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Comparison of Hemodynamic Response in Direct and Video Laryngoscopy in Hypertensive Patients

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Abstract

Introduction: Direct laryngoscopy & endotracheal intubation induces cardiovascular stress response which in turn causes tachycardia & hypertension. This is particularly harmful in hypertensive patients. In this study we compared the hemodynamic response in direct & video laryngoscopy in hypertensive patients.

Materials and Methods: In this study 98 controlled hypertensive patients ASA physical status 1 & 2 scheduled for elective surgery under general anesthesia requiring endotracheal intubation. Patients were divided in to 2 groups with 49 patients in each group. Group A: underwent endotracheal intubation with direct laryngoscopy. Group B: video laryngoscopy was used for the patients in this group. Both groups were assessed for Hemodynamic responses during laryngoscopy & intubation.

Statistical analysis: This was done using mean, standard deviation, ANOVA for repeated measures followed by Bonferroni test and 't' test.

Result: Video laryngoscopy showed less variations in hemodynamic responses compared to direct laryngoscopy, whereas time taken for video laryngoscopy was longer than that for direct laryngoscopy.

Conclusion: Video laryngoscopy is better than direct laryngoscopy to reduce stress responses during endotracheal intubation.

Keywords: Direct laryngoscopy; Video laryngoscopy; Hemodynamic response; Hypertension

Introduction

Endotracheal intubation is an integral part of anesthetic management and critical care of patient & has been practiced following its description by Rawbo them and Magil in 1921. Reild and Brace first described hemodynamic response to laryngoscopy and tracheal intubation. Adverse responses in the cardiovascular, respiratory and other physiological systems can be provoked due to noxious stimuli produced by laryngoscopy and intubation. This response can be transient, variable, unpredictable. Tachycardia and hypertension can result in myocardial ischemia and is undesirable and hence should be avoided.[1] The magnitude of hemodynamic response increases with the force and duration of laryngoscopy[1] and can be worsened by prolonged intubation time.[4,6] It begins 30 seconds after laryngoscopy and intubation and lasts for less than 10 minutes. Tracheal intubation approaches that minimize oro-pharyngo-laryngeal stimulation will attenuate this response. These changes may be well tolerated in healthy individuals. But in

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patients with hypertension, arrhythmias, coronary artery disease, it may prove fatal.

Recommendations for attenuating these responses are manifold and the techniques used should minimize these responses to the patients that are at risk.

The hemodynamic responses during laryngoscopy and endotracheal intubation may vary by premedication, social habits, preoperative medications, narcotic, and neuromuscular blocker doses and speed of anesthetic agent administration.[5]

Several drugs have been used to blunt these responses.[8,9] Certain drugs like Lidocaine, Esmolol, Fentanyl, Clonidine etc have been used to prevent pressor responses.[5]

Newer airway devices also play a major role is reducing pressor response to laryngoscopy and intubation. Video laryngoscopes provide better laryngeal view[7] as they do not require alignment of the oral, pharyngeal and laryngeal axis for visualization of glottis and tracheal intubation and cause minimal oropharyngolaryngeal stimulation and hence potentially attenuate the pressor response.

Recent publications have reported the superiority of video-laryngoscopy over direct laryngoscopy with respect to obtaining the glottic view, less associated local airway trauma, and maintaining oxygen desaturation when used for intubation of obese patients.[10–3] However, other studies report an increased intubation time and higher intubation failure rates with video laryngoscopy when compared to direct laryngoscopy.[16,17]

Materials and Methods

Following approval of institutional ethics committee and obtaining Informed and written consent, the study was conducted by department of anesthesiology, Father Muller Medical college and hospital, Mangalore. 98 patients of the age group above 18 yrs belonging to American association of anesthesiologist (ASA) class 1 and 2 posted for elective cases under e anesthesia were taken up for the study.

Patients unwilling or with Patients with blood pressure of >140/80, BMI >30kg/m^2, craniofacial abnormalities, chronic kidney disease, diabetes mellitus, ischemic heart disease, thyroid abnormalities were excluded from the study.

