USE OF MCCOY AND TRUVIEW LARYNGOSCOPE BLADES FOR INTUBATION IN PATIENTS WITH ANTICIPATED DIFFICULT AIRWAY WITH RESPECT TO EASE OF INTUBATION AND HAEMODYNAMIC RESPONSE

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ABSTRACT

BACKGROUND

The aim of this study is to compare the McCoy blade laryngoscope and TruView laryngoscope in patients with anticipated difficult tracheal intubation with respect to ease of intubation, haemodynamic stress response and incidence of complications.

MATERIALS AND METHODS

Out of 120 patients anticipated to have difficult intubation using the standard criteria of airway assessment preoperatively including modified Mallampati classification, mouth opening, neck extension, SLUX, Upper Lip Bite Test (ULBT) and thyromental distance. The patients are randomised into 2 groups using computer generated randomisation chart. Group T (n=60)- intubation with TruView blade and Group M (n=60)- intubation with McCoy blade. The two groups were studied using Chi-square tests. $p<0.05$ was considered statistically significant.

RESULTS

Overall, there was an improvement in the Cormack-Lehane grade (CL grade) after using either McCoy or TruView laryngoscopes. The number of patients with CL grade I (85.0%) in TruView group is significantly more as compared to grade I CL in McCoy group (50%), p=0.039, 13.3% of cases required ELM in the McCoy group, which was significantly more as compared to 3.3% cases in the TruView group. Mean total time taken for endotracheal intubation was 33.73 secs. in McCoy group, which was significantly less as compared to 64.03 secs. in TruView group. When compared between the groups, the increase in HR over the baseline was more in the McCoy group than the TruView group.

CONCLUSION

TruView laryngoscope provided excellent glottic view and showed better haemodynamic stability as compared to McCoy laryngoscope.

KEYWORDS

Anticipated Difficult Airway, Airway Indices, Ease of Intubation, Haemodynamic Response.

HOW TO CITE THIS ARTICLE: Pote DS, Kudalkar AG, Mahajan S. Use of McCoy and TruView laryngoscope blades for intubation in patients with anticipated difficult airway with respect to ease of intubation and haemodynamic response. J. Evid. Based Med. Healthc. 2017; 4(35), 2108-2113. DOI: 10.18410/jebmh/2017/410

BACKGROUND

The curved laryngoscope blade described by MacIntosh in 1943, remains the most popular device used to facilitate orotracheal intubation, both inside and outside the operating theatre and is considered as the gold standard.[1] The tip of the blade is engaged in the vallecula lifting the epiglottis upwards in an effort to see the cords. This is done in order to bring all three axes, viz. the oral, pharyngeal and laryngeal, in one line. Each one of these manoeuvres may cause injury and may fail to achieve its objective.

Financial or Other, Competing Interest: None.
Submission 11-04-2017, Peer Review 15-04-2017,
Acceptance 27-04-2017, Published 28-04-2017.
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In a small number of patients, some anatomical or pathological factors lead to difficult laryngoscopy. In some cases, larynx is visualised, but it is difficult to introduce the tube in the trachea. There has been considerable effort to identify the optimal preoperative tests to predict the possible occurrence of difficult intubation. Difficult endotracheal intubation is said to be present when normally trained anaesthesiologist needs more than three attempts or more than 10 mins. for successful endotracheal intubation with conventional laryngoscopy in such patients.[2] Hypoxia, haemodynamic disturbances and injury to airway structures can occur as a sequel. Direct laryngoscopy induces arterial hypertension, tachycardia as a result of increased catecholamine secretion secondary to proprioceptor stimulation of supraglottic structures.[3] Apnoeic conventional laryngoscopy may lead to oxygen desaturation, if laryngoscopy gets prolonged.

The 'McCoy-style' blade based on the standard MacIntosh blade, was invented in 1990s.[4] It has a hinged tip

that is operated by a lever mechanism on the back of the handle. It acts on hyoepiglottic ligament and allows elevation of the epiglottis while reducing the amount of force required, hence causing less mechanical stimulation. As it elevates epiglottis, visualisation of larynx is said to be easy.

In 2004, TruView EVO2 laryngoscope[5] developed by Truphatek International Ltd., Netanya, Israel, was introduced. It incorporates an unmagnified optic side port to its special blade. This provides a 42° additional anterior view necessitating reduced lifting force to bring glottis into view, reduced laryngoscopy and intubation time, lesser rise in heart rate and blood pressure and reduced incidence of postoperative sore throat. It also has a provision for continuous oxygen insufflation.

