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Research Article

Comparison of Time Taken for Intubation (TTI) in Conventional Laryngoscope with Video Laryngoscope for Endotracheal Intubation In Laproscopic Surgeries

Lakshmi S Pillai[1*], Sridevi Mulimani[2], Anusha Suntan[2], Deepa S Dandoti[2]

[1]*Department of Anaesthesiology, Sree Narayana Institute of Medical Science, Kerala, India.*

[2]*Department of Anaesthesiology, Shri B. M. Patil Medical College, BLDE, Vijayapura, Karnataka, India.*

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ABSTRACT

Background: Direct laryngoscopy necessitates the alignment of the oropharyngeal-laryngeal axis whereas video laryngoscope is an optical vision which doesn't require alignment. This study aimed to compare direct laryngoscopy with a Macintosh blade to King-Vision Video laryngoscope for endotracheal intubation in patients who were scheduled for elective laproscopic surgeries under general anaesthesia.

Methods: In this prospective randomised clinical study,118 adults with ASA I and II requiring endotracheal intubation for laproscopic surgeries under general anaesthesia were enrolled and randomised into either of the two groups by envelope method, Group DL-direct laryngoscope and Group VL-video laryngoscope where they were intubated using direct laryngoscope with Macintosh blade or King Vision videolaryngoscope. The Primary objective was to compare Time to intubate(TTI), Visualization of the laryngeal view by Cormack-Lehane grade and Successful first attempt. Secondary objective was to record the Number of intubation failure, Number of attempts, Change of anaesthesiologist and use of adjunct equipment and the complications such as oropharyngeal trauma, neck pain, dysphagia and hoarseness.

Results: In comparison to group DL (21.67±4.318s), group VL took longer time to intubate (26.21± 4.150s) but had superior glottic vision than DL group(p=0.0177). Compared to DL group (72.4%), the VL (84.5%) patients had their first successful attempt, inspite of 2 failures. Complications such as pharyngeal pain (8.6%vs29.3%), hoarseness (5.2%vs29.3%), Use of adjunct equipment like bougie (19%vs 3.4%) were significantly higher in DL compared to VL group, while oropharyngeal injury, dysphagia, number of attempts and change of anaesthetists were similar in both groups.

Conclusion: In comparison to the Macintosh laryngoscope, the King-vision VideoLaryngoscope took longer to intubate but had clearer glottis visualisation and a higher first-time success rate and can be used as a good teaching tool. In King-vision video laryngoscope, there was less use of auxiliary equipment and fewer complications.

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*Corresponding author.
E-mail address: lakshmisp13@gmail.com

Introduction

Securing the airway is the main step in anaesthesiology, which directly regulates the safety and outcome of patients [1-2]. Direct laryngoscopy by using the conventional Macintosh laryngoscope is the standard technique usually performed in securing the airway [3-4]. Macintosh laryngoscopy is one of the most popular used blade for direct laryngoscopy. The tongue of this blade has a slight curve that reaches to the tip of the vallecula of pharynx and cervical spine movement is greater with this blade [5]. Difficulties in carrying out a direct laryngoscopy by macintosh blade commonly emerges due to limited view angle of the glottic visualisation and it is poor illumination [3-4,6]. Insufficient visualization of the glottis leads to inadequate alignment of the oropharyngeal-laryngeal axis [6-7] and is associated with increased risk for trauma [3,6].

Video laryngoscope is the most innovative advancement in the management of difficult airways [4,6]. Various modifications of videolaryngoscopes have been developed. King vision videolaryngoscopes(KVVL)depends on digital technology where the image is projected from the tip to an eyepiece or monitor [4]. It is a portable, rigid, battery - operated video laryngoscope that has an integrated reusable display, two reusable video adapters and a choice of channelled and non-channelled blades [8].

The video laryngoscopy was developed to improve glottic visibility without requiring the oropharyngeal laryngeal axis to be oriented and includes less upward lifting force exerted with less neck movements [6,9]. Thus video laryngoscopes may therefore provide the possibility of more successful intubation and reduced complications. In pursuit of this, it becomes necessary to completely replace videolaryngoscope over conventional laryngoscope for tracheal intubation [10].

The goal of this study was to see direct laryngoscopy with a traditional Macintosh blade compared to indirect laryngoscopy with a King Vision Video laryngoscope for tracheal intubation in individuals requiring laproscopic surgeries under general anesthesia.