Thorough pre-anesthetic evaluation, routine investigations carried out and the patient was informed regarding the nature and purpose of the study.

The ease of intubation will be assessed based on the intubation difficulty scale

Parameter	Score
Number of attempts >1	N_1
Number of operators >1	N_2
Number of alternative techniques	N_3
Cormack-Lehane (CL) Grade 1	N_4
Lifting force required	
Normal	$N_5 = 0$
Increased	$N_5 = 1$
Laryngeal pressure	
Not applied	$N_6 = 0$
Applied	$N_6 = 1$
Vocal cord mobility	
Abduction	$N_7 = 0$
Abduction	$N_7 = 1$
Total IDS = Sum of scores	$N_1 = N_7$

Intubation difficulty scale (IDS) score (22)

Patient was explained about the NPO guidelines. Premedicated with Tab. Diazepam 5 mg and Tab. Pantoprazole 40 mg orally the night and asked to continue their antihypertensive medications at 6:00 am orally with sips of water on the day of the surgery.

On arrival to the operating room, all essential monitors connected and baseline heart rate, blood pressure, mean arterial blood pressure, oxygen saturation recorded. Large bore IV cannula (18G) secured and started on IV ringer lactate.

General anesthesia technique is standardized to all patients. Patients were divided into 2 groups: Group A and B. All patients were premedicated with Inj glycopyrrolate 0.2 mg/kg and Inj fentanyl 2 mcg/kg. Pre-oxygenated for 3-5 minutes, induced with Inj Propofol 2 mg/kg and paralyzed with Inj succinylcholine 2 mg/kg.

Group A intubated with Macintosh laryngoscope and Group B using video laryngoscope and with appropriate size cuffed oral endotracheal tube. After confirmation of tube position, cuff inflated, tube fixed and connected to ventilator. Anesthesia will be maintained with 33% oxygen, 66% nitrous oxide and isoflurane 0.6% on controlled ventilation. Vecuronium bromide will be used as maintenance with 0.1 mg/kg and top-ups 0.02 mg/kg.

Following parameters will be recorded before and after intubation

1. Heart rate
2. Mean arterial blood pressure
3. Oxygen saturation
4. End tidal carbon di-oxide

5. Laryngoscopic view/ease
6. Time taken for intubation

Result

Fig. 1 shows comparison of the Age between the two groups which shows that Age is higher in Direct laryngoscopy group with a t value of 0.494 and is statistically non significant with a p value of 0.623.

Table 2: Comparison of the Mean BP After intubation between the two groups shows that Mean BP After is higher in Direct laryngoscopy group with a t value of 7.26 and is statistically significant with a p value of <0.001.

Fig. 2 Comparison of the Mean BP after and before intubation and difference between the two groups shows that Mean BP after-before difference is higher in Direct laryngoscopy group with a t value of 25.965 and is statistically significant with a p value of <0.001.

Table 2: Comparison of the HR After intubation between the two groups shows that HR After is higher in Direct laryngoscopy group with a t value of 7.109 and is statistically significant with a p value of <0.001.

Fig. 3 Comparison of the HR after-before difference between the two groups shows that HR after-before difference is higher in Direct laryngoscopy group with a t value of 20.588 and is statistically significant with a p value of <0.001.

Comparison of the $EtCO_2$ After between the two groups shows that $EtCO_2$ After is higher in Direct laryngoscopy group with a t value of 6.997 and is statistically significant with a p value of <0.001.

Fig. 4 Comparison of the $EtCO_2$ after-before difference between the two groups shows that $EtCO_2$ after-before difference is higher in Video laryngoscopy group with a t value of -4.373 and is statistically significant with a p value of <0.001.

Table 2: Comparison of the Time taken between the two groups shows that Time taken is higher in Video laryngoscopy group with a t value of -6.133 and is statistically significant with a p value of <0.001.

