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C-MAC VIDEO LARYNGOSCOPY VERSUS FLEXIBLE FIBEROPTIC INTUBATION IN ANESTHETIZED PATIENTS

Anaesthesiology

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ABSTRACT

Background: In routine practice, direct laryngoscopy using a macintosh laryngoscope remains the gold standard technique for intubation but if difficult laryngoscopy is anticipated, or occurs unexpectedly following induction of general anaesthesia, intubation using video laryngoscope and fibreoptic bronchoscope can be an invaluable option.

Aims and objectives: It was a prospective randomized observational clinical study. After taking informed consent, 60 patients with ASA physical status I-II, in the age group of 18-60 years were randomly allocated into two groups of 30 patients each . Group [VL]patients were intubated with C-MAC Video laryngoscope while in Group [FB]patients were intubated with Fiberoptic bronchoscope.

Results: There were no significant differences between both groups in demographic data, Number of attempts and success rate. The mean intubation time in group VL was 20.14±2.83 seconds and 67.9±38.50 seconds in group FB. The intubation time was significantly longer in fiberoptic intubation as compared to C MAC Video laryngoscope .The mean intubation time showed significant difference ($p<0.05$).

Conclusion: C- Mac Video laryngoscopy is better than fibreoptic bronchoscopy in relation to intubation time, number of attempts and success rate. C- Mac Video laryngoscopy is better choice for unanticipitaed difficult airway under general anaesthesia whereas fibreoptic bronchoscopy is better for awake and anticipitated difficult airway.

KEYWORDS

C- Mac Video laryngoscope, flexible fibreoptic bronchoscopy, general anaesthesia

INTRODUCTION

Tracheal intubation is the mainstay of airway management for conducting surgical procedures in operating rooms and is also a lifesaving procedure performed daily in emergency department. The ultimate aim is to safely intubate the trachea and secure the airway.[1]The incidence of difficult tracheal intubation during routine anaesthesia has been estimated to be 3 –18%.[2] If difficult laryngoscopy is anticipated, or occurs unexpectedly following induction of general anaesthesia and mask or spontaneous ventilation is adequate, then alternative techniques such as blind nasal, retrograde, light- wand assisted,video laryngoscope and fibreoptic intubation can be utilised. In such scenarios, intubation using video laryngoscope and fibreoptic bronchoscope can be an invaluable option.[3] With the advent of video laryngoscope and fiberoptic bronchoscope, the approach to airway management has undergone a dramatic transformation. Both the tools provide an unparalleled view of the airway that helps in securing the most difficult of the airways. A fiberoptic bronchoscopy requires prior training, skill and meticulous preparation whereas a video laryngoscope has a shorter learning curve. Thus,video laryngoscopes have quickly gained popularity as an intubation device in a variety of clinical scenarios and settings not only in the hands of experts but also for novice anaesthesiologists. With the advances in video technology, more reliable and less expensive video laryngoscope are emerging in the market with increasing availability.[4]

MATERIALS AND METHODS

It was a prospective randomized observational clinical study conducted on 60 patients, aged 18-60 yrs of either sex and ASA grade I and II, scheduled to undergo elective surgery under general anaesthesia. Sample size was calculated in consultation with statistician taking intubation time in consideration and based on previous studies to get the power of study more than 80%.

Following the approval of Institutional Ethics Committee, and after obtaining a written informed consent, 60 patients with ASA physical status I-II, in the age group of 18-60 years were randomly allocated into two groups of 30 patients each .Group [VL] patients intubated with C-MAC Video laryngoscope. Group [FB] patients intubated with Fiberoptic bronchoscope.

