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A comparative study of airtraq video laryngoscopy and direct laryngoscopy for ease of intubation

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Abstract

Background: The most common route for tracheal intubation is orotracheal where an endotracheal tube is passed from oropharynx to trachea. Anatomical and physiological characteristics of the patient make intubation sometimes difficult. Video laryngoscope has more ease of intubation compared to direct laryngoscopy for both experienced and inexperienced person.
Objective: The present study was done to compare direct laryngoscopy with Airtraq videolaryngoscope in non-difficult airway for ease of intubation and study hemodynamic changes.
Materials and Method: Study was conducted on 60 patients presented for elective surgery under general anaesthesia. Patients were divided into 2 groups-V & D. In group D, direct laryngoscopy was performed with macintosh blade and in group V, videolaryngoscopy was performed with Airtraq video laryngoscope.
The number of attempts required, failure to intubate and time for intubation were noted. Any loss of airway, orodental injury to patient, cough response during intubation were noted.
The HR, SpO_2, SBP and DBP were noted at induction (baseline), 1, 3, 5 and 15 min after intubation.
Result: Number of attempt require to intubate patient in both group-not significant. Average time for intubate patients with group V -23.1 second, compared to group D-20. 1 second, that was significant. It was longer in Group V. Heart rate-significantly increase at 1 min, 3 min, 5 min and 10 min in Group D patients .Systolic BP and Diastolic BP- Significantly increase at 1 min and 3 min seen in group D and receded to baseline value at 5min and thereafter. No significant difference seen in Spo2 in both group.
Conclusion: In our study, Airtraq video laryngoscope resulted in significantly lesser hemodynamic response compared to direct laryngoscope. Little more intubation time required in videolaryngoscope compared to direct laryngoscope but that didn't affect much. Videolaryngoscope gained popularity as an intubation device in the hands of both airway

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experts and non-experts.

Keywords: Video laryngoscope, direct laryngoscopy, tracheal intubation

Introduction

Control of the airway is one of defining moments of anaesthesia. Before the 20th century, intubation of trachea had been described and performed rather crudely, often using fingers as a makeshift laryngoscope without using any pharmacological agents. Rigid direct laryngoscopy used to view the larynx and other adjacent structures under direct vision for the purpose of endotracheal intubation. Fiber optic intubation is the gold standard technique for anticipated difficult airway. Different types of video-laryngoscopes available now a days for filling gap between direct laryngoscopy and fiber-optic bronchoscopy for anticipated or unanticipated difficult airway. In video-laryngoscope, image of the laryngoscopic view is transmitted to external LCD screen. Operator can perform intubation while watching video screen instead of looking through opening of mouth [1]. Video-laryngoscope provide better view of anatomy of larynx to medical and paramedical doctors and other health care workers. Thus instructor can guide trainee operator during procedure. So it's very useful for teaching. External manipulation for assistant becomes very easy by viewing glottic structure, trauma to airway can be decreased with a large external screen of video-laryngoscope [2]. According to few studies, video-laryngoscopy yield a greater success rate for first attempt intubation than direct laryngoscopy. But recent randomized trial in ICU found that video-laryngoscopy did not yield higher success rate than direct laryngoscopy. Further more limited data available regarding success rate for non-difficult airway management with video-laryngoscope.

Methodology of study

- **Type of study design:** Comparative observational study.
- **Study setting:** ENT-Operation Theatre, GMERS Medical College, Gandhinagar.
- **Permissions:** Study was conducted with the permission of CRC, IEC and authorities of GMERS Medical College, Gandhinagar and its concerned departments.
- **Sample size:** Epi info software was used to calculate the sample size.

Confidence interval (two sided)	95%
Power	80%
Ratio of sample size	1

Mean ± SD	Group D	Group V	Difference
Intubation time (in seconds)	21.7±9.4	35.8±2.4	14.1

Sample size of Group D	30
Sample size of Group V	30
Total sample size	60

We will take 30 patients in group D and 30 patients in group V.

- **Sampling technique:** Convenient sampling.
- **Participant recruitment procedures in detail:** All indoor patients, posted for ENT surgeries under general anaesthesia, in GMERS Medical College and Research Hospital,

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Gandhinagar were chosen for the study.

Inclusion criteria

- ASA physical status class I and II.
- Age between 18-60 years of either sex posted for elective surgery.