Table 1:

	Group	N	Mean	Std. Deviation	t	df	P Value
Age	Direct laryngoscopy	49	49.140	8.629	0.494	96	0.623
	Video laryngoscopy	49	48.220	9.758			
Mean BP Before	Direct laryngoscopy	49	97.060	10.327	-9.617	96	<0.001
	Video laryngoscopy	49	115.040	8.039			
Mean BP After	Direct laryngoscopy	49	108.470	10.454	7.26	96	<0.001
	Video laryngoscopy	49	92.800	10.912			
Mean BP after - before difference	Direct laryngoscopy	49	11.410	5.184	25.97	96	<0.001
	Video laryngoscopy	49	-22.240	7.446			
HR Before	Direct laryngoscopy	49	76.350	6.437	-3.011	86.993	0.003
	Video laryngoscopy	49	81.100	8.987			
HR After	Direct laryngoscopy	49	85.940	7.625	7.109	96	<0.001
	Video laryngoscopy	49	74.960	7.665			
HR after -before difference	Direct laryngoscopy	49	9.590	4.378	20.59	96	<0.001
	Video laryngoscopy	49	-6.140	3.075			
$EtCO_2$ Before	Direct laryngoscopy	49	27.760	4.544	10.39	85.373	<0.001
	Video laryngoscopy	49	19.550	3.143			
$EtCO_2$ After	Direct laryngoscopy	49	32.160	4.165	6.997	96	<0.001
	Video laryngoscopy	49	26.690	3.548			
$EtCO_2$ after-before difference	Direct laryngoscopy	49	4.410	2.992	-4.373	95.591	<0.001
	Video laryngoscopy	49	7.140	3.195			
Time taken	Direct laryngoscopy	49	15.940	2.933	-6.133	96	<0.001
	Video laryngoscopy	49	19.960	3.529			

Table 2: Another pattern of the table

	Direct laryngoscopy(n=49) Mean ± sd	Video laryngoscopy(n=49) Mean ± sd	t	P Value
Age	49.14±8.63	48.22±9.76	0.494	0.623
Mean BP Before	97.06±10.33	115.04±8.04	-9.617	<0.001
Mean BP After	108.47±10.45	92.8±10.91	7.26	<0.001
Mean BP after - before difference	11.41±5.18	-22.24±7.45	25.965	<0.001
HR Before	76.35±6.44	81.1±8.99	-3.011	0.003
HR After	85.94±7.63	74.96±7.67	7.109	<0.001
HR after -before difference	9.59±4.38	-6.14±3.08	20.588	<0.001
$EtCO_2$ Before	27.76±4.54	19.55±3.14	10.394	<0.001
$EtCO_2$ After	32.16±4.17	26.69±3.55	6.997	<0.001
$EtCO_2$ after-before difference	4.41±2.99	7.14±3.2	-4.373	<0.001
Time taken	15.94±2.93	19.96±3.53	-6.133	<0.001

