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A comparative study between McCoy laryngoscope versus the tascope in orotracheal intubation in adult surgical patients undergoing general anaesthesia

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***Abstract*---**Introduction: McCoy laryngoscope and video laryngoscopes are being increasingly used as they offer advantages over the conventional laryngoscopes in airway management. The aim of this study is to compare and evaluate the efficacy of McCoy laryngoscope and TAScope in providing good glottic view and ease of intubation and observing the hemodynamic stress response. Materials and Methods: It is a randomised study including 60 patients aged 18-60 years with

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ASA grade I and II, divided equally in Group M and Group T, posted for elective surgery. Ease of intubation was evaluated by intubation difficulty score(IDS). Hemodynamic parameters, intubation time and airway trauma were compared in both the groups. Results: IDS TOTAL was higher in group M and was statistically significant ($p<0.001$). The mean time taken for intubation in group T was 46.08seconds and 26.53seconds in group M ($p<0.001$). There was a transient increase in pulse and blood pressure after laryngoscopy in both the groups but rise were less in group T. Less airway trauma was observed in group M as compared to group T. TAScope took more time compared to McCoy but it resulted in better first attempt intubation, provided more haemodynamic stability and less airway trauma as compared to McCoy.

***Keywords*---**bougie, endotracheal intubation, intubation difficulty score (IDS), stress response, video laryngoscope.

Introduction

Laryngoscopy and tracheal intubation are noxious stimuli that give rise to a transient but marked increase in heart rate (HR) and blood pressure (BP) due to the lifting force exerted by the laryngoscope blade on the base of the tongue while lifting the epiglottis. To reduce hemodynamic response during intubation, laryngoscope blades are designed with varied shapes. During laryngoscopy and endotracheal intubation major stress responses are triggered; first due to sympathetic stimulation releasing catecholamines which lead to tachycardia and hypertension which in turn increases the myocardial oxygen demand; second due to vagal stimulation leading to parasympathetic activation that manifests as bradycardia and hypotension. Both of these can be fatal in patients who have a history of ischemic heart disease. [1, 2] Anaesthetic literature has focused more on the pharmacological methods for obtundation of the response, and literature related to non-pharmacological methods, specifically laryngoscopy blade design, is limited.

Because airway catastrophe is still one of the leading causes of mortality and morbidity in anaesthesia, various attempts have been made to modify laryngoscopes from the traditional Macintosh laryngoscope to the digital video laryngoscope. The McCoy laryngoscope is designed to elevate the epiglottis with its hinged tip. This design has two advantages compared with the conventional Macintosh laryngoscope; less force is applied during laryngoscopy and stress response to laryngoscopy is reduced, and difficult laryngeal visualization may be improved by lifting the epiglottis, especially in patients with fixed necks in neutral position. [3, 4]

The TAScope (The Anaesthetist Society scope) is an indigenously designed Video laryngoscope by a fraternity member. It is a channelled, anatomically angulated video intubation aid with an endoscopic camera which can be connected to mobile phones and tablets. [5] TAScope is a video intubation aid to help passage of tube in difficult airways. It involves the use of endoscope or borescope camera (5.5 mm

diameter HD camera) which is either connected to laptop/or even compatible mobiles or tablet. There is a customized channel for insertion of bougie and the endotracheal tube is railroaded over bougie under vision. As compared to the various video laryngoscopes available in the market, TAScope is very cheap which makes it handy in limited resource setting. It does not need alignment of the axis to improve the intubating conditions because the axis of the TAScope is curved and the image is seen on the screen. The need of more sophisticated and complex airway instrument like flexible fiberoptic bronchoscope can be reduced to a particular extent with the increasing use of TAScope. Thus, TAScope as a video laryngoscope will go a long way in not only difficult airway scenarios but also in decreasing the cost burden involved in procuring modern day video laryngoscopes. This study was carried out to compare and evaluate the efficacy of McCoy laryngoscope and the TAScope (a Video Laryngoscope) in providing good glottic view and ease of intubation and its effect on hemodynamic stress response in adult surgical patients undergoing General Anaesthesia.

