighten the angle between the mouth and the glottic opening and this stretch causes pain in oropharyngeal tissues and trigger a stress response.[8]

New devices have been developed that shows the vocal cords through a fine video camera placed on the tip of the device; this is known as indirect laryngoscopy, or video laryngoscopy. Indirect laryngoscopes, or video laryngoscopes, are thought to provide a better view of the vocal cords when compared with direct laryngoscopes.[4] and also improves the first-attempt success rates of tracheal intubation and decreases intubation difficulty.[9] video laryngoscopes provides better laryngoscopic view, easy to operate and reduce difficulty in intubation. It also causes less damage to oropharyngeal structure and thus helps alleviate the noxious stimuli during laryngoscopy.[10] Hence, this study aims to evaluate the laryngoscopic view, ease of intubation and haemodynamic changes during intubation using video laryngoscope in patients with non difficult airway.

MATERIALS AND METHODS

After obtaining approval from Institutional Review Committee, this interventional study was conducted in Nepal Medical College Teaching Hospital from January 2023 to July 2023 AD. A written informed consent was taken from all the patients participating in the study. Fifty nine patients more than 18 years of age belonging to ASA class I and II requiring endotracheal intubation undergoing elective surgery under general anaesthesia were included in the study. Patients who has a history of cervical injury, thyromental distance <6.5 cm, mouth opening <3 cm and having class III and IV Mallampati grade during airway examination were excluded from the study.

Pre- anesthetic evaluation of patients was done one day prior to the surgery. Airway assessment which includes mouth opening, Mallampati grading (MPG) and thyromental distance (TMD) was done prior to surgery. Patient was kept nil per oral after midnight. Baseline vitals were recorded on the day of surgery. Intravenous (IV) access was established using intravenous cannula of 18 or 20 Gauge. Patients' were monitored for electrocardiogram (ECG), non-invasive blood pressure both systolic blood pressure (SBP) and diastolic blood pressure (DBP), heart rate (HR), mean arterial pressure (MAP), oxygen saturation using pulse oximeter, and end-tidal carbondioxide (ET-Co2). An endotracheal tube of internal diameter (ID) 7.0 mm was used for female while 7.5mm ID tube was used for male patients .

With continuous monitoring induction of anesthesia was done by administering injection midazolam 2 mg, fentanyl 2 mcg/kg, propofol 2-3 mg/kg IV. Following adequate bag and mask ventilation, neuromuscular blockade Was achieved with IV rocuronium 1 mg/kg. Tracheal intubation was performed 90 seconds after rocuronium injection by trained anesthesiologist. The heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure was recorded at different time intervals, T1-baseline before induction of anesthesia, T2-immediately after laryngoscopy, T3-one minute after intubation, T4-three minutes after intubation and T5-five minutes after intubation.

Maintenance of anesthesia was done by delivering oxygen at 2 L/min, Isoflurane 1.0% volume. At the end of the surgery neuromuscular blockade was reversed using neostigmine 0.04-0.08 mg/kg and glycopyrolate 10 mcg/kg and awake tracheal extubation was done and then patient were shifted to Post Anesthesia Care Unit (PACU).

For intubation using video laryngoscope, the patient's neck was not extended and was kept in neutral position. The tracheal tube was pre fitted into the device before insertion. When necessary, the epiglottis was lifted by elevating the blade into the vallecula. A stylet was always inserted into the tracheal tube to guide the tube during video laryngoscopy.[11] The glottic view was assessed by Cormack and Lehane (C&L) grading,[12] then ET tube was inserted. Correct placement of the tracheal tube was confirmed by bilateral chest auscultation and capnography.

Glottic opening grade, total duration of intubation and numbers of attempts of intubation was recorded. Visualization of laryngeal inlet was assessed according to C&L grade: I: vocal cords visible; II: only the posterior commissure visible; III: only epiglottis is visible; IV: neither glottis nor epiglottis visible. A C&L grade I or II view was defined as 'easy' and a grade III or IV as 'difficult'.[13] Time between the cessation of oxygen supply until the waveform was confirmed with end tidal carbondioxide monitoring was taken as total duration of intubation. All parameters were recorded in a special proforma.

Intubation was considered as failure if:

- the tracheal tube could not be placed due to difficulty viewing the glottis
- the time from the insertion of the laryngoscope into the oral cavity until its removal exceeded 60 seconds or
- the patient displayed signs of oxygen desaturation
- Statistical analysis was done using SPSS 16 software.

RESULTS

Total 59 patients were involved in this study. The mean age of patients involved in the study was 39.17 ± 11.18 yrs. Out of 59 patients, 16 were male and 43 were female with M:F ratio of 27.1/72.9%. Thirty six patients belonged to ASA grade of physical status, ASA I and 23 to ASA II. During airway assessment, 26 patients had grade I and 33 patients had grade II MPG, mean length of mouth opening was 4.49±0.6 cm and thyromental distance was 7.69±0.89 cm (Table 1).