Exclusion criteria

- Patients with anticipated difficult airway (Mallampati class 3 and 4).
- Restricted head extension.
- <2 cm inter incisor gap.
- Prognathism.
- Obesity with body mass index >30.
- Hypertension.
- Coronary heart disease.
- Valvular heart disease.
- Pregnancy.
- Raised intracranial and intraocular pressures.

Intended intervention

After approval from the ethical committee of our college, 60 ASA I and II patients scheduled for elective surgeries were chosen for the study.
Preanaesthetic checkup was done one day prior to the surgery. Patients were evaluated for any systemic diseases and laboratory investigations like CBC, LFT, RFT, ECG, CXR should be evaluated and only if they are within normal limit, were included in this study. Informed written consent was obtained.
Preparation of patients was included period of overnight fasting. Anaesthesia machine was checked. Appropriate size endotracheal tubes, working laryngoscope with medium and large size blades, stylet and working suction apparatus were kept ready before the procedure. Crash cart was kept ready.

Procedure
Pre-operative preparations

- Patients of American Society of Anesthesiologist (ASA) physical status I and II in the age group 18-60 years of either sex, scheduled to undergo surgeries under general anaesthesia were included after approval from the institution's ethical and scientific committee.
- After taking informed and written consent, patients were randomly allocated by convenience in either of two groups-Group D (n = 30) and Group V (n = 30). In operation theatre, preoperative base line parameters like heart rate (HR), respiratory rate (RR), SpO_2, noninvasive systolic blood pressure (SBP), diastolic blood pressure (DBP) were recorded.
- Intravenous (IV) access was secured with a 20 G cannula and infusion of Ringer's lactate to be started.
- **Group-D (N=30):** Patients in this group were intubated using direct laryngoscopy and endotracheal intubation done.
- **Group-V (N=30):** Patients in this group were intubated using AIRTRAQ videolaryngoscopy and endotracheal intubation done.

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- Patients were induced with intravenous fentanyl 2 µg/kg, propofol 2 mg/kg followed by suxamethonium 2 mg/kg.
- A consultant anaesthesiologist with more than 5 years of experience had perform all intubations, single anaesthetist had intubated all patients. In Group D patients, laryngoscopy was performed with Macintosh blade and in Group V, it was performed with Airtraq video laryngoscope. Endotracheal tube was used in both groups to aid in intubation. Patients in both groups were intubated in sniffing position with 7.5mm (females) or 8mm (males) cuffed endotracheal tube. After intubation, the cuff was inflated. Correct placement of the endotracheal tube was confirmed by chest rise and by the presence of end-tidal capnography. Patients were then mechanically ventilated.
- The HR, SpO2, SBP and DBP were noted at induction (baseline), 1, 3, 5 and 15 min after intubation.
- Any loss of airway, orodental injury to patient, cough response during intubation were noted.
- In case of failure to intubate, Patient was postponed. Airway loss was defined as drop in SpO2 less than 92% or fail to intubate after 2 attempts with direct laryngoscopy or Airtraq videolaryngoscopy.
- If there was desaturation during the intubation process, patient was mask ventilated till saturation improved and intubation was attempted again.
- The ease of intubation was assessed as grade 1-3.

Grade 1 (good): Glottis visualised adequately and intubation accomplished easily.

Grade 2 (satisfactory): Glottis visualised adequately but required external manipulation over the larynx.

Grade 3 (poor): Glottis visualised adequately but failed to intubate in the first attempt irrespective of external manipulation.

- The proportions of patients in both groups having grade 1 ease of intubation was compared.
- The number of attempts required, failure to intubate and time for intubation was noted.
- Intubation time was considered as the time from the introduction of the laryngoscope into the oral cavity to the appearance of end-tidal carbon dioxide waveform.
- For all the continuous variables, the results was given in mean ± standard deviation (SD) and categorical variables as a percentage. To compare the mean difference of numerical variables between groups, Student's t-test was applied.
- To obtain the association of categorical variables, the Chi Square test was applied after testing the normality of data. P value <0.05 was considered statistically significant. Statistical analysis was done using Epi.info, CDC software.