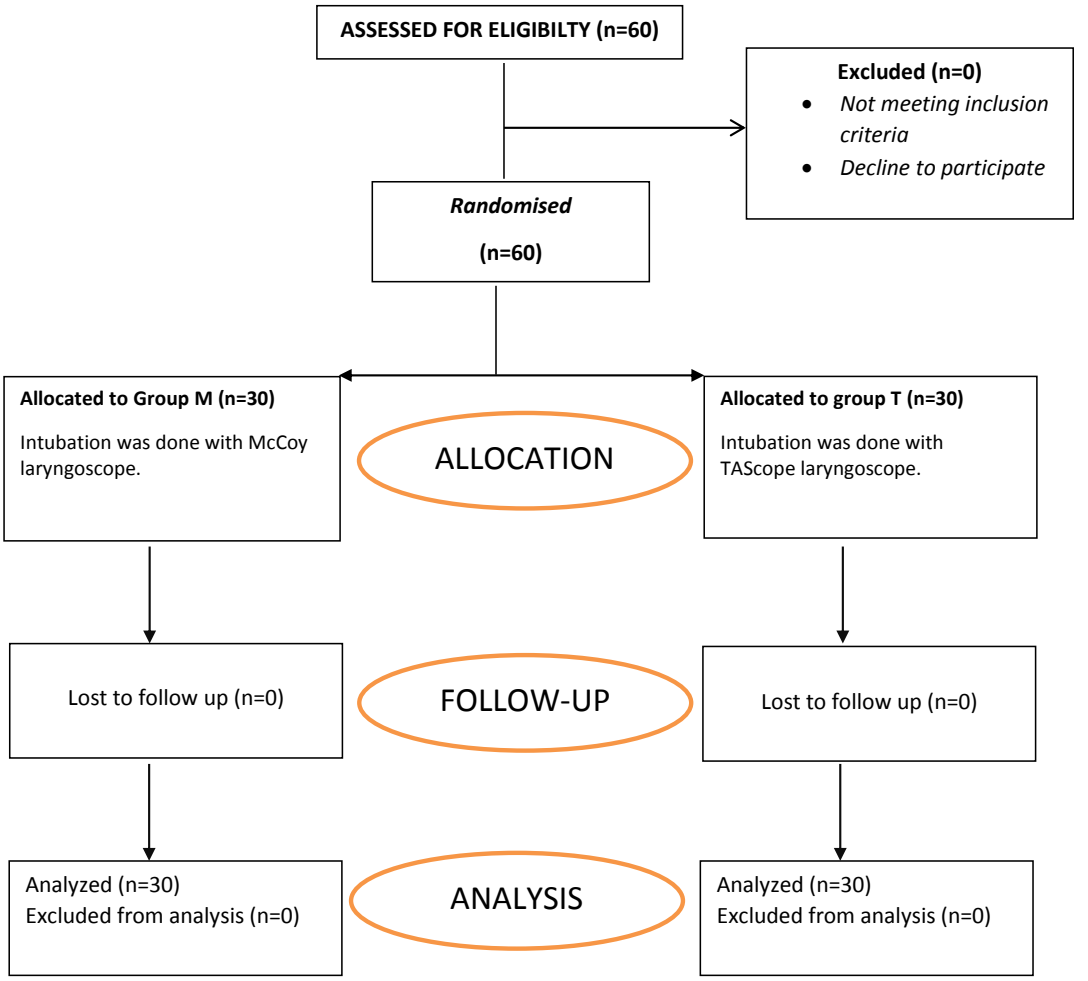
Materials and Methods

After ethical committee's approval (letter no. SVIEC/ON/MEDI/BNPG18/D19174), an observational study was carried out in the department of Anaesthesiology, Dhiraj Hospital, Vadodara for duration of 18 months. Sixty patients aged between 18 to 60 years of either gender belonging to American Society of Anaesthesiologists (ASA) grade I or II undergoing elective surgical procedures were taken for the study. Written and informed consent was taken from all the patients. Patients with haemodynamic and respiratory compromise anticipated difficult airway, history of gastroesophageal reflux disease and body mass index (BMI) >35 kg m-2 were excluded from the study.