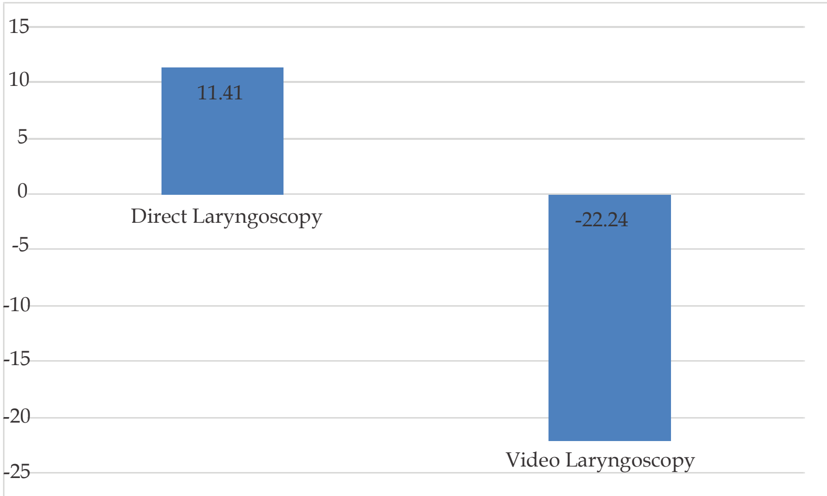


Fig. 1: Mean BP after-before difference

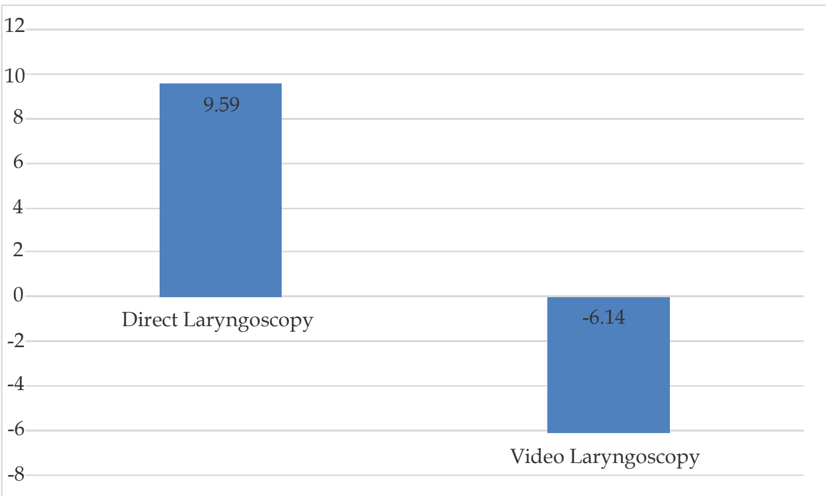


Fig. 2: HR after-before difference

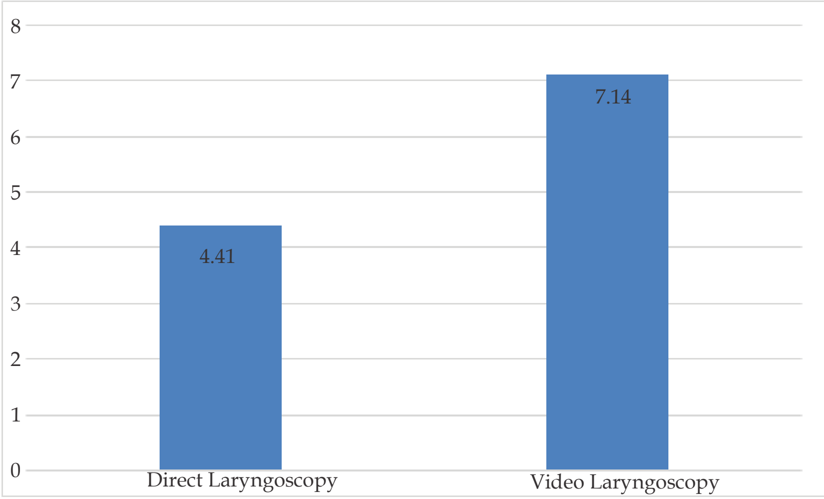


Fig. 3: $EtCO_2$ after-before difference

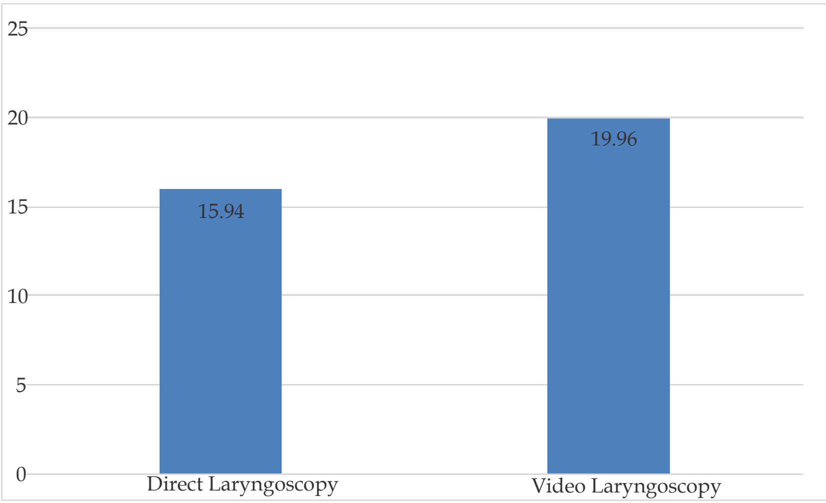


Fig. 4: Time taken for intubation

Chi square test for comparison of the categorical variables

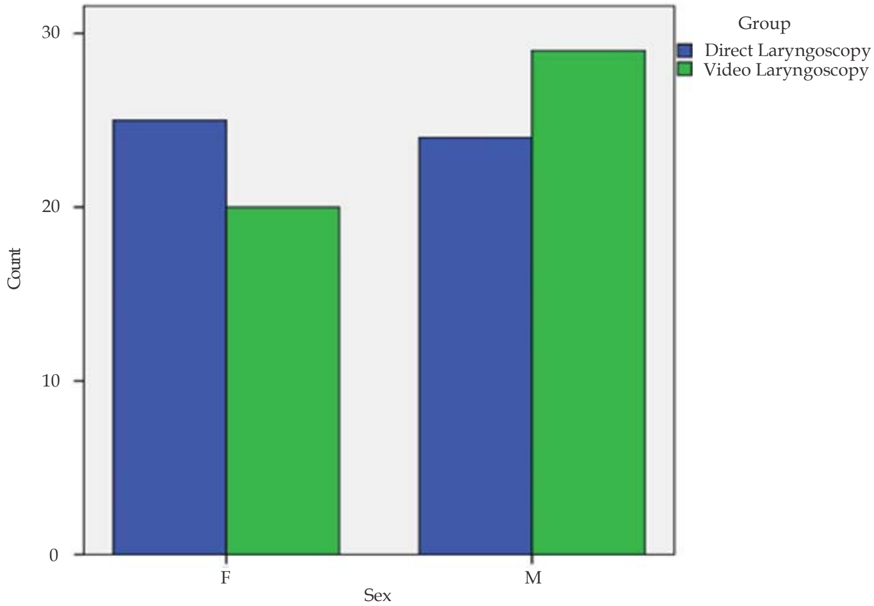