Keeping the above things in mind, the present study was conducted to compare the McCoy blade laryngoscope and TruView laryngoscope in patients with anticipated difficult tracheal intubation with respect to ease of intubation, haemodynamic stress response and incidence of complications.

MATERIALS AND METHODS

The present prospective, randomised controlled trial to compare the TruView and McCoy laryngoscope blades for tracheal intubation was carried out in 120 patients undergoing elective surgical procedures under general anaesthesia requiring tracheal intubation. The study was approved by the Institutional Ethics Committee. A written, valid informed consent was taken.

Inclusion Criteria

- Age more than 18 years.
- Elective surgical patients requiring general anaesthesia with endotracheal intubation.
- Patients anticipated to have difficult intubation using the standard criteria of airway assessment.
- Patient willing to give consent.

Exclusion Criteria

- Paediatric patients.
- Patients with airway trauma or obvious airway deformity.
- Patients for emergency surgery.
- Obstetric patients.

The patients were randomised into 2 groups using computer generated randomisation chart.

Group T (n=60)- intubation with TruView blade and Group M (n=60)- intubation with McCoy blade.

A complete preoperative assessment was carried out. Thorough airway assessment was done, which included Modified Mallampati Classification, mouth opening, neck extension, SLUX, ULBT and thyromental distance.

Anaesthesia was induced with Inj. Propofol 2-2.5 mg/kg in graded doses till loss of consciousness given over 20-30 secs. Neuromuscular blockade was achieved with Inj. Vecuronium bromide 0.1 mg/kg. After 3 minutes of manual ventilation, direct laryngoscopy was done with the patient's head and neck in sniffing position using MacIntosh laryngoscope and Cormack and Lehane grading was assessed. The patients who had CL grading of I and II were not considered for further analysis. In patients with CL grading III and IV, after ventilating for 15 seconds, another laryngoscopy was performed using the laryngoscope under study.

Group M- McCoy laryngoscope was inserted and the Cormack and Lehane grading was noted. If CL grade was found to be 3 or higher, the lever of the McCoy was used and any improvement in Cormack-Lehane grading was noted. If needed, external laryngeal manoeuvre and help of intubation assisting devices was taken and noted. Haemodynamic changes and ease of intubation were observed and noted.

In Group T, TruView laryngoscope with attached digital camera was inserted along the midline till visualisation of epiglottis. Oxygen flow at 8 litres/min. was insufflated through the side port of TruView to prevent fogging. Then, caudal pressure was applied towards the lower jaw to bring larynx in view. A premounted appropriate size endotracheal tube over the stylet was inserted under laryngoscopic view obtained on camera viewer.

Intratracheal placement of the tube was confirmed with chest auscultation and capnometry.

For ease of intubation, the parameters studied were- Cormack-Lehane grade with MacIntosh blade, Cormack-Lehane grade using McCoy and TruView blade, need for External Laryngeal Manoeuver (ELM), time for intubation, use of intubation assist devices like bougie or different technique, number of attempts at intubation and number of operators.

In both the groups, the best glottic view achieved was graded as per Cormack-Lehane grading criteria.

The haemodynamic response to laryngoscopy was observed at following time interval- at the time of induction, at the time of laryngoscopy, at the time of intubation, every 2 mins. interval for 10 mins. after intubation.

The following parameters were noted. Heart rate, systolic blood pressure and diastolic blood pressure.

Anaesthesia was then maintained with oxygen, nitrous oxide, intermittent vecuronium and propofol infusion (inhalational agents not used because to maintain uniformity in all cases due to sporadical availability and expensive). Complications if any, such as desaturation, hypertension, arrhythmias and airway trauma was noted.

RESULTS

Among the 120 patients studied, 60 were allocated to McCoy group and other 60 were allocated to TruView group.

McCoy Group				TruView Group		
CL	With MacIntosh Blade	McCoy Blade		With MacIntosh Blade	TruView	
		No.	%		No.	%
I	-	*30	50.0	-	51	85.0
II	-	26	43.3	-	8	13.3
III	52	4	6.7	55	1	1.7
IV	8	0		5	0	

Table 1. Comparison of Improvement in the Cormack-Lehane Grading with McCoy and TruView

By Chi-square test, P=0.039, *significant.

Table 1 reveals that, overall, there was an improvement in the CL grade after using either McCoy or TruView laryngoscopes. In McCoy group, 30 patients had Cormack-Lehane I, 26 had grade II and 4 patients had grade III as compared to 52 and 8 patients having CL grade of III and IV respectively with MacIntosh blade. None of the patients had grade IV CL. In the TruView group, 51 patients had grade I, 8 patients had grade II and 1 patient had grade III as compared to 55 and 5 patients having CL grade III and IV respectively with MacIntosh blade. The number of patients with CL grade I (85.0%) in TruView group is significantly more as compared to grade I CL in McCoy group (50%), p=0.039.