Methods

After approval by the Ethical Committee of B.L.D.E.(DEEMED TO BE UNIVERSITY) and written informed consent from 118 adults with ASA I and II, between age group of 18-60 years, requiring endotracheal intubation for laproscopic surgeries under general anaesthesia, were screened and randomised based on computerized random number table into two groups: Group DL where intubation was performed using conventional Macintosh laryngoscope and Group VL where subjects were intubated using King vision videolaryngoscope. Patients undergoing rapid sequence intubation, restricted cervical extension and movements, tumours of oropharyngeal region, trauma to airway, local infection of neck, burns and swellings in neck region, previous difficult intubation, pregnant patients, obese patients BMI >30kg/m2were excluded from the study.

The primary investigator who performed the laryngoscopy was a trainee with experience of more than 25 successful intubations with each study devices. Attending anesthesiologist chose the endotracheal tube size and prepared for the intubation. The study device along with alternate rescue devices (bougie, intubating LMA, fiberoptic scopes) were also kept ready. Patients were taken to the operation theatre, standard monitoring devices including pulse oximeter, sphygmomanometer cuff, endtidalcapnogram, electrocardiogram leads were connected and baseline values were recorded.

Intravenous line was secured and patients were optimally preoxygenated with 100% oxygen by facemask for 3 min and premedicated with intravenous 0.01 mg/kg glycopyrollate,0.15 mg/kg ondansetron,0.02 mg/kg midazolam. Injection Fentanyl 2mcg/kg and Propofol 2mg/kg intravenous were used to induce anaesthesia and Succinylcholine 2mg/kg was administered to aid tracheal intubation after ensuring sufficient mask breathing. Patients of Group DL had their head positioned in sniffing position and in Group VL had their head in neutral position (Figure 1) to attain the laryngoscopic view. During laryngoscopy primary investigator/operator was permitted to use external laryngeal manipulation or change position of head to improve glottis view to facilitate intubation.

If the laryngeal view was not proper, operator had to remove laryngoscope, then the next attempt would be counted as an additional attempt. Each intubation attempt was terminated if there was a fall in saturation to less than 95% in pulse oximeter. Bag mask ventilation was done with 100% oxygen between attempts if necessary, till saturation returned to 100%. The total time for intubation that is TTI was noted, which was defined as time between insertion of blade to first upstroke of capnography. The operator would also record the ease of visualization of the glottis structures based on the classification described by Cormack and Lehane and the successful first attempt. Number of attempts and use of adjunct equipment was recorded. After 2 unsuccessful attempts, a senior practitioner would attempt for the intubation. After the third failed intubation attempt, patient was called off from the study protocol and excluded from the study. Patients after getting successfully intubated, were maintained under anaesthesia using oxygen, nitrous oxide, isoflurane and Injection atracurium. Patients were reversed with intravenous 0.05mg/kg neostigmine and 0.01mg/kg glycopyrollate when the first attempts of breathing noticed. They were extubated when fully awake and adequately reversed. Patients were further assessed regarding the complications related to the

laryngoscopy and intubation, in the recovery room and further within 24 hours, as per the proforma.

On the basis of the previuos study done by Keerthi et al [11] the minimum sample size required was 110 group with 95% level of significance and 90% power.118 patients were screened (Figure 2) and Data was represented using Mean ±SD, percentages and diagrams. Basic variables such as age, BMI, ASA Grade and the primary objective in this study that is Time to intubate (TTI) were compared using Mann Whitney U test. Significant difference between other objectives such as glottis visualisation, number of attempts, number of failures, change of equipment, anaesthesiologist and complications were found using Chi square test.

Figure 1- Showing insertion of kvvl in to the oropharynx.