Sex * Group

Crosstab

			Group		Total
			Direct laryngoscopy	**Video laryngoscopy**	
Sex	F	Count	25	20	45
		% within Group	51.0%	40.8%	45.9%
	M	Count	24	29	53
		% within Group	49.0%	59.2%	54.1%
Total		Count	49	49	98
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	**df**	**P value (<0.05 is significant)**
Pearson Chi-Square	1.027	1	.311



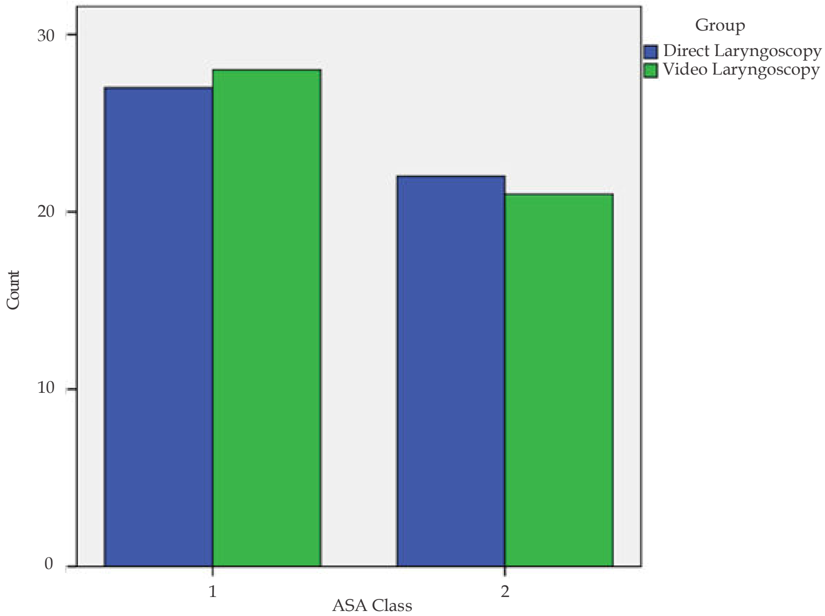
ASA class:

Crosstab

			Group		Total
			Direct laryngoscopy	Video laryngoscopy	
ASA Class	1	Count	27	28	55
		% within Group	55.1%	57.1%	56.1%
	2	Count	22	21	43
		% within Group	44.9%	42.9%	43.9%
Total		Count	49	49	98
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	P value (<0.05 is significant)
Pearson Chi-Square	.041	1	.839



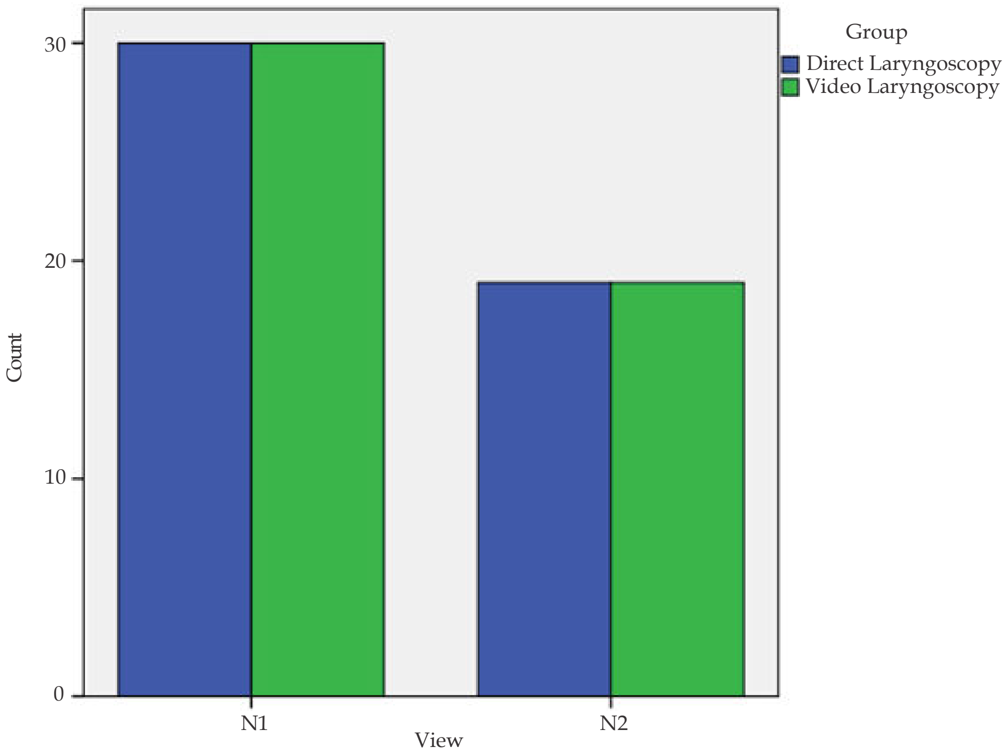
Laryngoscopic view:

Crosstab

			Group		Total
			Direct laryngoscopy	Video laryngoscopy	
View	N1	Count	30	30	60
		% within Group	61.2%	61.2%	61.2%
	N2	Count	19	19	38
		% within Group	38.8%	38.8%	38.8%
Total		Count	49	49	98
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	P value (<0.05 is significant)
Pearson Chi-Square	<0.001	1	1.000