Procedure

Patients were shifted to operation theatre (OT) after pre-anaesthetic evaluation and preparation. Written and informed consent was checked. An intravenous cannula of 18 Gauze was secured and an infusion of ringer's lactate solution was started. Sixty patients were equally randomised into 2 groups, GROUP M and GROUP T of 30 each using sealed envelope by an anaesthetist not involved in the study. [Table / Figure I]

[Table / Figure I]: Study Flow Diagram



Patients were attached with multi-parameter monitoring: electrocardiogram (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO_2) and $ETCO_2$ monitor. All the patients were uniformly premedicated with inj. glycopyrrolate 0.04mg/kg, inj. ondansetron 0.08mg/kg, inj. midazolam 0.04mg/kg i.v. (intravenously) 10 minutes before induction. Preoxygenation was then done with 100% 02 for 5 minutes. Base line vitals (pre-induction) viz Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and SpO_2 (oxygen saturation) was noted. Induction was done with 2.5mg /kg propofol i.v. and inj. Succinylcholine 2mg/kg i.v. was used as the muscle relaxant to facilitate the intubation. Post Induction vitals (pre-laryngoscopy): HR, SBP, DBP, MAP and SpO_2 were noted.

An anaesthesiologist having good experience with McCoy and TAScope carried out intubation according to the groups allotted as follows:

GROUP M: In sniffing position and with help of McCoy laryngoscope the tube was inserted into the glottis and intubation was achieved.

GROUP T: Patient was positioned with head in neutral position. After obtaining adequate view of the larynx, bougie was inserted via the vocal cords on which the tube tip was rail-roaded under vision. Then the bougie was taken out.

Intubation was confirmed for proper placement of tube in the trachea by the presence of carbon dioxide in the exhaled breath for three consecutive times via capnography. Endotracheal tube was fixed after confirming equal air entry in both the lungs. Haemodynamic monitoring viz HR, SBP, DBP, MAP and SPO_2 were recorded immediately after intubation (T0) and later at 2 (T2), 4 (T4), 6 (T6), 8 (T8), 10 (T10) minutes.

Parameters Assessed

The Primary Outcome Measure was Intubation Difficulty Score. [6] Intubation difficulty score was used to evaluate intubating performance of laryngoscopy. IDS score is a blend of objective and subjective criteria that permit a quantitative and qualitative approach to the progressive nature of the difficulty in intubation. [Table / Figure II]

[Table / Figure II]: Intubation Difficulty Score (IDS)

PARAMETER	
Number of attempts attempt 1/2/3/4	N1 Score 0/1/2/3
Number of operators operators 1/2/3/4	N2 Score 0/1/2/3
Number of alternative techniques	N3
Cormack grade CLG Grade I: Entire vocal cord visualized CLG Grade IIa: Posterior part of vocal cords seen Grade IIb: Arytenoids only seen CLG Grade IIIa: Epiglottis only seen (liftable) Grade IIIb: Tip of epiglottis only seen (adherent) CLG Grade IV: No glottis structure seen	N4 N4=0 N4=1 N4=2 N4=3
Lifting force required Normal Increased	 N5=0 N5=1
Larngeal pressure Not applied Applied	 N6=0 N6=1
Vocal Cord mobility	

Abduction Adduction	N7=0 N7=1
TOTAL SCORE: IDS= sum of scores	N1 to N7

[Table / Figure III]: IDS Score and degree of intubation difficulty

IDS Score	Degree of difficult
0	Ease
1 to 5	Slight difficulty
> 5	Moderate to major difficulty

In this scoring the value of IDS is '0' in full visual view of glottic opening with vocal cords are seen to be nicely abducted. Every variation from this defined 'ideal intubation' increases the scoring that indicates increasing difficulty of intubation. The total IDS score being the sum of all variation from the definition. [Table / Figure III]

Secondary measures

- Intubation time: It measured from entry of the device into the oral cavity beyond incisiors until confirmation of proper placement of tracheal tube by the presence of carbon dioxide in the exhaled breath for three consecutive times via capnography.
- HR, SBP, DBP, MAP and SPO2 were recorded pre-induction, post-induction and immediately after intubation (T0) and later at 2 (T2), 4 (T4), 6 (T6), 8 (T8) and 10 (T10) minutes.
- Complications / Airway Trauma: All complications were recorded with special attention to common complications such as upper airway trauma and blood soiling of laryngoscope.