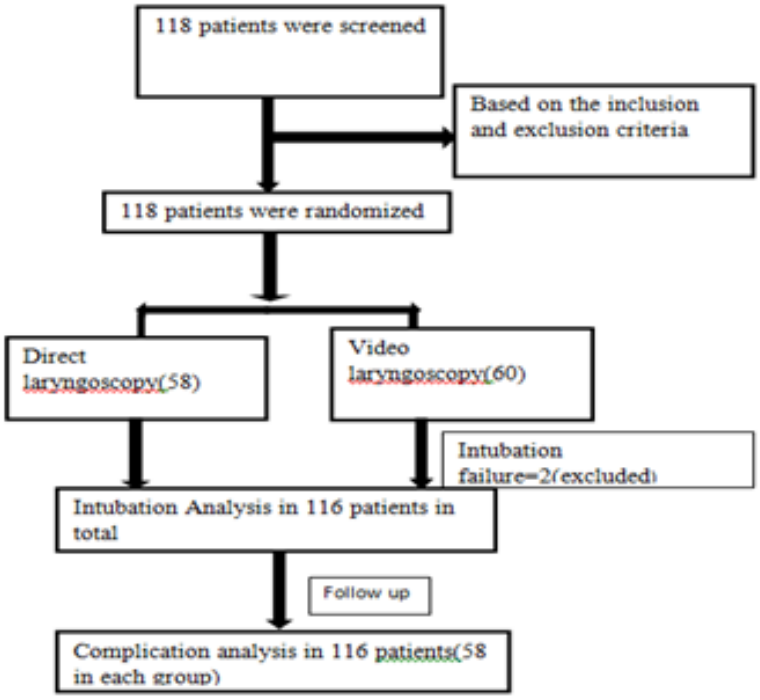

Figure 2- Flow chart illustrating patient inclusion

Results

Demographic data and ASA physical status in both the groups were comparable (Table 1).

There was no difference in age, BMI and ASA class between two groups. It was seen that Time to intubate in Video laryngoscope group took longer time compared to Macintosh group.

Time to intubate in Videolaryngoscope (VL) group took longer time compared to directlaryngoscope (DL) group (p value=0.001) but 72.4% of VL group had better glottis visualization that is Cormack lehane (CL)grade 1 compared to 48% in DL group (Table 2) (p value=0.017).

The first successful attempt in VL was 84.5% compared to 72.4% in DL, but the overall total number of attempts were comparable between both the groups (Table 3). Change of anaesthesiologist were comparable between VL group (96.6 %) and DL (94.8%) group.

Out of total 58 subjects 19% practitioners in DL group used adjunct equipment compared to 3.4% in VL group (P value=0.0081) (Table 4). Two tracheal intubation failures were noted in VL group and were excluded from the study.

In complications, subjects in DL group suffering from pharyngeal pain and hoarseness (Figure 3) were increased compared to VL group (p value is 0.0006) whereas other complications such as oropharyngeal injury (5.2% in VLgroup vs 15.5% in DLgroup) and dysphagia (1.7% in VL group vs 3.4% in DL group) were statistically comparable (Table 5).

Table 1- Comparison of basic variables like Age, BMI, ASA grades and Time to Intubate between two groups.

Variables	Video Laryngoscopy		Macintosh Laryngoscopy		Mann whitney U test	P value
	Mean	±SD	Mean	±SD		
Age	34.38	12.732	37.78	14.391	U=1456	P=0.212*
BMI	23.47	3.004	24.05	3.400	U=1498	P=0.309*
ASA Grades	1.50	0.504	1.59	0.497	U=1537.00	P=0.353*
Time to intubate(s)	26.21	4.150	21.67	4.318	858.000	P=0.001**

*: Insignificant (p value is more than 0.05) **: Highly Significant (p value is less than 0.05)

Table 2- Distribution of patients according to Visualisation of the laryngeal view by Cormack-Lehane grade

Cormack Lehane grade	Video Laryngoscopy(VL) No. of Patents	Percentage(%)	MacintoshLaryngoscopy(DL) No. of patients	Percentage(%)	Chi square test	P value
1	42	72.4	28	48.3	X2=10.103	P=0.0177*
2	13	22.4	17	29.3		
3	3	5.2	10	17.2		
4	0	0	3	5.2		
Total	58	100.0	58	100.0		

*: Highly Significant-P value for this particular data is more than 0.05.

Table 3- Distribution of patients according to Number of intubations and Number of first successful attempt

No of intubations	Video Laryngoscopy(VL) No. of Patents	Percentage(%)	MacintoshLaryngoscopy(DL) No. of patients	Percentage(%)	Chi square test	P value
1	49	84.5	42	72.4	X2=2.538	P=0.2810
2	7	12.1	13	22.4		
3	2	3.4	3	5.2		
Total	58	100.0	58	100.0		

Insignificant-P value is more than 0.05, but percentage wise number of first attempt in VL (84.5%) is higher than DL (72.4%).