Result

The study included 60 non-COVID patients who were allocated into two equal groups. Demographic data and Mallampati scores between the two groups were comparable [Table 1]. Intubation grade between two groups were comparable. Number of attempt require to intubate patient in both group were not significant. Average time for intubate patients with group V, 23.1 second, compared to group D, 20.1 second, that was significant, it was longer in Group V. (Table 1)

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Table 1A: Baseline characteristics of the patients

Characteristic		Group V N=30	Group D N=30	*P* value	Inference*
Mean Age ± SD (years)		38.4 ± 16.7	34.4 ± 13.4	0.31	Ns
Mean Weight ± SD (kg)		61.1 ± 9.8	59.6 ± 10.4	0.56	Ns
Sex	Male	10	16	0.12	Ns
	Female	20	14		
MPG	Grade 1	18	16	0.58	Ns
	Grade 2	12	14		
*Ns = non-significant; S = significant					

Table 1B: Baseline characteristics of the patients

Characteristic		Group V N=30	Group D N=30	*P* value	Inference*
Intubation Grade	1	28	27	0.64	Ns
	2	2	3		
Attempt	1	28	30	0.15	Ns
	2	2	0		
Time		23.1 ± 3.7	20.1 ± 3.8	0.002	S
*Ns = non-significant ; S = significant					

Table 2: Mean Heart Rate (beats per minute) with standard deviation at various intervals

Time (in minutes)	Group V N=30	Group D N=30	*P* value
Pre-op baseline	87.3 ± 14	89.8 ± 9.7	0.482
Intra-operative	84.9 ± 13.9	87 ± 6.6	0.554
1 min	87.6 ± 13.8	101 ± 6.8	0.001
3 min	88.6 ± 13.9	100 ± 6.1	0.001
5 min	89.3 ± 14	99 ± 6.7	0.009
10 min	87 ± 13.5	95.3 ± 5.0	0.01
15 min	86.3 ± 13.5	91.5 ± 4.6	0.127

Baseline heart rate were comparable in both group. But significant difference in heart rate at 1 min, 3 min, 5 min and 10 min data were noted. It comes to baseline value at 15 min.

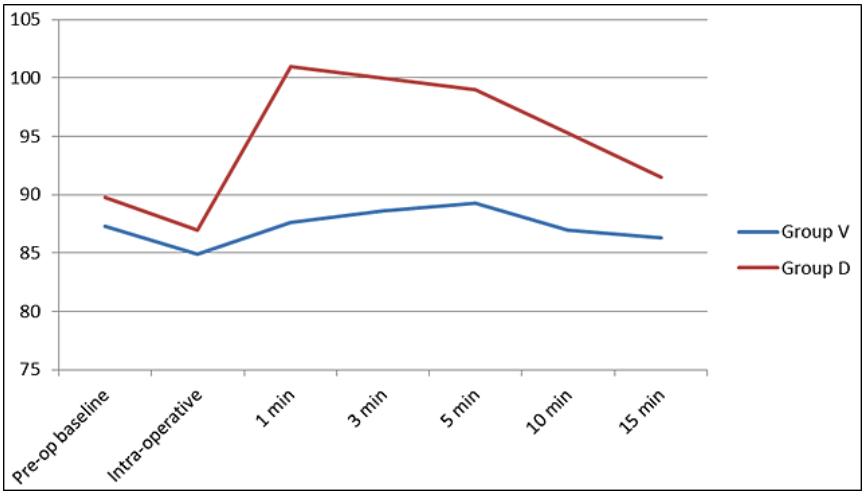

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Table 3: Mean SBP with standard deviation at various intervals

Time (in minutes)	Group V N=30	Group D N=30	*P* value
Pre-op baseline	124.5 ± 10.8	125.1 ± 11.6	0.486
Intra-operative	121 ± 10.6	122.6 ± 11.3	0.575
1 min	124.7 ± 10.4	138.2 ± 11.1	0.0001
3 min	125.9 ± 10.1	135.6 ± 11.8	0.001
5 min	126.9 ± 10.2	128.6 ± 13	0.591
10 min	124.1 ± 10.1	125.7 ± 11.2	0.565
15 min	123.1 ± 10.3	123.3 ± 11.5	0.944

Baseline SBP: Value comparable in both group. Significant difference in SBP at 1 min and 3 min seen in between two group. It receded to baseline value at 5min and thereafter.

