Indian Journal of Clinical Anaesthesia 2024;11(4):551–556

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Indian Journal of Clinical Anaesthesia

Journal homepage: www.ijca.in

Original Research Article

A skill lab training experience with truview video laryngoscope in different airway scenarios using an adult manikin

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ARTICLE INFO

Article history:
Received 18-05-2024
Accepted 21-09-2024
Available online 07-11-2024

Keywords:
Airway management
Tracheal intubation
Video laryngoscope
Truview video laryngoscope
Skill lab
Learning curve

ABSTRACT

Background: Video laryngoscopes enhance laryngeal visibility and improve the chances of successful intubation, especially in difficult airway scenarios. Video laryngoscopes require development of a skill to perform a successful intubation. As with surgical endoscopes and laparoscopes, this device has a learning curve to achieve dexterity in hand-eye co-ordination necessary for intubation. In our study, we studied the learning curve of Truview video laryngoscope.

Aim and Objectives: To evaluate intubation time and study the learning curve of Truview video laryngoscope in easy and difficult airway scenario in adult manikin. Compare ease of intubation with Truview video laryngoscope in both airway scenarios.

Materials and Methods: After approval of the Institutional ethics Committee, the study was conducted at the skill lab and simulation centre in four sessions. Each session was conducted at a time interval one-week apart. Using Truview video laryngoscope, thirty postgraduate students, were asked to intubate a manikin in easy and difficult airway scenarios. At the end of every session, the parameters pertaining to intubation were recorded. Primary outcome was the time taken for successful intubation and the secondary outcome of ease of intubation was noted. All thirty participants completed the study.

Results: The time required for intubation decreased significantly for Session 1 from 46.77 ± 7.94 to 24.07 ± 5.85 ($p<0.001$*) in session 4 in the easy airway scenario. In the difficult airway scenario, time decreased from 36.07 ± 4.25 in session 1 to 19.77± 9.38($P<0.001$*) in Session 4. Participants also rated the device with respect to ease of intubation significantly better in Session 4 for both easy (IQR- 1-1, $p<0.001$*) and difficult (IQR- 1-1.25, $p<0.001$*) airway scenarios. We noted significantly improved learning curve of Truview video laryngoscope in both easy and difficult airway scenarios in the period of our study.

Conclusion: We concluded that the Truview video laryngoscope provides faster intubation time and better ease in handling the device in different airway scenarios in the study period. The device has a quick learning curve and users can become adept in handling intubations, in both easy and difficult airways with a little practice. In the difficult airway, the Truview video laryngoscope achieves faster intubation.

1. Introduction

In the training of anaesthesiologists and medicine post-graduate residents, airway management takes prime importance. Major morbidity and mortality in operating room, intensive care unit and emergency department is due to failure to handle anticipated and unanticipated difficult airway. The consequences of a difficult, failed or unrecognized oesophageal intubation are that it can lead to hypoxic brain damage, cardiac arrhythmias, cardiac arrest and death.[1] Tracheal intubation is usually done by direct laryngoscopy with the Macintosh laryngoscope, which is

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https://doi.org/10.18231/j.ijca.2024.099

considered the gold standard for intubation.[2] In contrast to the Macintosh laryngoscope, newer video laryngoscopes improve laryngeal view, shorten time to intubation, improve success rates and offer feedback to the residents during training, especially for challenging airways.[3]

Macintosh laryngoscope a line-of-sight laryngoscope which allows the operator to directly visualise the larynx and intubate the trachea. Amongst the recently available video laryngoscopes, is the Truview video laryngoscope which has a rigid hyperangulated blade design and a prism which transmits an image to the eye-piece.[4] So, they require the user to be familiar with the handling of instrument. Deliberate practice by trainees on manikins should be included in the training because video laryngoscopy involves acquiring a new set of skills such optimal indirect image acquisition of the glottis, hand -eye co-ordination as well as manoeuvring of the endotracheal tube into the larynx. We attempted to study the learning curve of the Truview video laryngoscope in novices.