Table 4- Distribution of patients according to adjunct equipment

Adjunct equipment	Video Laryngoscopy(VL) No. of Patients	Percentage	Macintosh Laryngoscopy(DL) No. of patients	Percentage	Chi square test	P value
No	56	96.6	47	81.0	X2=7.017	P=0.0081*
Yes (Bougie)	2	3.4	11	19.0		
Total	58	100.0	58	100.0		

*: Highly Significant- p value is less than 0.05.

Table 5- Distribution of patients according to Pharyngeal Pain

Pharyng Pain	Video Laryngoscopy(VL) No. of Patents	percentage	Macintosh Laryngoscopy(DL) No. of patients	Percentage	Chi square test	P value
No	53	91.4	41	70.7	X2=8.0777	P=0.0045*
Yes	5	8.6	17	29.3		
Total	58	100.0	58	100.0		

*: Highly Significant-p value is less than 0.05.

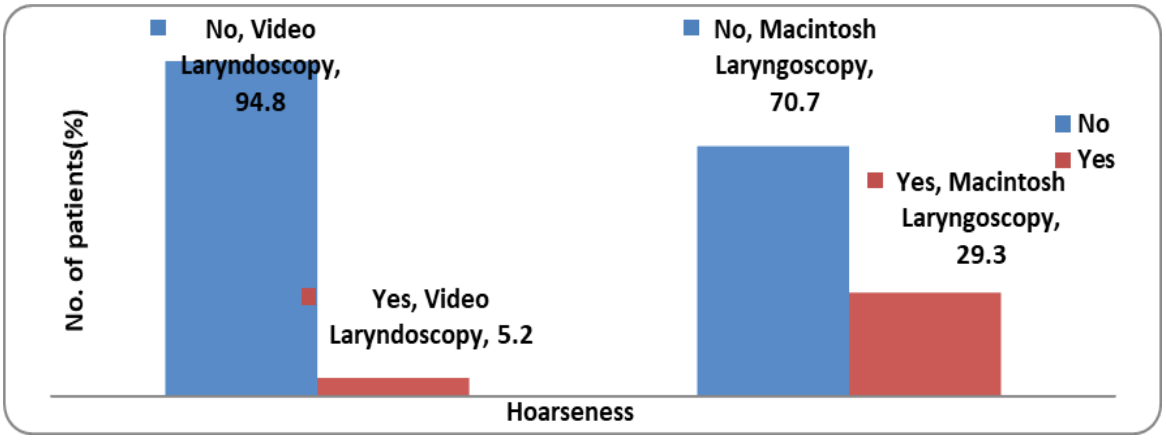

Figure 3- Distribution of patients having hoarseness in both groups

Discussion

This prospective randomised study aimed to compare the Time taken for Intubation using a KVVL versus the use of a Macintosh laryngoscope, on total 118 adult patients for routine airway management. Our first objective was to evaluate the time to intubate and it was found in video laryngoscopy group time to intubate was prolonged compared to Macintosh group. These findings were similar to other studies conducted by Basar erdivanli et al [13] and Keerthi et al [11]. In contrast to our findings in another study conducted by De-Xing Liu et al [12] time for intubation in video Laryngoscopy group took less time compare to Macintosh group.

Intubating with a video laryngoscope (KVVL) took longer time than intubating with a Macintosh laryngoscope. This could be because the King Vision blade is longer and more acutely angled, it may be necessary to enter the King Vision 'L' shaped blade at a certain angle to the patient's chest. Other video laryngoscopes, such as the McGrath VL, have blade designs that are comparable to the traditional Macintosh DL which simulates a laryngoscopy procedure for the operator. The King Vision blade may narrow the mouth canal making tube passage and adjustment more challenging during oral intubation.

The other objectives in our study were the visualisation of the laryngeal view by Cormack –lehane grade and first successful attempt which was better with video laryngoscope than Macintosh. In video laryngoscopy group 72.4% had better glottis visualization that is Cormack lehane grade 1 compared to 48% DL group. This was similar to study conducted by De-Xing Liu et al [12] and Sherif M Elhadi et al [4].