Sum of ASA class and Laryngoscopic view

			Group					
			Direct laryngoscopy		Video laryngoscopy			
		N	Count	Column N %	Count	Column N %	Chi square	P value
Sex	F	45	25	51.00%	20	40.80%	1.027	0.311
	M	53	24	49.00%	29	59.20%		
ASA Class	1	55	27	55.10%	28	57.10%	0.041	0.839
	2	43	22	44.90%	21	42.90%		
View	N1	60	30	61.20%	30	61.20%	0	1
	N2	38	19	38.80%	19	38.80%		

On comparison of Direct laryngoscopy and Video laryngoscopy groups in relation to the parameter Sex, there are 45F and 53M numbers each category. The number of F is higher in Direct laryngoscopy group with a percentage of 51. The number of M category is higher in Video laryngoscopy group with a percentage of 59.2. This comparison is statistically not significant with a p value of 0.311.

On comparison of Direct laryngoscopy and Video laryngoscopy groups in relation to the parameter ASA Class, there are 55 1 and 43 2 numbers each category. The number of 1 is higher in Video laryngoscopy group with a percentage of 55.1. The number of 2 category is higher in Direct laryngoscopy group with a percentage of 44.9. This comparison is statistically not significant with a p value of 0.839.

Discussion

Laryngoscopy & endotracheal intubation results in sympathetic stimulation that leads to hypertension & tachycardia.[1] Heart rate is an important determinant of myocardial oxygen demand & tachycardia is a risk factor for development of perioperative myocardial ischemia & infarction.[2] Hypertension increases the peri-operative cardiac risk. Hence the need to attenuate sympathetic response to laryngoscopy & endotracheal intubation is important.[14,15] Direct laryngoscopy involves stretching the oropharyngeal tissues in an attempt to straighten the angle between the mouth & glottis opening & this stretch triggers a stress response.[5] As tracheal intubation is unavoidable for surgical procedures, sympathetic stimulation is reduced by minimizing the stretching of tissues in the laryngo-pharynx.

Various anesthetic agents, adjuvants & analgesics have been used to blunt the level of stimulation & stress response to the manipulation & stimulation of airway during laryngoscopy & intubation. Fentanyl, beta adrenergic receptor blockers, lignocaine have been used.[5,8,9]

Newer airway devices have also been used to facilitate either laryngoscopy & intubation to avoid major sympathetic stimulation or to aid difficult intubation. Video laryngoscope, McCoy laryngoscope are a few newer devices us for laryngoscopy to reduce the stress response. The upward lifting force required to expose the glottis during laryngoscopy is much less during video laryngoscopy when compared to a direct laryngoscopy & that results in less traction applied to soft tissues. Therefore it might be associated with less sympathetic stimulation.

It is usually recommended that elective surgery should be postponed in cases of severe hypertension (diastolic BP >115 mmHg, systolic BP >200 mmHg) until BP is less than 150/90 mmHg. It is seen that peri-operative hemodynamic fluctuations occur less frequently in treated hypertensive patients than in untreated hypertensive patients & hemodynamic fluctuations increase morbidity. It has been suggested that rapid correction of BP or prevention of increase in HR may be all that is required.

This study compared the hemodynamic responses during video laryngoscopy & direct laryngoscopy. All intubations were done by a single anesthesiologist experienced in both devices. This would eliminate any possible bias regarding device application. The study revealed that hemodynamic changes – (mean arterial blood pressure, heart rate) are less significant during tracheal intubation with video laryngoscopy than direct laryngoscopy. However, the time taken is higher in video laryngoscopy with a significant p value of <0.001. However, there is little evidence of association between a preoperative BP less than 140/90 mmHg & peri-operative cardiac risk. Our results demonstrated better hemodynamic stability following oral endotracheal intubation using video laryngoscopy than during direct laryngoscopy.

We conclude that endotracheal intubation is associated with less significant hemodynamic changes with video laryngoscopy than in direct laryngoscopy.