2. Material and Methods

After Institutional Ethics Committee permission (DYPMCK/315/2020/IEC dated 25-09-2020) and written informed consent from thirty post- graduate students in anaesthesiology and medicine speciality, the study was conducted at the Skills and Simulation Centre of our institute. Participation in the study was voluntary. Participants with less than three years' experience in performing laryngoscopy and tracheal intubations with direct laryngoscopes were enrolled for the study. Participants who had used any video laryngoscope in the past were excluded from the study. The study was conducted in four sessions, marked as Session 1, 2, 3 and 4. Each session was conducted at a time interval of one week apart.

For session 1, all participants were given a trial with Macintosh laryngoscope for familiarisation with manikin anatomy on the Laerdal Airway Manikin® (Laerdal Medical, Stavanger, Norway). All the participants were shown a 5- minute video showing the use of Truview PCD video laryngoscope (Truphatek International Limited, Netanya, Israel). The participants were shown the procedure of intubation using the eyepiece of Truview video laryngoscope (TVL)to visualise the larynx, manoeuvre the endotracheal tube in the larynx and confirm successful intubation with an AMBU resuscitator bag (AMBU, Copenhagen, Denmark). The TVL used in the study is shown in (Figure 1). In every session, participants used the TVL for intubation along with a stylet in a 6.5 number cuffed Portex Endotracheal Tube. In each session, the participants intubated in two airway scenarios. The first airway scenario used for intubation with the manikin was the normal airway designated as easy scenario as shown in (Figure 2). The second scenario of the difficult airway was created by adding a rigid cervical collar in the same manikin, restricting neck extension, making it difficult to access the larynx as shown in (Figure 3). All participants intubated the easy airway scenario first followed by difficult airway scenario in the same sequence. The duration taken from picking up the laryngoscope to the successful confirmation of ventilation using the AMBU Bag was recorded as the time for intubation. The Ease of intubation scale from a previous study[5] was explained to the participants, where participants graded the intubation, Grade 1 is very easy intubation, Grade 2 is easy intubation, Grade 3 is moderate, Grade 4 intubation is difficult and in Grade 5- intubation is impossible. The primary outcome of the study was time for successful intubation. The secondary outcome was ease of intubation as rated by the participants.

Figure 1: Truview video laryngoscope

2.1. Sample size

The sample size was determined using an a priori power analysis, aiming to detect a power difference of 0.8 at a set α-level of 0.05. Based on a pilot study that observed a mean intubation time difference of 10 seconds between the two scenarios, with a standard deviation of 12 seconds, the calculated group size was 24. To account for potential dropouts, 30 participants were enrolled.

2.2. Statistical analysis

Data was analysed using Software SPSS v.28, MS EXCEL 2016.

Comparison of time to intubation was done using Unpaired- T test. Ease of intubation was compared using Kruskal Wallis test. A comparison between first and last

Figure 2: Easy airway scenario

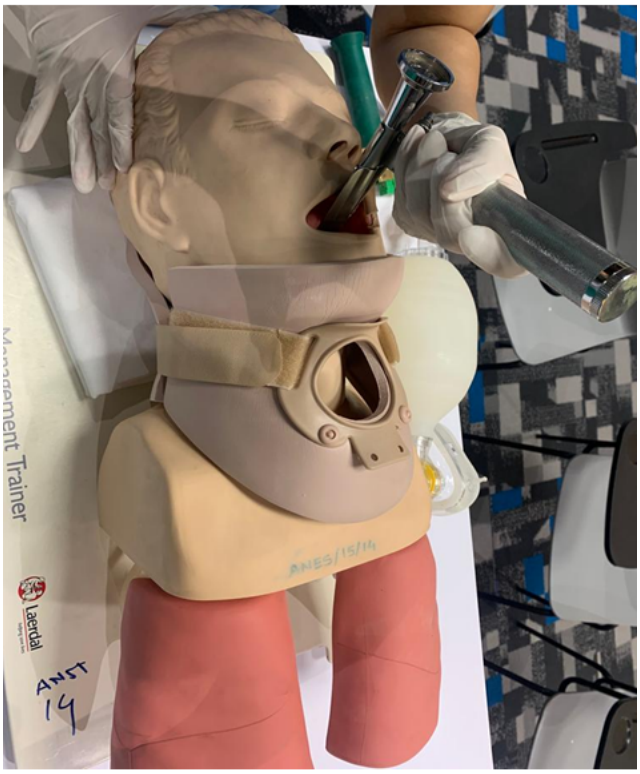

Figure 3: Difficult airway scenario

session on ease of intubation was done using Mann Whitney U test. The learning curve was analysed for intubation time using ANOVA. P value (<0.001) * indicated significant results.