In a study by Ibinson et al [14], the success rate for one-time intubation with video laryngoscope was reported to be 93.6 percent. Our findings showed that the intubation success rate for first-time intubation in the video laryngoscope group (84.5 percent) was higher than that in the direct laryngoscope group (72.4 percent). This difference percentage wise was significant. But these findings where opposite to the findings obtained in Keerthi et al [11].

In a study by Tanvi et al [19] showed that mean time to intubate patients using the DL was 15.85 s while the meantime with KVVL was 13.75 s (P = 0.084, overall first-pass success rates with DL and KVVL were 89.94% and 85.16%, respectively (P = 0.076)

Regarding the total number of trials, it was found to be statistically insignificant. This was in agreement with the study conducted by Sherif M hanif et al [4]. However, there were two intubation failures in VL group out of 60 patients taken and they were excluded which was similar to the study conducted by De Xing Liu et al [12].

In our study out of total 58 subjects, there was no change of anaesthesiologist in 96.6 % in VL group and 94.8% in Macintosh group. This difference between both groups with regards to change of anaesthesiologis was not significant which was similar to the study conducted by Du Xing et al [12].

Out of total 58 subjects Macintosh (DL) group (19%) had more usage of adjunct equipment compared to video (VL) group (3.4%). Above findings were contrary to the study conducted by M.A Pieters et al [15] in which on manikins, expert and rookie staff compared seven videolaryngoscopes to the Macintosh where macintosh group had scored highest in user satisfaction.

In our study the comparison between patients suffering from oropharyngeal injury and dysphagia were found to be statistically insignificant. Out of 58 subjects in each group, 8.6 % of video laryngoscopy group had pharyngeal pain and 29.3% of Macintosh group had pharyngeal pain. Subjects in Macintosh group suffering from pharyngeal pain were higher compared to video laryngoscopy group, even there was significant difference between both groups in complication such as hoarseness, 29.3% of patients in Macintosh had hoarseness compared to 5.2% in video laryngoscope.

De Xing Liu et al [12] found 6 occurrences of oropharyngeal bleeding, 2 cases of lip injury, and 1 case

of incisor injury following intubation in the direct laryngoscope group, which was almost identical to the findings in this investigation. In the video laryngoscope group, however, there were only two incidences of lip damage and less subjects had obvious sound changes. The intubation device and catheter harm the throat due to increased tissue tension induced by raising the jaw with the direct laryngoscope to align the oro-pharyngeal laryngeal axis anatomically. Several studies have shown that the video laryngoscope lifts the mandible with even less force than a direct laryngoscope in both normal and troublesome airways. As a result, when the endotracheal tube is properly inserted, it lessens the stress in the throat tissue and the harm produced by tracheal intubation [16-18].

Limitations

First, haemodynamic responses following laryngoscopy were not included in this study. Hemodynamics during laryngoscopy and intubation is important, especially in ASA grade III and IV patients, cardiac disease and hypertensive patients in whom exaggerated hemodynamic response can worsen their clinical condition. Second, the sample involved in this study was regional cases, so the anatomical data may vary due to differences in ethnicity. As a result, many more research may be required to complete the validation analysis based on the findings of this investigation. Third, the training and experience of the operator could have affected the time taken to intubate and first-pass success.

Conclusion

In our study, the King-vision Video Laryngoscope took longer to intubate than the Macintosh laryngoscope, but it had better glottis visualisation and a greater first-time success rate with less auxiliary equipment and fewer difficulties. Therefore, video laryngoscopes are worth considering over Macintosh laryngoscope in airway management because of their ease of use and acceptable safety profile.

References

[1] Hinkelbein J, Iovino I, De Robertis E, Kranke P. Outcomes in video laryngoscopy studies from 2007 to 2017: systematic review and analysis of primary and secondary endpoints for a core set of outcomes in video laryngoscopy research. BMC anesthesiology. 2019; 19(1):1-9.

[2] Lewis SR, Butler AR, Parker J Cook TM, Schofield-Robinson OJ, Smith AF. Videolaryngoscopy versus direct laryngoscopy for adult patients requiring tracheal intubation: a Cochrane Systematic Review. Br J Anaesth. 2017; 119(3):369-383.

[3] Serocki G, Bein B, Scholz J, Dörges V. Management of the predicted difficult airway: a comparison of conventional blade laryngoscopy with video-assisted blade laryngoscopy and the GlideScope. Eur J Anaesthesiol. 2010; 27(1):24-30.