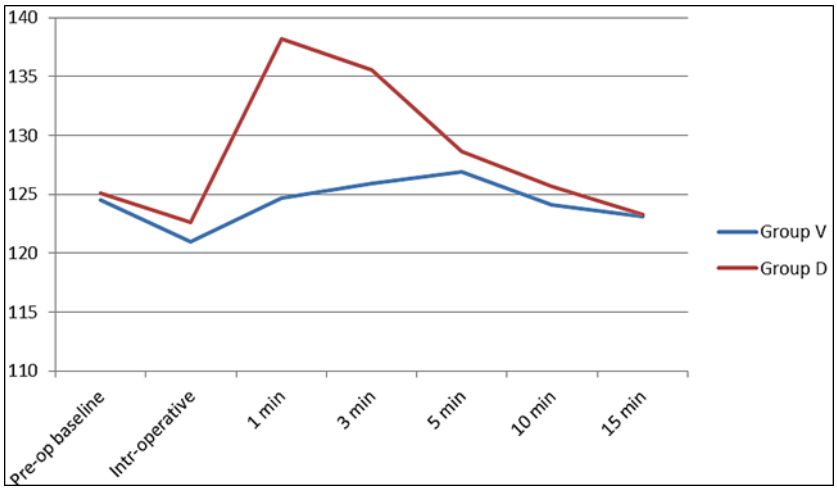

Table 3: Mean DBP with standard deviation at various intervals

Time (in minutes)	Group V N=30	Group D N=30	*P* value
Pre-op baseline	79.5 ± 7.1	78.9 ± 9.1	0.766
Intra-operative	79.6 ± 6.6	76.9 ± 9.1	0.987
1 min	80 ± 6.5	89 ± 9.9	0.0001
3 min	81 ± 6.5	85.9 ± 9.6	0.02
5 min	81.9 ± 6.4	82.1 ± 9.5	0.949
10 min	79.5 ± 6.1	79.9 ± 9.4	0.823
15 min	77.6 ± 6.5	78.9 ± 9.7	0.545

Baseline DBP were comparable in both group. Significant difference in DBP seen at 1 min and 3 min after intubation. Like SBP, DBP came to baseline value at 5 min and afterward.

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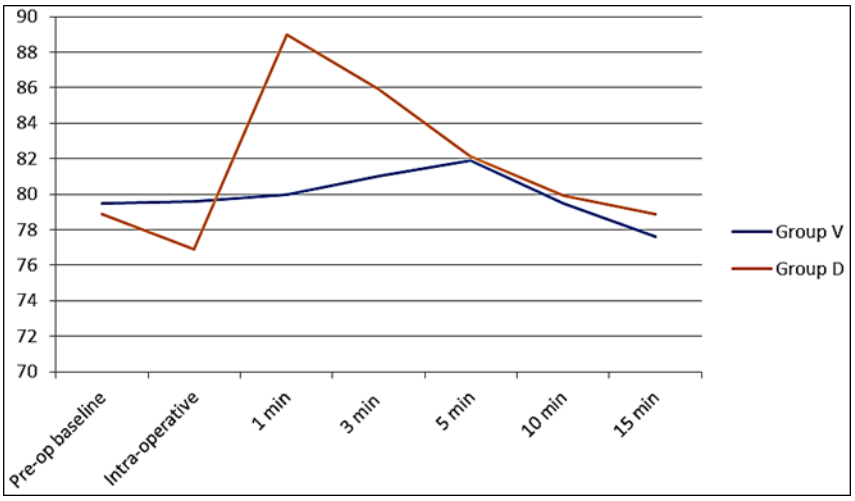
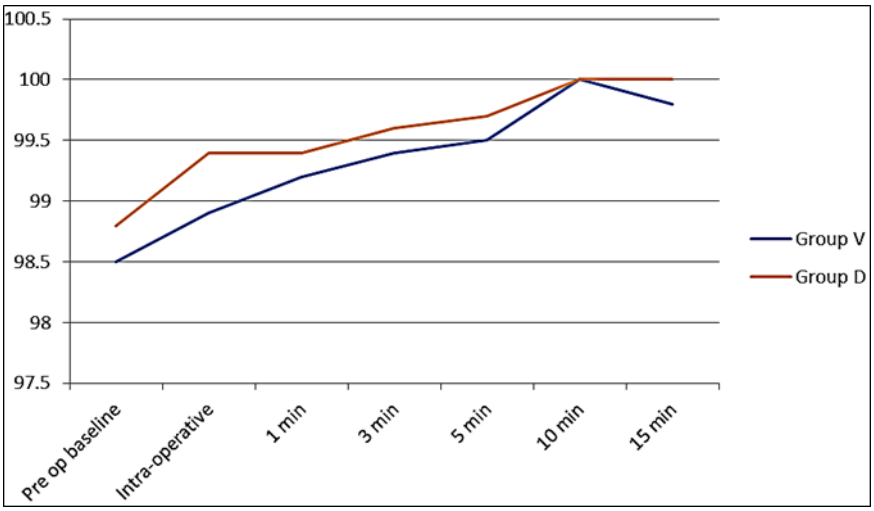