Observation and Results

Demographic data of the patients were comparable in both the groups with respect to age, weight, BMI, ASA grade and MPG grade (p>0.05). [Table / Figure IV]

[Table /Figure IV]: Demographic distribution of patients in both the groups

	GROUP M (n=30)	GROUP T (n=30)	t	P VALUE
	Mean ± sd	Mean ± sd		
Age (Years)	36.77±12.16	38.17±13.23	-0.427	0.671
WEIGHT (Kgs)	66.5±12.8	67.27±14.93	-0.214	0.832
HEIGHT (cms)	165.83±5.9	166.87±7.16	-0.61	0.544
BMI	23.94±4.28	23.94±4.37	0	1
ASA Grade I II	 18 12	 17 13		
MPG I	 11	 15		

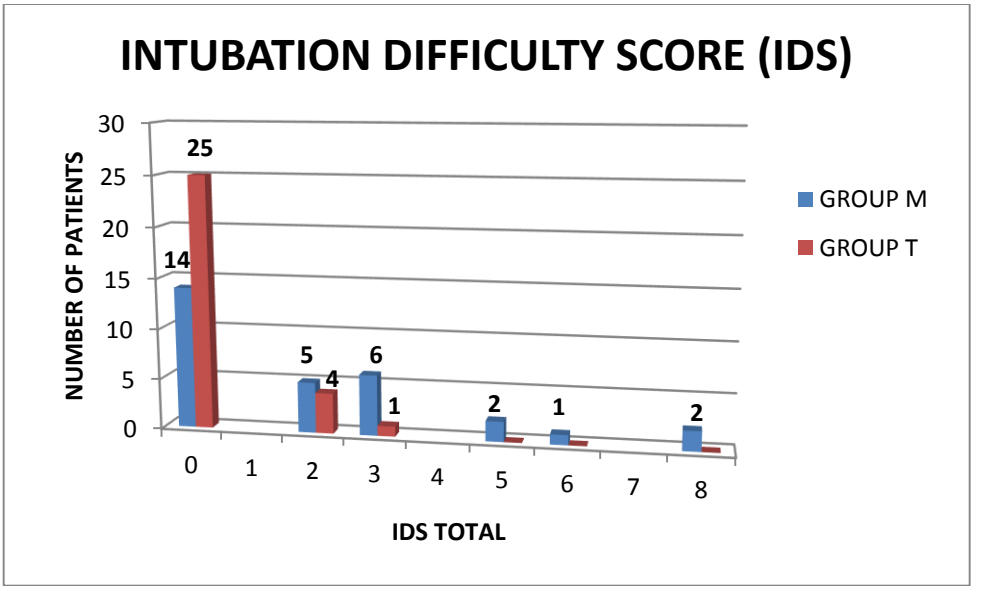
II	19	15		

Outcome Measures

[Table /Figure V]: Intubation Difficulty Score (IDS) in both the groups

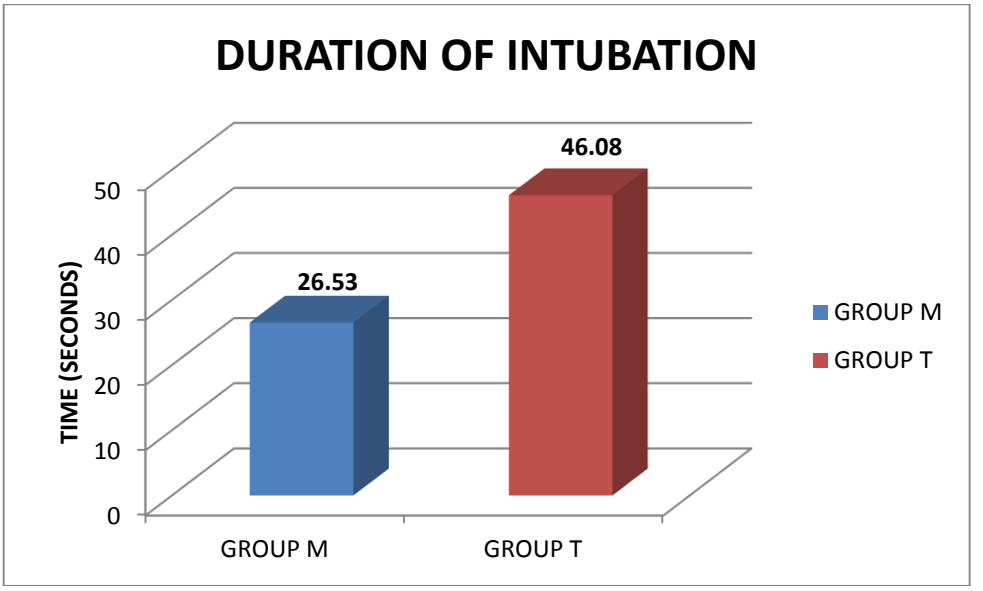
			Group		Total
			Group M	Group T	
INTUBATION DIFFICULTY SCORE (IDS TOTAL)	0	Count	14	25	39
		%	46.7%	83.3%	65.0%
	2	Count	5	4	9
		%	16.7%	13.3%	15.0%
	3	Count	6	1	7
		%	20.0%	3.3%	11.7%
	5	Count	2	0	2
		%	6.7%	0.0%	3.3%
	6	Count	1	0	1
		%	3.3%	0.0%	1.7%
	8	Count	2	0	2
		%	6.7%	0.0%	3.3%
Total		Count	30	30	60
		%	100.0%	100.0%	100.0%