[4] Elhadi SM, Rady WK, Elfadly AM. A comparative study between the macintosh laryngoscope and the king vision video laryngoscope in endotracheal intubation. Anaesth. Intensive Care Med. 2016; 3(4):168-172

[5] Dalvi NP, Sayed NI. Laryngoscopes. In: Baheti DK, Laheri VV(Eds). Understanding Anesthetic Equipment & Procedures. 2nd ed. New Delhi: Jaypee Brothers Medical Publishers; 2018. 145-60.

[6] Amir B. Channa.Video laryngoscopes. Saudi J Anaesthesia. 2011; 5(4): 357–359.

[7] Kriege M, Pirlich N, Ott T, Wittenmeier E, Dette F. A comparison of two hyperangulated video laryngoscope blades to direct laryngoscopy in a simulated infant airway: a bicentric, comparative, randomized manikin study. BMC Anesthesiol. 2018; 18(1):1-9.

[8] Shimada N, Hayashi K, Sugimoto K, Takahashi M, Niwa Y, Takeuchi M. [The KINGVISION: clinical assessment of performance in 50 patients]. Masui. 2013; 62(6):757-60.

[9] Piepho T, Fortmueller K, Heid FM, Schmidtmann I, Werner C, Noppens R. Performance of the C-MAC video laryngoscope in patients after a limited glottic view using Macintosh laryngoscopy. Anaesthesia. 2011; 66(12):1101-5.

[10] Patel B, Surti J, Jani P, Vachharajani P. A Comparison of Kings Vision Video Laryngoscope with Macintosh Laryngoscope in Adult Patients Undergoing Elective Surgical Procedure. International Journal of Science and Research (IJSR). 2018; 7(2):218-222.

[11] Nandakumar KP, Bhalla AP, Pandey RK, Baidya DK, Subramaniam R, Kashyap L. Comparison of Macintosh, McCoy, and Glidescope video laryngoscope for intubation in morbidly obese patients: Randomized controlled trial. Saudi J Anaesth. 2018; 12(3):433-439.

[12] Liu DX, Ye Y, Zhu YH, Li J, He HY, Dong L, et al. Intubation of non-difficult airways using video laryngoscope versus direct laryngoscope: a randomized, parallel-group study. BMC Anesthesiol. 2019; 19(1):75.

[13] Erdivanli B, Sen A, Batcik S, Koyuncu T, Kazdal H. Comparison of King Vision video laryngoscope and Macintosh laryngoscope: a prospective randomized controlled clinical trial Bras. Anestesiol. 2018; 68(5):499-506.

[14] Ibinson JW, Ezaru CS, Cormican DS, Mangione MP. GlideScope Use improves intubation success rates: an observational study using propensity score matching. BMC Anesthesiol. 2014; 14:101.

[15] Pieters BM, Wilbers NE, Huijzer M, Winkens B, van Zundert AA. Comparison of seven videolaryngoscopes with the Macintosh laryngoscope in manikins by experienced and novice

personnel. Anaesthesia. 2016; 71(5):556-64.
[16] Kaki AM, AlMarkabi WA, Fawzi HM, Boker AM. Use of Airtraq, C-Mac, and Glidescope laryngoscope is better than Macintosh in novice medical students' hands: A manikin study. Saudi J Anaesthesia. 2011; 5:576–381.
[17] Carassiti M, Zanzonico R, Cecchini S, Silvestri S, Cataldo R, Agrò FE. Force and pressure distribution using Macintosh and GlideScope laryngoscopes in normal and difficult airways: a manikin study. Br J Anaesth. 2012; 108(1):146–151.
[18] Fiadjoe JE, Gurnaney H, Dalesio N, Sussman E, Zhao H, Zhang X, et al. Stricker; A Prospective Randomized Equivalence Trial of the GlideScope Cobalt® Video Laryngoscope to Traditional Direct Laryngoscopy in Neonates and Infants. Anesthesiology. 2012; 116(3):622–628.
[19] Mallick T, Verma A, Jaiswal S, Haldar M, Sheikh WR, Vishen A, et al. Comparison of the time to successful endotracheal intubation using the Macintosh laryngoscope or KingVision video laryngoscope in the emergency department: A prospective observational study. Turk J Emerg Med. 2020; 20(1): 22–27.