Table 4: Mean SPO2 with standard deviation at various intervals

Time (in minutes)	Group V N=30	Group D N=30	*P* value
Pre-op baseline	98.5 ± 1.1	98.8 ± 1.0	0.26
Intra-operative	98.9 ± 0.86	99.4 ± 0.6	0.12
1 min	99.2 ± 0.4	99.4 ± 0.5	0.15
3 min	99.4 ± 0.55	99.6 ± 0.5	0.15
5 min	99.5 ± 0.5	99.7 ± 0.5	0.3
10 min	100 ± 0.6	100 ± 0.3	0.3
15 min	99.8 ± 0.4	100 ± 0.2	0.01

No significant difference seen in Spo2 in both group.



Discussion

Video-laryngoscopes are indirect laryngoscopes that work on the principle of "looking around the corner" which is possible by placing the camera at distal tip of the laryngoscope blade [1].

Sympathetic stimulation with laryngoscopy and intubation evoke a transient but significant increase in heart rate and blood pressure.

The demographic parameters were comparable in two groups. It was found to be statistically unsignificant and similar findings were observed in study of Anita Devi N, *et al*. and Ahmed S *et al*. [3, 4]

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Intubation time was significantly faster for Group D (20.1±3.8) as compared to Group V (23.1±3.7) in our study. Akihisiya Y *et al*. and Anita Devi N *et al*. found similar findings [5, 3]. There was no difference in intubation grade and in number of attempts. Our findings were similar to study of Puthenveeti, *et al.* [6].

Video-laryngoscope gives better hemodynamic control as compared to Macintosh laryngoscope. There were significantly lesser pulse rate at 1 min, 3 min, 5 min and 10 min. After 10 min onwards it returns to baseline value, similar findings observed in Anita Devi N *et al*. [3].

There was also significantly decline in SBP and DBP at 1 min and 3 min after intubation which returns to baseline after 3 min. These findings correspond to study done by Elhadi SM *et al*. where heart rate and MAP were significantly lower in group K as compared to group M [7].

Studies were done using Glidescope Airtraq and Macintosh laryngoscope in patient during routine airway management to deliver general anaesthesia and found higher haemodynamic response value in Macintosh response in Macintosh group when compared with Glidescope and Airtraq, Upadhyaya S. *et al.* [8].

There was no any complication occurred during use of this devices such as sore throat, mucosal injuries, failure to intubate, dental damage, palatal perforation. Williams *et al.* [9] reported palatal perforation from a styletted tracheal tube following use of McGrath videolaryngoscope, results similar to our study found in Taylor A.M. *et al.* [10].

Our study has some limitation. All intubations were performed by consultant anaesthetist with 5 year experience. Ease of intubation was not assessed in difficult airways.

Anaesthetist most commonly done tracheal intubation with Macintosh blade. Direct laryngoscopy requires anatomical alignment of oral, pharyngeal and laryngeal axis with the line of sight view. Video-laryngoscope provides direct visualization of glottis. There is no need to align oro-pharyngo-laryngeal axis and low upward lifting force require for view of glottis visualization of the airway. On a monitor may be helpful for less experienced intubators in airway management and possibly decrease the rate of esophageal tube misplacements. Furthermore, there is faster learning curve relative to DL, independent of experienced laryngoscopist [11].

Conclusion

- In our study, Airtraq video laryngoscope resulted in significantly lesserhemodynamic response compared to direct laryngoscope.
- Little more intubation time required in videolaryngoscope compared to direct laryngoscope but that didn't affect much.
- Videolaryngoscope gained popularity as an intubation device in the hands of both airway experts and non-experts.
- Thus we conclude that videolaryngoscope is superior option than direct laryngoscope. But more studies we require for safety and efficacy in cases of difficult airway.

Conflicts of interest: None declared.

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