Studies done by Ali Reza Pournajafian, Mohammed Reza Ghodraty, Seyed Hamid Reza Faiz on Comparison Glidescope video laryngoscope & Macintosh laryngoscope regarding hemodynamic responses during orotracheal intubation showed no changes in heart rate but significant changes were seen with blood pressure & mean arterial pressure.

As per a study done by R.L.J.G. Massen, B.M.A. Pieters, B. Maathuis on Endotracheal intubation using Videolaryngoscopy causes less cardiovascular response compared to classic direct laryngoscopy in cardiac patient showed changes in heart rate & blood pressure.

Conclusion

According to the study we conducted, we conclude that video laryngoscopy is better than direct laryngoscopy.

References

1. Henderson J. Airway management in the adult. In: Miller RD, Eriksson LI, Fleisher LA, Wiener–Kronish JP, Young WL, editors. Miller's Anesthesia. 7th ed. Philadelphia: Churchill Livingstone Elsevier; 2010;1573–610.
2. Mittnacht AJ, Weiner M, London MJ, et al. Anesthesia for myocardial revascularisation. In: Kaplan JA, Reich DL, Savino JS, editors. Kaplan's Cardiac Anesthesia. 6th ed. Missouri: Saunders Elsevier 2011;522–69.
3. Kanchi M, Nair HC, Banakal S, et al. Hemodynamic response to endotracheal intubation in coronary artery disease: Direct versus video laryngoscopy. Indian J Anesth 2011;55:260–5.
4. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anesth 1987;59:295–9.
5. Gravlee GP, Ramsey FM, Roy RC, et al. Rapid administration of a narcotic and neuromuscular blocker: A hemodynamic comparison of fentanyl, sufentanil, pancuronium, and vecuronium. Anesth Analg 1988;67:39–47.
6. Stoelting RK. Circulatory changes during direct laryngoscopy and tracheal intubation: Influence of duration of laryngoscopy with or without prior lidocaine. Anesthesiology 1977;47:381–4.
7. Van Zundert A, Maassen R, Lee R, et al. A Macintosh laryngoscope blade for video laryngoscopy reduces stylet use in patients with normal airways. Anesth Analg 2009;109:825–31.
8. Goldman L, Caldera DL. Risks of general anesthesia and elective operation in the hypertensive patient. Anesthesiology 1979;50(4):285–92.
9. Omote K, Kirita A, Namiki A, et al. Effects of nicardipine on the circulatory responses to tracheal intubation in normotensive and hypertensive patients. Anesthesia 1992;47(1):24–7.
10. SK Ndoko, R Amathieu, L Tual, et al. Tracheal intubation of morbidly obese patients: A randomized trial comparing performance of Macintosh and Airtraq laryngoscopes. Br J Anesth, 100(2008).
11. P Aceto, V Perilli, C Modesti, et al. Sollazzi Airway management in obese patients Surg Obes Relat Dis, 9(2013);809–15.
12. I Bathory, JC Granges, P Frascarolo, et al. Magnusson Evaluation of the Video Intubation Unit in morbid obese patients, Acta Anesthesiol Scand, 54 (2010).
13. J Marrel, C Blanc, P Frascarolo, et al. Magnusson Video laryngoscopy improves intubation condition in morbidly obese patients, Eur J Anesthesiol, 24 (2007).
14. Slogoff S, Keats AS. Does perioperative myocardial ischemia lead to postoperative myocardial infarction? Anesthesiology 1985;62:107–14.
15. Slogoff S, Keats AS. Myocardial ischemia revisited. Anesthesiology 2006;105:214–6.
16. DA Sun, CB Warriner, DG Parsons, et al. Moult The GlideScope Video Laryngoscope: Randomized clinical trial in 200 patients Br J Anesth 94(2005).
17. DA Sun, CB Warriner, DG Parsons, et al. Moult The GlideScope Video Laryngoscope: Randomized clinical trial in 200 patients Br J Anesth, 94 (2005).