[Table /Figure VI]: Intubation Difficulty Score of patients in both the groups



Comparison of the IDS TOTAL between the two groups shows that IDS TOTAL is higher in McCOY group with a t value of 3.505 and is statistically significant with a p value of 0.001. [Table / Figure V and VI]

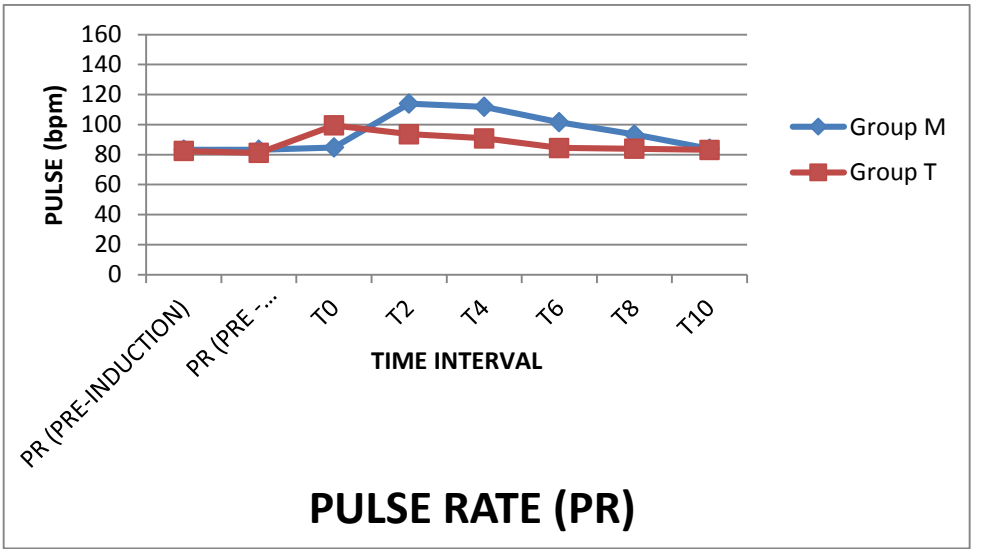
[Table /Figure VII]: Duration of Intubation in both the groups



Comparison of the intubation time (seconds) between the two groups shows that INTUBATION TIME is higher in group T with a t value of -12.2 and is statistically significant with a p value of <0.001. [Table / Figure VII]