Time (Secs)	Mean Time Taken For Endotracheal Intubation_(x ± SD)			
	N	McCoy	N	TruView
T1	60	*29.80 ± 05.19	60	52.33 ± 10.40
T2	10	*23.60 ± 02.17	18	37.89 ± 06.76
T3	00	-	1	19.00 ± 00.00
Total Time	**60**	***33.73 ± 09.88**	**60**	**64.03 ± 16.80**

Table 2. Comparison of Mean Time Taken for Endotracheal Intubation between Two Groups

By Student's t-test, P=0.001, * significant.

- Table 2 shows the mean time taken for insertion of endotracheal tube was 29.80 secs for first attempt (T1) in McCoy group, which was significantly less as compared to 52.33 secs. in TruView group.
- Mean time taken for endotracheal intubation was 23.60 secs. for second attempt (T2) in McCoy group, which was significantly less as compared to 37.89 secs. in TruView group.
- Mean total time taken for endotracheal intubation was 33.73 secs. in McCoy group, which was significantly less as compared to 64.03 secs. in TruView group.

DISCUSSION

It is always a challenge to intubate trachea in a patient who is predicted to have difficult intubation. Many tests are devised to predict this difficulty and multiple equipments are manufactured to overcome the difficulty.

The present study is a prospective, randomised, controlled trial to comparatively evaluate the use of McCoy and TruView laryngoscope blades for intubation in patients with difficult airway. The factors studied were ease of intubation indicated by the Cormack-Lehane grading, number of attempts taken for intubation, the total time taken for successful intubation and also the number of attempts and the operators performing the intubation. It was also noted whether any intubation assist device was used. The haemodynamic response to insertion of the device and the tracheal intubation was also noted. Complications in both the groups were also noted.

In recent years, both these instruments are being used regularly and there are several studies published critically evaluating various aspects of these gadgets.

The ease of intubation is closely related to the patient's Cormack-Lehane grading during laryngoscopy, higher grade indicating increasing level of difficulty. Usually, grade III and IV are indicative of difficult laryngoscopy. Initially, in all patients, we performed laryngoscopy using regular MacIntosh blade and the CL grading was confirmed. If CL grade was I or II, it was indicative of easy laryngoscopy and intubation. These patients were excluded from further analysis as they would not have required special means of intubation.

However, if the CL grade was III or IV, then further laryngoscopy was performed using either McCoy or TruView blade and again the CL grade was assessed. There was significant improvement in Cormack and Lehane grading. In group T, 55 (91.7%) and 5 (8.3%) out of 60 patients had CL grade 3 and CL grade 4 respectively with MacIntosh blade, which improved to CL 1 in 51 (85%), CL 2 in 8 (13.3%) and CL 3 in 1 (1.7%) with TruView laryngoscope. While in M group, 52 (86.7%) patients had CL 3 and 8 (13.3%) patients had CL 4 with MacIntosh blade, which improved to CL 1 in 30 (50%), CL 2 in 26 (43.3%) and CL 3 in 4 (6.7%) after use of McCoy laryngoscope. This was statistically significant (p=0.039). There were significantly more patients having grade I CL in TruView group than in McCoy. TruView laryngoscope allows for indirect visualisation of larynx.

Various studies have been done in this regard that support our finding. Tutuncu et al[5] did a comparative study between TruView and MacIntosh blades in 185 patients to determine the quality of laryngoscopic exposures. Two successive laryngoscopies were performed on the same patient, first with the MacIntosh blade and second with the TruView blade. They found a better laryngeal view with the TruView laryngoscope than with the MacIntosh laryngoscope. Improvement of at least one Cormack-Lehane

grade was noted in 79.1% patients (26.7% of patients who were grades III or IV and 52.4% of patients who were grade II).

Li et al[6] in their study in a random cross-over fashion used the standard MacIntosh laryngoscope and TruView laryngoscopes in turn for direct laryngoscopy.

Similarly, Kumar N et al[7] found better glottic views with the TruView laryngoscope in their study comparing the TruView, MacIntosh and McCoy laryngoscopes in 60 patients undergoing elective surgery. The laryngeal view obtained was significantly better with the TruView EVO2, Cormack-Lehane grade I being in 100% of patients (CL I/IIa/IIb/III/IV - 20/0/0/0/0) followed by McCoy with 60% of patients being grade I (12/8/0/0/0; p=0.03) and MacIntosh (10/3/7/0; p=0.006) laryngoscope with only 50% of patients being grade I.