In this study all patients had grade I type of laryngeal view during laryngoscopy (Table

Table 1: Demographic profile and airway assessment

Variables	Mean	SD
Age (Yrs)	39.17	11.18
Sex(M/F)	16/43 (27.1/72.9 %)	
ASA(I/II)	36/23 (61/39 %)	
Mouth opening (cm)	4.49	0.6
Thyromental distance (cm)	7.69	0.89
Mallampati grade(I/II)	26/33 (44.07/55.93 %)	

Table 2: Laryngoscopic view

Cormack-Lehane grade(C&L)	n = 59
Grade I	59 (100 %)

Table 3: Ease of intubation

Variables	Mean	SD
Intubation time (sec)	18.93	7.08
No of attempts (I/II)	58/1 (98.3/1.7 %)	

Table 4: Haemodynamics

Time	Heart rate/min (Mean±SD)	Mean arterial pressure (Mean±SD)
T1	81.69±12.43	97.59±10.48
T2	94.25±15.92	107.17±14.76
T3	95.32±13.18	101.92±12.95
T4	88.49±14.20	90±12.93
T5	85.85±14.63	86.51±12.65

2). The mean time required for intubation was 18.93±7.08 sec and out of 59 patients 58 were intubated in first attempt and only one patient required second attempt for intubation (Table 3).

The base line (T1) heart rate was 81.69±12.43/min and mean arterial pressure was 97.59±10.48 mmHg. Immediately after laryngoscopy (T2), the heart rate was 94.25±15.92/min and mean arterial pressure was 107.17±14.76 mmHg. One minute after intubation (T3), the heart rate was 95.32±13.18/min and men arterial pressure was 101.92±12.95 mmHg. Three minutes after intubation (T4), the heart rate was 88.49±14.20/min and mean arterial pressure was 90±12.93 mmHg and five minutes after intubation (T5), the heart rate was 85.85±14.63/min and mean arterial pressure was 86.51±12.65 mmHg (Table 4).

DISCUSSION

Difficult intubation specially in patients with unanticipated difficult airway is a major concern because of the risk of serious consequences of failed intubation. It occurs mostly due to difficult direct laryngoscopy which leads to impaired view of vocal cords. Many difficult intubations will not be recognized until after induction of anesthesia even after proper airway assessment. Video laryngoscopes are designed to provide a better glottic view during laryngoscopy without the need to align oral, pharyngeal and laryngeal axes. The major advantage of an improved glottic view are that adverse events associated with a blind intubation may be avoided.

In our study, all patients had grade I type of laryngeal view during laryngoscopy and the mean time required for intubation was 18.93±7.08 sec. Out of 59 patients, 58 (98.3%) were intubated in single attempt and there was no significant haemodynamic changes during laryngoscopy with video laryngoscope. This is similar to study conducted by Liu *et al*[14] where 100.0% of patients had grade I and II of total glottis exposure. Single attempt success rate of intubation was 96.1% using video laryngoscope but the mean time required for intubation was higher than our study.

Bhat *et al*[15] in 2015 conducted a study comparing direct laryngoscope and C-MAC video laryngoscope for intubation with 50 in each group in lateral position. This study shows that video laryngoscope is better than direct laryngoscope for endotracheal intubation. The result of this study was similar to our study in terms of laryngoscopic view but not better in terms of ease of intubation in video laryngoscopy group because it was conducted in lateral position. Intubation in a patient positioned laterally is difficult for anesthesiologists probably because of unfamiliarity of this position. Patients with anticipated airway difficulties were excluded from this study as similar to our study; this explains why C&L Grade II or higher scores were not encountered in our study.

Su *et al*[16] in 2011 did a meta-analysis of randomized trials comparing video laryngoscope and direct laryngoscope. Eleven trials were studied which included a total of 1196 patients. They compared the glottic view between video laryngoscopy and direct laryngoscopy. The C&L grading was used in all trials and it was found that video laryngoscope can achieve significantly improved view of the glottis during tracheal intubation in comparison to direct laryngoscope. Time of intubation was almost the same in both group but in case of difficult airway it was significantly reduced in videolaryngoscope group.

Maharaj *et al*[17] in 2007 conducted a randomized controlled trial for the intubation of patients with cervical spine immobilization using Macintosh and Airtaq video laryngoscope and concluded that, lesser duration for intubation(13.2 sec vs 20.3 sec) and lesser additional maneuver was needed in videol aryngoscope group. In video laryngoscope group, all 20 (100.0%) patients were intubated in one attempt while in the Macintosh group, 19 (95.0%) patients were intubated in one attempt, and 1 (5.0%) patient required 3 attempts which was similar to our study.

Direct laryngoscopy and endotracheal intubation causes sympathetic stimulation leading to an average increase in blood pressure by 40-50% and heart rate by 20.0%.[18] Takahashi *et al*[19] concluded that hemodynamic changes following endotracheal intubation are likely to occur because of direct tracheal irritation rather than stimulation of the larynx. In our study there was no significant haemodynamic changes during laryngoscopy with video laryngoscope which is similar to study done by Massen *et al*[20] which showed less hemodynamic responses during endotracheal intubation using indirect videolaryngoscopy incorporating a Macintosh blade compared to classic direct laryngoscopy. The improved glottic view provided by indirect video laryngoscopy reduces the need for excessive force on the laryngoscope causing less haemodynamic changes. Similar finding was observed in the study done on hemodynamic response by Dashti *et al*[21] using Glidescope video laryngoscope and Macintosh direct laryngoscope in patients with untreated hypertension. In a study done by Yu *et al*[22] in 2017, haemodynamic response was studied in patients with difficult airway in emergency department using video laryngoscope and Macintosh laryngoscope and showed that the mean arterial pressure and heart rates before induction, after induction, after laryngoscopy, 5 and 10 minutes after intubation was lesser in video laryngoscope group at various time intervals.

Thus from this study we concluded that endotracheal intubation using video laryngoscope provides good laryngoscopic view, better intubating condition for the ease of intubation without significant haemodynamic changes, thus considering worth for intubation of non difficult airway.

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