Present study compared the intubation time, number of attempts, success rate, haemodynamic parameters and complications in both groups using FOB and CMAC Video laryngoscope respectively. A day before surgery,a detailed pre anesthetic checkup was done. Tablet alprazolam was given to all the patients at night before surgery. In the preparation room, intravenous (i.v) cannula 20 gauge was inserted and Inj.midazolam 2 mg and Inj. ranitidine 50 mg and inj glycopyrrolate 0.2 mg were given i.v 15 to 20 min before induction to all patients. The patients were shifted to the operating room and standard monitors were applied (non-invasive blood pressure, pulse oximetry, electrocardiogram) before induction of anaesthesia. Patients were pre-oxygenated via face mask for three minutes with 100% oxygen. General anaesthesia was induced using fentanyl 1-2 microgram/kilogram (mcg/kg) followed by propofol 2 mg/kg, nasopharyngeal airway was inserted in more patent nostril after adequate lubrication for the purpose of paraoxygenation during intubation procedures. Ventilation was assessed using face mask and inj succinyl choline 1.5 mg/kg was given.The patient was given intermittent positive pressure ventilation (IPPV) until full relaxation was achieved. Paraoxygenation was started via nasopharyngeal airway after attaching breathing circuit to it @10-12 litre/minute (l/min). Then intubation was performed using C-MAC laryngoscopy in group [VL] or using fiberoptic bronchoscopy in group [FB] through oral route. Maintenance was done with oxygen,nitrous oxide,isoflurane , inj vecuronium (0.08-0.12 mg/kg) and intermittent positive pressure ventilation .In group [VL], patients were intubated with C-MAC Video laryngoscope. The operator introduced the video laryngoscope into the midline of the oropharynx and gently advance until the blade tip passed the posterior portion of the tongue. Then the operator turned his or her eyes to the video screen in order to manipulate the scope and obtain the best view of the glottis. The glottic view was optimized by a combination of advancing or withdrawing the laryngoscope slightly while increasing the tilt on the blade to seat the device in the vallecula or on the posterior surface of the epiglottis to obtain the best glottic view. All of this was done using video visualization with the eyes directed at the video screen the entire time. When the VL was appropriately positioned, the glottic aperture was visualised in the centre of the upper third of the video display. The ETT was navigated through the glottic aperture while continuously visualizing the video screen. The placement was confirmed by ETCO2

and five point of auscultation of the chest.

In group [FB], patients were intubated with fiberoptic bronchoscope as follows:
Preparation of the fibreoptic bronchoscope was done i.e Functioning light source and camera were attached and fine focussing as well as white balancing was done.The fiberscope was lubricated with aqueous jelly, and loaded with the appropriate size ETT onto the scope. Oral intubating airway was inserted into the mouth.The fiberoptic bronchoscope was held with the thumb on the lever to manipulate the tip of bronchoscope with two possible movements, tip up/down and Clockwise/anticlockwise rotation of the scope. Then we passed fiberoscope orally superior to the tongue into the oropharynx while visualising the pharyngeal structures and then between vocal cords until visualisation of tracheal ring and carina. After that we released the ETT and advance it with a gentle rotating motion through the mouth, oropharynx and larynx, keeping the carina in the field of vision always to prevent dislocation of the fiberscope out of the larynx into the oesophagus.[5] We removed the fiberscope whilst visualising, to ensure that the tip of the ETT is in the trachea, 3-5cm above the carina. We fixed the ETT in place and connected to the anaesthetic breathing circuit. The ETT position was confirmed by capnography, auscultation of bilateral air entry, observation of bilateral chest movement, misting of the tube and feeling air movement at the tip of the tube.

Intubation time was recorded using stopwatch, which was the time taken from the insertion of C- MAC or fiberoptic bronchoscope till the passage of the endotracheal tube into the glottis. The Number of attempts and Success rate were noted. Hemodynamic variables were measured during baseline just before induction of anaesthesia at 1 minute, 3 minutes and 5 minutes and then after every 10 minutes till 120 minutes or end of surgery. Complications like desaturation, trauma to oral, pharyngeal or laryngeal structures and arrhythmias were recorded.

STATISTICAL ANALYSIS

From a pilot study done on ten patients in each group, we calculated our sample size. Taking power of 0.80 and alpha error of 0.05, our sample size was calculated as 27 in each group. Considering the possibilities of dropouts, the required sample size was enhanced to 30 in each group.All the statistical analysis of the data were done with statistical programming software IBM SPSS (Statistical Package for Social Sciences) version 23.0. The continuous variables (quantitative data) such as age, BMI, heart rate, blood pressure etc. were presented as mean ± standard deviation and analysed by applying Student's t-test. The categorical variables (qualitative data) were analysed by Chi-square test. $P < 0.05$ was considered statistically significant in all the analysis.

RESULTS

No statistically significant difference was found in both the groups as regarding demographic profile i,e age, sex, body mass index, ASA status, Wilson score (Table 1), and hemodynamic variables i,e systolic ,diastolic and mean arterial blood pressure, heart rate, arterial saturation (figure 1,2,3,4). The mean time taken for intubation in group VL was 20.14±2.83 seconds and in group FB was 67.98±38.50 seconds. The groups showed a statistically significant difference ($p < 0.05$). All the 30 patients were successfully intubated in first attempt in group VL. In group FB, 27 out of 30 patients were successfully intubated in first attempt. Two patients were intubated in second attempt in group FB. One patient in group FB could not be intubated and was later intubated using Video laryngoscope. The difference in the number of attempts in both the groups was found to be statistically non-significant ($p>0.05$). The success rate was 100% in group VL and 96.33% in group FB. The difference in the success rate in both the groups was found to be statistically non-significant ($p>0.05$).