3. Results

The demographic data of age and gender of the participants was noted. Participants had a mean age (years) of 27.25 ± 0.698. Eighteen participants were females and twelve were males.

Table 1: Demographic data distribution

Gender	**Male**	**Female**
	12	18
Age (years) (mean± SD)	27.25 ± 0.698	

Table 2: Intubation time in both scenarios in all sessions

Scenario	**Intubation Time (seconds)**	**Session 1**	**Session 2**	**Session 3**	**Session 4**
Easy	Mean	46.77	43.87	30.80	24.07
	SD	7.94	18.19	11.30	5.85
Difficult	Mean	36.07	51.83	31.17	19.77
	SD	4.25	23.39	5.48	9.38

Table 3: Comparison of intubation time between the first session and fourth session in both airway scenarios

Variable	**Scenario**		**Session 1**	**Session 4**	**P Value**
Intubation Time (in Seconds)	Easy	Mean	46.77	24.07	<0.001*
		SD	7.94	5.85	
	Difficult	Mean	36.07	19.77	<0.001*
		SD	4.25	9.38	

Value (<0 001 * indicates significant results

Table 4: Comparison of intubation time in both easy and difficult airway scenarios of session 4

Session 4 Intubation time (seconds)	**Easy scenario**	**Difficult scenario**	**p- value**
Mean	24.07	19.77	0.00* (p <0.05* significant)
SD	5.85	9.38	

There was a reduction in time taken for intubation in every successive session in the easy airway scenario. There is a statistically significant difference between time for intubation in Session 1 and Session 4 with faster intubation being done in Session 4. There is increase in intubation time in Session 2 of the difficult airway scenario, which is seen to reduce in subsequent sessions. Similar findings of faster intubation time in Session 4 were seen which was significantly shorter as compared to the time taken in

Session 1. At the end of the study, intubation was faster in difficult airway than in easy airway scenario.

Participants rated ease of use of the instrument to be very easy for both airway scenarios in Session 4 of the study with a statistically significant difference from the ease rated in Session 1.

Considering the primary outcome of time for intubation, there is a decline in time to intubation resulting in faster intubation time with TVL. Faster intubation times were achieved in a four-week period of the study showing that the learning curve is short for TVL in both the airway scenarios.

4. Discussion

Video laryngoscopes achieve an indirect wide view of the glottis without aligning oral, pharyngeal, and laryngeal axes or without fully flattening the primary and secondary curves. Using a video laryngoscope requires acquisition of new skills such as eye- hand-brain coordination necessary for any user- screen interface interaction as in laparoscopic surgery. Rosser et al. presented evidence indicating that surgeons who engaged in video gaming demonstrated superior performance in laparoscopic surgery.[6]

In our study as shown in (Table 1) there is no significant difference in demographic data distribution. Time to Intubation is a parameter which gains importance in critical situations where delay in intubation can result in hypoxia and cardiac arrest. Time taken for intubation in seconds in all sessions of both easy and difficult airway scenario is shown in (Table 2), the time taken for intubation in easy airway scenario in session 1 is 46.77±7.94 and difficult airway scenario is 36.07±4.25. On comparing the time taken for intubation between first and forth session of both easy and difficult airway scenarios as seen in (Table 3) there is significance in both scenarios with p value of < 0.05. Kurt Ruetzler et al. observed intubation time with Truview was 27 s (IQR: 23–34) in their manikin study.[7] which was similar to that noted in our study for the easy scenario 24.07 ± 5.85 in Session 4 as depicted in (Table 4). In the difficult airway scenario, time taken for intubation was lesser than in the easy airway scenario (19.77±9.38 v/s 24.07 ±5.85, p= 0.00*) this difference is made out on shown in (Table 2). Aleksandrowicz D applied cervical collar for immobilisation to create a difficult airway as was done in our study (Figure 3) and noted shortest ventilation time with Truview Evo2 (35.7 s ±9.27) during intubation by novices.[8]