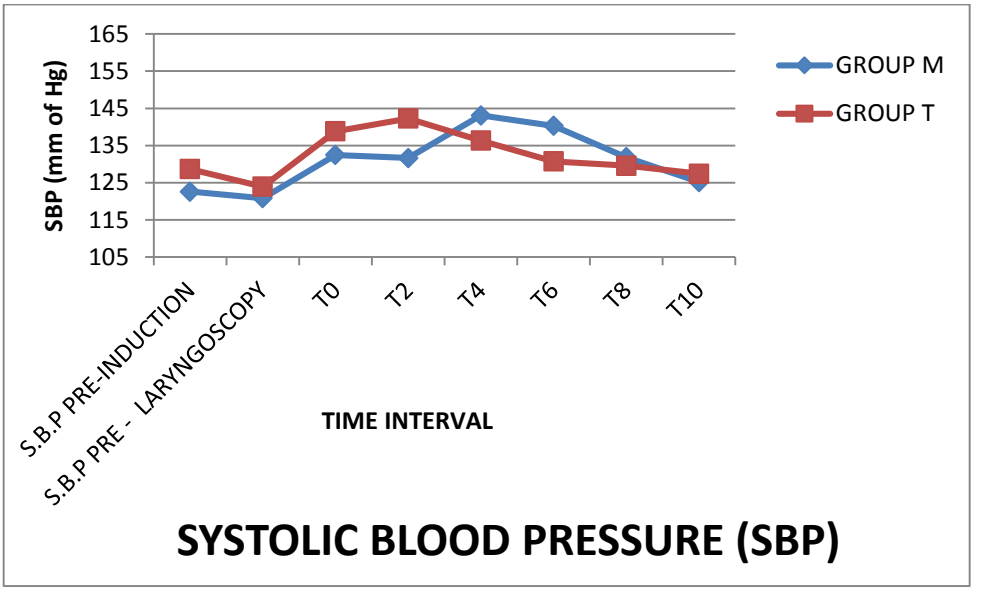
Hemodynamic Changes

[Table /Figure VIII]: Mean Pulse Rate (PR) at different time intervals in both the groups



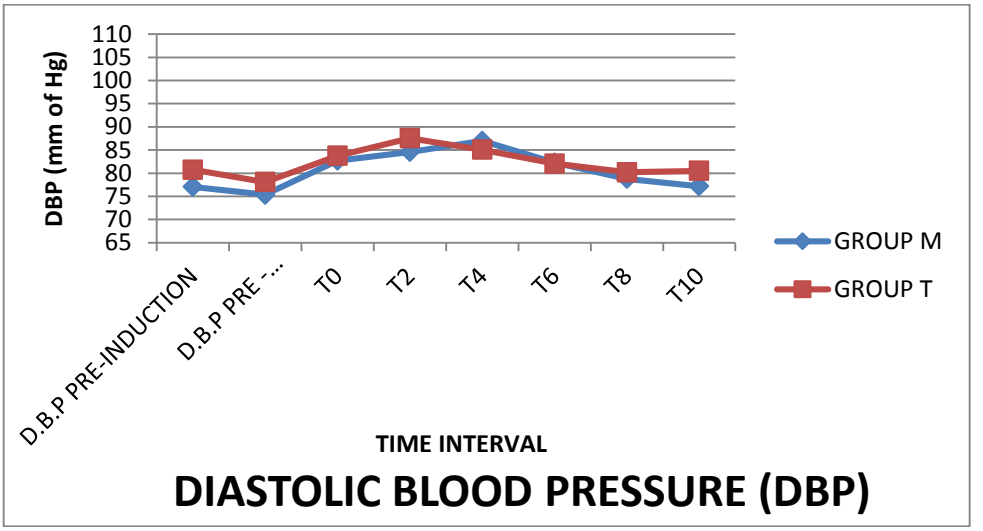
On comparing the two groups, the rise in the pulse rate (PR) compared to baseline values (PR pre-induction) was 37% in group M & 20.74% in group T. The difference in pulse rate between Group M & Group T remained statistically significant up to 8 minutes post intubation (T8). [Table / Figure VIII]

[Table /Figure IX]: Systolic Blood Pressure (SBP) at different time intervals in both the groups



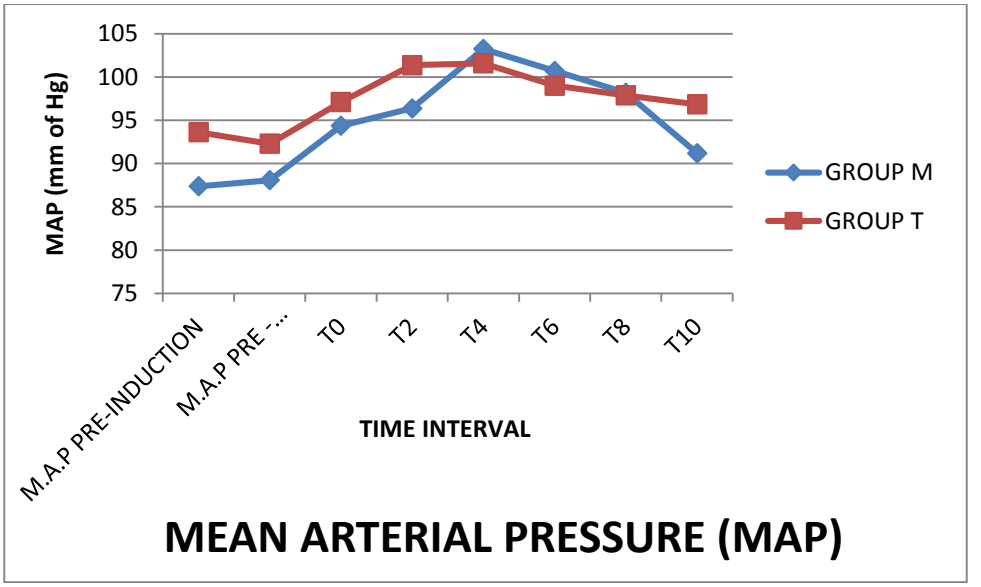
The rise in the SBP compared to baseline values (SBP pre-induction) was 25.22% in group M & 11.99% in group T. The difference in systolic blood pressure (SBP) between Group M & Group T remained statistically significant up to 6 minutes post intubation (T6). [Table / Figure IX]