In a comparative study, Singh et al[8] (2009) found that TruView EVO2 provided better laryngoscopic view than MacIntosh laryngoscope in anticipated difficult intubation scenarios. TruView EVO2 improved laryngeal view in 92% cases by one or more Cormack-Lehane grade.

The TruView laryngoscope provides a field of vision spanning 42° anterior from the proximal scope end of the laryngoscope. This results in a better view of the glottis with a significantly reduced lifting force. On the contrary, with the MacIntosh laryngoscope, only a straight line vision is visualised. MacIntosh laryngoscope can provide a maximum of 30° anterior view of structures at its tip. However, to get this 30° anterior view, the laryngoscopist has to visualise at point V2, which necessitates a mouth opening of 4 cm. This mouth opening will only be achieved by applying a greater lifting force, but still adequate glottic view is not guaranteed.

Regarding the time taken for intubation, the mean time taken for intubation and resumption of effective ventilation in the group T was 64.03 ± 16.80 seconds and in the group M was 33.73 ± 9.88 seconds (p=0.001), which is significant. Thus, intubation using TruView laryngoscope needed statistically and clinically longer time for intubation and resumption of effective ventilation as compared to McCoy laryngoscope, i.e. laryngoscopy, intubation and confirmation of ventilation.

Nineteen patients among the T group required more than 50 seconds to complete laryngoscopy, intubation and to resume effective ventilation. Among these patients, one could not be intubated even after 3 attempts was considered as failure and intubation was achieved with the McCoy blade laryngoscope and bougie. This patient had long overhanging epiglottis obscuring laryngeal view. In the M group, all patients could be intubated within 35 seconds.

Similar results were reported by many authors as well. Timanaykar et al[9] also found longer intubation time with the TruView laryngoscope, i.e. 33.62 ± 5 seconds compared to MacIntosh laryngoscope, which required only 23.11 ± 5 seconds (p<0.01).

Barak et al[10] in their comparative study between TruView and MacIntosh laryngoscopes in 170 adult patients, similarly reported longer intubation time with the TruView laryngoscope. They required 33 ± 12 seconds with TruView and 24 ± 13 seconds with the MacIntosh laryngoscopes for intubation (p=0.0001).

Insertion of endotracheal tube in the larynx also requires compressing the tongue, taking the tongue on left side and lifting the epiglottis so as to visualise the larynx. With TruView, since indirect view of the larynx is available through the lens, the soft tissue of the floor of the mouth are not compressed or the epiglottis is not lifted. This may make insertion of tube difficult even though visualisation is easy.

Li et al[6] also noted longer time for intubation with the TruView laryngoscope in their study in 200 patients. The overall Time Taken for Intubation (TTI) was 34 seconds in the MacIntosh group and 51 seconds in the TruView group. The average TTI differed by 17 secs. Although, this reflects a 50% increase in mean intubation time, overall they believed that this period of time is clinically acceptable for elective cases. However, they commented that TruView laryngoscope may have limitations during rapid sequence intubation.

The number of attempts required for successful tracheal intubation, we noted in our study that 50 (83.3%) patients could be intubated in first attempt in McCoy group and 42 (70.0%) in TruView group and difference was not significant. 10 (16.7%) patients required two attempts in McCoy group and 17 (28.3%) in TruView group. This also was not significant.

In group T, one patient could not be intubated even after 3 attempts and had to be intubated with McCoy laryngoscope and intubating bougie. Overall, the number of attempts required in the McCoy group was less than that in the TruView group, but again statistically this was not significant.

TruView laryngoscope needs to be inserted from the midline leaving very less space for inserting and guiding the tube from the angle of the mouth towards the midline. Although, the optical equipment in these newer laryngoscopes provide a better glottic view. It requires more skillful eye and hand coordination due to the indirect image obtained during the procedure. In addition, during intubation, tube can only be seen by the laryngoscopist at the vocal cord level and some problems may occur while guiding the tube up to that level.

While studying haemodynamic parameters, Timanaykar et al[9] in 2011, in their study to evaluate and compare TruView blade with the MacIntosh blade in 200 patients found significant increase in heart rate and systolic blood pressure in both the groups (p <0.05). They returned to near baseline values by 10 minutes in both the groups. The peak rise in heart rate and systolic blood pressure was comparable in both the groups with no statistical differences.

Kumar et al[7] compared MacIntosh, McCoy and TruView EVO2 laryngoscopes for tracheal intubation and found similar increase in the haemodynamic parameters post intubation in all the three groups without any significant differences between them.