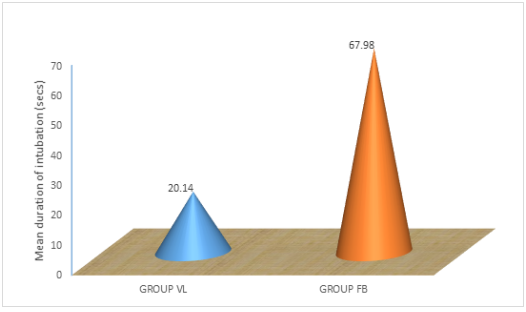
DEMOGRAPHIC DATA

	Group VL	Group FB	p- Value	Significance
Age (years)	37.10±10.07	35.20±8.84	0.45	NS
Sex • Male • Female	 10 20	 9 21	0.781	NS
Body Mass Index(kg/m2)	32.04+3.18	32.10+3.59	0.47	NS
ASA Grade • Class I • Class II	 25 5	 26 4	0.718	NS
MPG • Class I • Class II	18 12	19 11	0.989	NS
WILSON SCORE • Mean Value	5.00±0.74	5.26±0.69	0.761	NS

PRIMARY OUTCOME

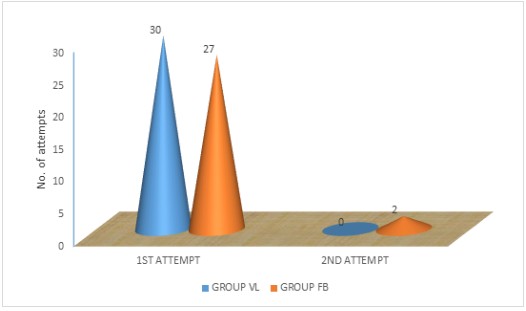
	Group VL	Group FB	p-Value	significance
Duration of Intubation (seconds)	20.14+2.83	67.98+38.50	0.001	SS
Number of attempts • 1st Attempt • 2nd attempt	30 0	27 2	0.143	NS
Success rate	100%	96.33%	0.313	NS

DURATION OF INTUBATION



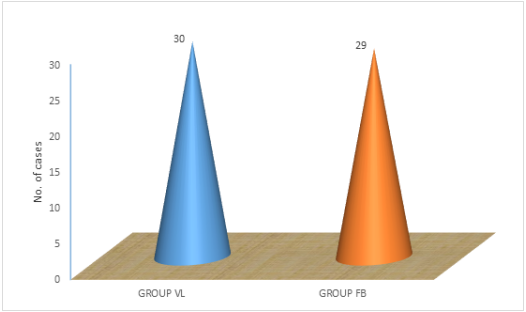
p=0.001 (Statistically significant)

NUMBER OF ATTEMPTS



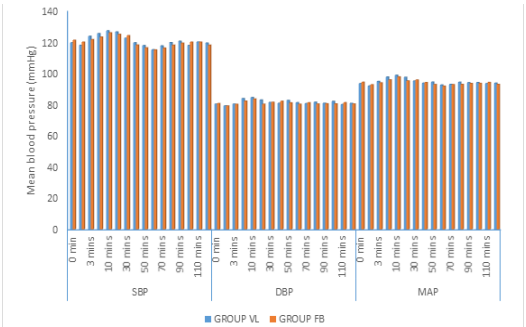
p=0.143 (Non significant)

SUCCESS RATE OF INTUBATION



p=0.313 (Non significant)

HAEMODYNAMICS (BLOOD PRESSURE) CHANGES



p>0.05 (Non significant)

DISCUSSION

Laryngoscopy occupies a distinctive position in anaesthesia practice. The ultimate aim is to secure the airway in minimum attempts and without compromising the patient's oxygenation.[5] Video laryngoscope and fiberoptic bronchoscope are relatively new devices that help in routine intubation and in anticipated difficult airway. Although fiberoptic bronchoscope is considered as the gold standard for tracheal intubation in patients with anticipated difficult intubation, it is observed that C MAC Video laryngoscope also has the potential to become the choice of equipment for both predicted as well as unpredicted difficult intubations.[6]

In present study, no statistically significant difference was found in both the groups as regarding demographic profile i.e. age, sex, body mass index, ASA status, Wilson score . The time taken for tracheal intubation was recorded from insertion of C MAC Video laryngoscope or fibreoptic bronchoscope till the passage of ETT in the fully anesthetized patients.The mean intubation time in group VL was 20.14±2.83 seconds and 67.9±38.50 seconds in group FB. The intubation time was significantly longer in fiberoptic intubation as compared to C MAC Video laryngoscope .The mean intubation time showed significant difference (p<0.05).