[Table /Figure X]: Diastolic Blood Pressure (DBP) at different time intervals in both the groups



The rise in the Diastolic Blood Pressure (DBP) compared to baseline values (DBP pre-induction) was 13.45% in group M & 13.53% in group T. The difference in diastolic blood pressure (DBP) between Group M & Group T remained statistically significant up to 2 minutes post intubation (T2). [Table / Figure X]

[Table /Figure XI]: Mean Arterial Pressure (MAP) at different time intervals in both the groups

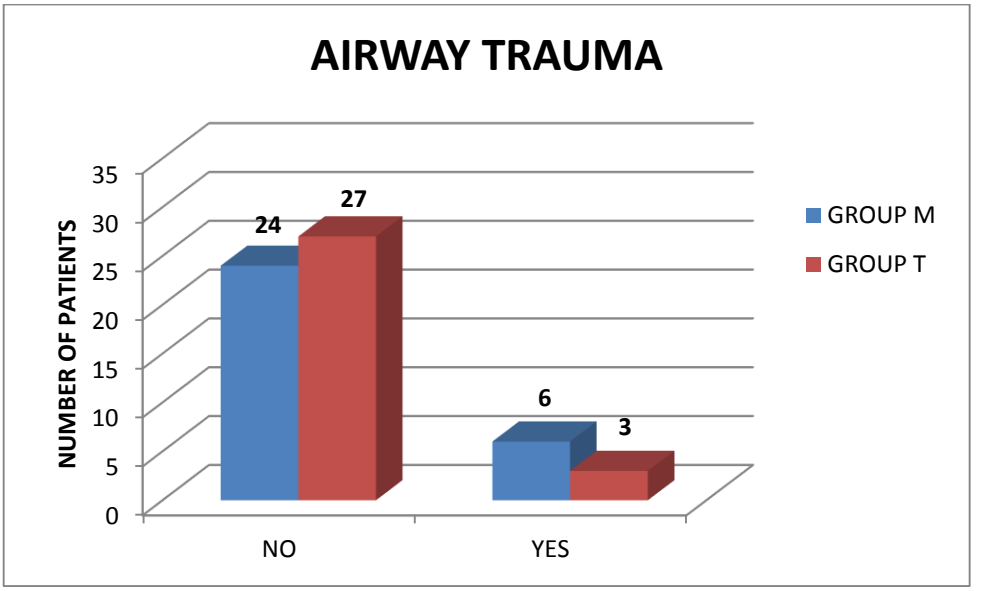


The rise in the mean arterial pressure (MAP) compared to baseline values (MAP pre-induction) was 11.06% in group M & 7.08% in group T. The difference in

mean arterial pressure (MAP) between Group M & Group T remained statistically significant up to 02 minutes post intubation (T2). [Table / Figure XI]

The SPO $_2$ changes in the pre intubation and post intubation periods in both group M and group T was not statistically significant.

[Table /Figure XII]: Airway Trauma in both the groups



In group M 20% patients (6 patients) had blood staining on ET tube whereas in group T only 10% patients (3 patients) had blood staining on ET tube. [Table / Figure XII]

Limitations

Firstly, the potential for bias exists as it is impossible to blind the anaesthesiologist to the device being used. Also, certain measurements used in this study are of subjective nature. This study was conducted by experienced user of both the devices; hence the results may differ in the hands of less experienced users. Lastly, this study was conducted in patients of normal airway so the results might differ when used in cases of difficult airway.