Similar to these studies, in our study, we noted that compared to baseline, there was a significant increase in

heart rate after device insertion and intubation. When compared between the groups, the increase in HR over the baseline was more in the McCoy group than the TruView group. This trend was observed till 4 mins. after intubation ($p<0.019$) after which there was no significant difference upto 10^{th} minutes ($p>0.05$). Systolic blood pressure at preoperative period was 132.80 mmHg in McCoy group, which was comparable to 131.47 mmHg in TruView group and difference was statistically not significant. In both the groups, there was statistically significant change over the baseline up to 2 minutes post intubation. Though statistically significant, clinically there was not much difference between the groups. When compared between the groups, this was significant till after intubation period. After this, both the groups were comparable.

The mean diastolic blood pressure in the preoperative period was 81.37 mmHg in the McCoy group, which was comparable to 80.68 mmHg in the TruView group and difference was statistically not significant. Individual group showed statistically significant change in the diastolic blood pressure till after 2 minutes of intubation and more sporadically thereafter. When compared between the two groups, the change in the DBP was not statistically significant.

The two main causes of haemodynamic responses to tracheal intubation are the stimuli to the oropharyngeal structures produced by laryngoscopy and the stimuli to larynx and trachea caused by tracheal tube insertion. Exposure of the glottis during laryngoscopy requires the elevation of the epiglottis by a forward and upward lifting of the laryngoscope blade. This consistent noxious stimulus is associated with an increase in heart rate and blood pressure secondary to sympathetic discharge. There are studies showing lesser increase in heart rate and blood pressure following intubation with laryngoscopes. These suggest that any laryngoscopy technique requiring lesser lifting force would proportionally reduce the sympathetic discharge and hence changes in heart rate and blood pressure. TruView laryngoscope, designed to view 42 degrees anterior, offers an optical view of the glottis via the prismatic lens without having to align oral, pharyngeal and tracheal axes. Hence, the hypothesis that a potentially better view of the glottis is obtained without much haemodynamic disturbances. But, since it provides an indirect view of larynx and requires a hand-eye coordination, the time of laryngoscopy maybe more.

Khan et al[11] in their study of cardiovascular responses and POGO scoring between TruView and MacIntosh laryngoscopes have shown the requirement of a significantly reduced force and hence significantly lesser haemodynamic response ($p<0.05$) during TruView laryngoscopy as compared to the MacIntosh laryngoscope. One interesting finding by Khan et al[11] was that the laryngoscopy time was comparable in both the groups (19.6 vs. 22.2 seconds). This probably explains lesser haemodynamic response with the TruView laryngoscope.

Tong Shi-Yi, et al[12] observed the feasibility and safety of intubation with TruView laryngoscope in the infants. Sixty-two infants scheduled for selective plastic surgery under general anaesthesia were randomly divided into 2 groups of T (TruView laryngoscope) and M (MacIntosh laryngoscope) with 31 cases each. The view of glottic exposure were recorded. HR and SpO2 were recorded before, at intubation and 1, 2, 3, 4 and 5 mins. after intubation. The time for glottic exposure and intubation and complications during intubation were recorded as well. The view of glottic exposure of both groups was similar. The time required for glottic exposure and intubation were longer in group T than those in group M (P 0.05). There were no significant differences in HR and SpO2 between two groups. There were no significant complications related to intubation in two groups. They concluded that compared to MacIntosh laryngoscope, TruView is an effective intubation tool for infants with longer times for glottic exposure and intubation.

Regarding the laryngoscopy and intubation related complications, none of the cases showed desaturation in the McCoy group. Only one patient in the TruView group had desaturation. In the McCoy group, 2 patients showed hypertension and 2 patients had dysrhythmias. No such complication was observed in the TruView group. None of the patients had airway trauma in both the groups.

Thus, TruView laryngoscope provides better glottic view as compared to McCoy with less changes in haemodynamic parameters. However, longer time is needed to intubate and to achieve effective ventilation. Being a complex equipment, sometimes technical problems can arise, which may necessitate another attempt for intubation. The maintenance of oxygen saturation throughout the intubation process by the oxygen insufflation system is an added advantage in TruView. The incidence of intubation-related complications are relatively minor and can be avoided by exerting more care.

CONCLUSION

TruView laryngoscope provided excellent glottic view as compared to McCoy laryngoscope. More attempts at intubation were required in TruView group as compared to McCoy group, though this was not statistically significant. Intubation time required for McCoy laryngoscope was significantly less as compared to TruView. Both the groups were comparable with respect to the number of operators and use of the intubation assist devices. The haemodynamic changes when compared in both the groups were significant till 2-4 minutes after intubation. Overall, TruView group showed better haemodynamic stability. The number of complications in both the groups were comparable, not severe and could be easily managed.

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