Clinical studies show that Intubation Difficulty Scale score was significantly less in the Truview EVO2 group compared with the Macintosh group (0.30 ± 0.7 vs 1.70 ± 1.8; P = .002).[9] Indirect laryngoscopes facilitated the ease of intubation and obtained more favourable subjective scores from the participants was noted by Lye et al.[5] However, a clinical study by Bakshi showed that participants novice to video laryngoscopes rated use of video laryngoscopes more difficult compared to Macintosh,[10] whereas another study[11] which compared the ease of intubation between McGrath MAC, Truview and Macintosh groups showed that the McGrath MAC and Truview groups had better ease of intubation (p value < 0.05) similar results seen in our study as shown in (Table 5) the ease of intubation in all sessions of both airway scenarios with significant p value as seen in (Table 5). On comparing ease of intubation between first and last session of easy and difficult airway scenarios as seen in (Table 6) in both scenarios shows significant p value of < 0.05.

We analysed the learning curve for Truview based on intubation time depicted in (Table 7) and our results showed faster intubation times at the end of the study even in novice trainees. Bradbury CL, Hillermann C, and Mendonca C demonstrated that an experienced anaesthesiologist could quickly familiarize themselves with video laryngoscope and master its use within the first few intubations.[12] An advantage of using this device is that it employs a technique familiar to that of direct laryngoscopy using Macintosh laryngoscope. It is user-friendly and when familiarity is achieved, there is minimal additional learning required with the laryngoscope. Novice users could also master the technique rapidly.[13]

The study conducted by Eismann demonstrated better visualisation of laryngeal views (Cormack- Lehane and POGO score) with use of hyperangulated video laryngoscope blades than the standard Macintosh blade. Participant reviews of the video laryngoscopy devices showed better ratings in difficult airways[14] which is reflected in our findings. Intubation using video-laryngoscopy allowed better vocal cord exposure (Cormack and Lehane classification) for novice learners in airway manikin.[15] In the study by Declercq, time taken for endotracheal intubation was significantly reduced with VL airway scope compared to direct laryngoscope for experts and novices (13 vs. 20 s; p < 0.0001) with higher intubation success probability (98 vs. 81%; p < 0.0001).[16] With video laryngoscopes, real time feedback can be provided to the user by staff and experts during the procedure for intubation which is visualised on the screen of the device.

5. Limitations

The primary limitation of our study is that it was conducted on manikins. Patients exhibit inter-individual variability, which cannot be replicated in a manikin-based study. Skill retention was not investigated in this study. Follow up studies translating to clinical skill transfer are required.

6. Conclusion

We found favourable learning outcomes and ease in intubation scores in a short period of training with Truview video laryngoscope in novices with video laryngoscopes. Inclusion of training with video laryngoscopes on manikins

Table 5: Ease of intubation in all sessions of easy and difficult airway scenarios

Scenario		Session 1	Session 2	Session 3	Session 4	P value
Easy	Median	2.00	2.00	2.00	1.00	<0.001*
	IQR	(2 -3)	(1 -3)	(1 -2)	(1 -1)	
Difficult	Median	2.00	2.00	2.00	1.00	0.001
	IQR	(2 -2)	(1 -3)	(1 -2)	(1 - 1.25)	

Table 6: Comparison of ease of intubation between the first session and fourth session of easy and difficult airway scenarios

Scenario		Session 1	Session 4	P Value
Easy scenario	Median	2.00	1.00	<0.001*
	IQR	(2-3)	(1-1)	
Difficult scenario	Median	2.00	1.33	<0.001*
	IQR	(2 - 2)	(1 - 1.25)	

P value (<0.001) *indicates significant results

Table 7: Comparison of intubation time of all sessions of both airway scenarios

Scenario		Session 1	Session 2	Session 3	Session 4	P value
Easy	Mean	46.77	43.87	30.80	24.07	< 0.0018*
	SD	7.94	18.19	11.30	5.85	
Difficult	Mean	36.07	51.83	31.17	19.77	< 0.001*
	SD	4.25	23.39	5.48	9.38	

P value (<0.001*) indicates significant results

in residency program can inculcate skills of airway management.

7. Source of Funding

None.

8. Conflict of Interest

None.

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Cite this article: Patil A, Jadhav A, Kumar YA, Golconda SK. A skill lab training experience with truview video laryngoscope in different airway scenarios using an adult manikin. *Indian J Clin Anaesth* 2024;11(4):551-556.