Discussion

This study was conducted with the objectives of comparing haemodynamic changes like heart rate, blood pressure and SpO_2 during laryngoscopy, intubating performance by observing the number of supplementary attempts, number of supplementary operators directly operating, number of alternative techniques used, degree of glottic exposure, subjectively increased lifting force required during larynoscopy, need for external laryngeal manipulation and position of vocal cords.

In my study total IDS score was '0' in 25 out of 30 patients, score '2' in 4 patients and score '3' in 1 patient in TAScope group whereas total IDS score in McCoy roup was '0' in 14 patients, '2' in 5 patients, '3' in 6 patients, '5' in 2 patients, '6' in 1 patient and score '8' in 2 patients. My study is in congruent with the study of QE Ali et al [7] wherein they observed that the IDS were significantly less in the King Vision video laryngoscope group as compared with McCoy and Macintosh laryngoscopes groups (*P*=0.001). Similarly, Jain et al [8] observed that IDS score was significantly less in the CMAC group compared to the McCoy group ($p < 0.05$). Hema Saxena et al [9] in his study also observed that IDS score with Truview group was significantly low as compared to McCoy Group ($p < 0.001$).

In my study, the mean time taken for intubation in group T is 46.08 seconds as compared to 26.53 seconds in group M. Comparison of the intubation time between the two groups shows that intubation time is higher in group T and is statistically significant with a p value of <0.001. this was similar to a study conducted by Ramneek Kaur et al [10] where it was found that the time to intubation was significantly more with TAScope group (38.3±6.7) as compared to Macintosh group (27.6±9.1) with a $p<0.01$. Some studies [11] showed lesser time taken for intubation with Video laryngoscopes (King Vision) than compared to McCoy and some studies showed longer time taken for intubation with Video laryngoscopes (TAScope/C-MAC) than compared to McCoy. This owes to the use of a conduit (bougie) to pass the endotracheal tube in some video laryngoscope like TAScope. In TAScope, the use of a bougie is mandatory to pass the endotracheal tube across the vocal cords; hence negotiating the tube by rail-roading over the bougie takes a longer time.

On comparing the two groups, the rise in the pulse rate compared to baseline values (PR pre-induction) was 37% in group M and 20.74% in group T. The difference in pulse rate between Group M and Group T remained statistically significant up to 8 minutes post-intubation (T8). The rise in the systolic blood pressure (SBP) compared to baseline values (PR pre-induction) was 25.22% in group M and 11.99% in group T. The difference in systolic blood pressure (SBP) between Group M and Group T remained statistically significant up to 6 minutes post-intubation (T6). The rise in the diastolic blood pressure (DBP) compared to baseline values (PR pre-induction) was 13.45% in group M and 13.53% in group T. The difference in diastolic blood pressure (DBP) between Group M and Group T remained statistically significant up to 2 minutes postintubation (T2). The rise in the mean arterial pressure (MAP) compared to baseline values (PR pre-induction) was 11.06% in group M and 7.08% in group T. The difference in mean arterial pressure (MAP) between Group M and Group T remained statistically significant up to 02 minutes postintubation (T2).Systolic blood pressure, diastolic blood pressure, and mean blood pressure returned close to the baseline values earlier in Group T as compared to group M. In similar studies conducted by QE Ali et al [7] and Dr Sarfaraz Ahmad et al [11] it was observed that there was a significant rise in heart rate from pre intubation values but came down near to pre-intubation values within 10 minutes of intubation, but the post intubation rise in heart rate and mean arterial pressure were significantly less in King Vision group as compared to McCoy group.Thus, our findings were quite comparable to the above mentioned studies with regards to hemodynamic stress response. In my study, airway trauma was observed in 20% patients in group M as compared to only

10% patients in group T with a p value of 0.278 which is statistically non-significant.

Conclusion

On the basis of this study, it was concluded that TAScope provides ease of intubation, number of first attempts of successful intubation, providing better visualization of the vocal cords (Cormack-Lehane grade) as evident by the intubation difficulty score (IDS). Also, there is better obtundation of hemodynamic stress response to intubation with TAScope when compared to McCoy laryngoscope. Though TAScope takes more time compared to McCoy owing to the use of bougie, the advantages it offers over McCoy are fairly evident.

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