The reason for longer intubation time in FB group is that FOI technique requires extensive practice and training.[7] It is difficult to learn and master. Even with practice FOI can be challenging.[8] There are also some technical difficulties in anaesthetized patients like inability to identify the anatomy of the airway due a collapsed pharyngeal mucosa and large tongue blocking the route of fibreoptic bronchoscope.[9] In some cases presence of airway edema and secretions masked the glottic view.[10] Sometimes there was difficulty in advancing the ETT over the fiberscope due to tube impingement onto the epiglottis, right and left arytenoids, inter arytenoid tissue.[11] All these factors contribute to longer intubation time in FB group whereas C MAC Video laryngoscope provides better glottis view even as compared to DL.[12]Video laryngoscopes have special curvature and they provide better and wider glottis view even in presence of secretions ,edema and in difficult airways thus decreasing the time of intubation and improving the success rate.[13,14] Video laryngoscope is easier to use and quicker to learn. So C-MAC Video laryngoscope are increasing in popularity and slowly becoming the preferred tool for the management of the airway.

Similar results with mean intubation time were obtained in a separate study done by Shady Rady et al. In their study the Intubation time was significantly higher in fiberoptic (62.97±37.54 sec) as compared to video laryngoscopy(22±2.83 sec) in patient with anticipated difficult airway.[15]

- In our study after giving the proper general anaesthesia, all the 30 patients were successfully intubated in first attempt in group VL(100%) whereas 27 out of 30 patients were intubated in the first attempt (90%) in group FB. Two patients were intubated in second attempt in group FB and one patient in group FB could not be intubated and was later intubated using video laryngoscope. This shows better intubation success rates with the video laryngoscopes although it was not statistically significant (p>0.05). The success rate was compared in both groups. The success rate was 100% in group VL and 96.33% in group FB, thus showing better results with video laryngoscope.
- These results of our study coincide with the study done by Salama AK et al. The number of patients intubated was higher with video laryngoscope from first attempt all 100% patients were intubated. Where as in fiberoptic bronchoscope 73.3% patients were intubated in first attempt and 23.3% from second attempt and 3.3% from the third attempt.[16]

These results could be attributed to the fact that in anaesthetized patients muscle tone is reduced and base of the tongue, soft palate and epiglottis all approximate to posterior pharyngeal wall, which make the fiberoptic bronchoscope more difficult. Also, in oral fiberoptic intubation, head extension is possible but chin lift cannot be fully applied because mouth must be kept open.[17]Thus, leading to poor success rates and more than one attempts. This problem was resolved by three main ways i.e. by using intubating airways such as ovassapian, berman airways, by applying jaw thurst [18] with mouth open or by applying lingual traction.[19] In our experience we also encountered the same problem in six patients then we used intubating airway and our results improved in terms of intubation time and success rate. Fiberoptic bronchoscopy also requires training and its operating skills can be mastered only over time with practice.Thus intubation time and success rates may also vary from user to user depending upon their training and experience.

LIMITATIONS

Prepration time is longer with fiberoptic intubation and expertise is needed for successful intubation. Since our patients were anaesthetized and intubation was attempted after giving succinyl choline, we faced difficulty in intubating few patients as the muscle tone was reduced and base of the tongue, soft palate and epiglottis all approximate to posterior pharyngeal wall, which make the fiberoptic bronchoscopy more difficult. Video laryngoscope cannot be used in patients with decreased mouth opening where intubation can only be performed using fiberoptic bronchoscope because minimum 25mm of mouth opening is required for the insertion of video laryngoscope.[20]

CONCLUSION

We conclude that C-MAC Video laryngoscopy is better than Flexible fiberoptic intubation in comparison to intubation time, number of attempts and success rate. Both devices are comparable with respect to haemodynamic profile and rate of complications. C-MAC Video laryngoscope is more easier to use and less time consuming as compared to fiberoptic bronchoscope as it needs more prepration and intubation time. It is noticed that C-MAC Videolaryngoscope is better than Fiberoptic bronchoscope in unanticipated difficult airway under general anaesthesia. On the other hand, fiberoptic bronchoscope is a better choice in awake and anticipated difficult airway.

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