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Correlation Analysis of Lemon, IDS, and Wilson Scores in Assessing Intubation Difficulty in Patients Undergoing General Anesthesia

Ade Putra Fratama Sinaga[1*], Tasrif Hamdi[2], Qadri Fauzi Tanjung[2]

[1] *Master of Clinical Medicine/Anesthesiology and Intensive Therapy Study Program Faculty of Medicine, Universitas Sumatera Utara, H. Adam Malik Hospital, Medan, Indonesia*
[2]*Anesthesiology and Intensive Therapy Study Program/Department, Faculty of Medicine, Universitas Sumatera Utara, H.Adam Malik Hospital Medan,*

***Corresponding Author**: Ade Putra Fratama Sinaga, E-mail: adeputra535@ymail.com

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ABSTRACT

Introduction: The act of intubating with an endotracheal tube is a definitive airway management technique that provides maximal protection against the occurrence of aspiration of stomach contents or fluids. Some studies recommend the use of a head pillow to improve the laryngoscopic view by enhancing the occipito-atlanto-axial angle and enlarging the submandibular space. The aim of this study was to find out comparison of the level of difficulty of intubation in intubation techniques with and without the use of pillows.

Methods: The design of this study was a randomized cross-sectional study with two research groups conducted to compare the difficulty levels of intubation using the technique with and without a pillow.

Results: Patients without a pillow often required a little assistance during intubation, while the majority of patients using a pillow were easily intubated. However, no significant difference was found between the two groups ($p>0.05$). Patients intubated without a pillow had an average score of 15.9±1.6, while those intubated with a pillow had an average score of 10.8±1.8, showing a significant difference between the two groups ($p<0.05$). Using the Cormack-Lehane score, most patients without a pillow were at grade 2, while the majority of patients with a pillow were at grade 1. A significant difference was found between the two groups ($p<0.05$).

Conclusion: Patients intubated without a pillow often required a little assistance, while the majority of patients intubated with a pillow were easily intubated; however, no significant difference was found between the two groups ($p>0.05$).

Keywords

Intubation, Pillow Intubation, Easily intubated

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INTRODUCTION

The act of anesthesia greatly affects perioperative morbidity and mortality.[1] Airway management to remain open is a major problem in cases with general anesthesia because it is an important maneuver in saving a person's life.[2] Airway management can be done in various ways such as face mask, Laryngeal Mask Airway (LMA) and Endotracheal Tube Intubation (ETT).[3]

Intubation is a very important maneuver in anesthesia. Endotracheal intubation is a quick, simple and safe non-operative technique to facilitate all airway management goals.[4] The American Society of Anesthesiologists (ASA) defines intubation difficulty as a situation where an anesthesiologist is unable to insert an endotracheal tube (ETT) into the patient's trachea.[5] The ASA reports that 17% of adverse events in the respiratory system are caused by intubation difficulties, of which 85% result in death or brain damage.[6]

The rate of intubation difficulties varies from 1 in 1000 to 2000 in elective cases, 1 in 250 in obstetric cases and 1 in 100 in emergency cases.[7]

Anticipating airway difficulties in the preoperative period and being prepared to manage them is an important task for anesthesiologists. Among the most widely used and applicable clinical tests is the modified Mallampati test. Intubation difficulties are associated with serious complications if the anesthesia team fails to do so as they can lead to death or permanent brain damage. Other risks include respiratory tract injury, such as bleeding, aspiration, secretion build-up leading to respiratory failure or hypoxia.[8] Failure to manage patients with difficult airway results in 25 - 30% of anesthesia deaths. Intubation failure can potentially lead to serious problems such as hypoventilation, hypoxemia, brain cell damage and death.[9]

To overcome intubation difficulties, optimal patient positioning is essential for visualization of the larynx during direct laryngoscopy and intubation. The success of direct laryngoscopy depends on achieving a line of sight from the upper maxilla teeth to the larynx. Several studies have suggested that proper head and neck positioning is one of the most important steps in laryngoscopy and tracheal intubation that helps to obtain a good view of the glottis, thus minimizing the rate of tracheal injury, duration of the procedure, and repetition of laryngoscopy and intubation attempts which ultimately reduces the overall trauma rate and further complications.[10]

The best laryngoscopic view is obtained when the oro-pharyngo-laryngeal axis is in a straight line. The 'sniffing' position has been advocated as the standard for direct laryngoscopy. However, the 'sniff' position facilitates a view of the larynx in 4% of patients which cannot be done with simple head extension. The 'sniffing' position also improves pharyngeal airway patency in patients with obstructive sleep apnea.[11]
Some studies advocate the use of a head pillow to improve the laryngoscopic view by increasing the occipito-atlanto- axial angle and enlarging the submandibular space. Some previous studies in several countries used pillows of different heights which would result in different glottic views. However, this recommendation for the use of head pillows is not based on clinical examination.[12] Likewise, the use of pillows in a study conducted in Korea, the use of pillows that are too high results in counterproductive outcomes.[13] In the author's daily observations, it was also found that in some cases intubation without the use of pillows was faster and easier to perform.

From the description above, it can be seen that there are some data differences in the recommendations for the use of head pillows in assisting intubation procedures. The use of a pillow during intubation is recommended, but several studies have revealed no difference in the level of difficulty when using a pillow and without a pillow. Based on this, the researcher is interested in designing a study that assesses the level of difficulty of intubation using a pillow and without a pillow at Haji Adam Malik Hospital Medan. It is hoped that this study can provide a source for future research in recommending the optimal position of the patient for visualization of the larynx during direct laryngoscopy and intubation. The aim of the study were threefold [1] to determine the demographic characteristics of patients who underwent intubation at Haji Adam Malik Hospital Medan, [2] To determine the comparison of the level of difficulty of intubation with the use of pillows and without the use of pillows, [3] to determine the comparison of Wilson's Score and Cormack and Lehane as predictors of intubation difficulty. as predictors of intubation difficulty assessment.

METHODS

The population in this study were all patients who received general anesthesia surgery and underwent intubation procedures at H. Adam Malik Hospital Medan. With the research sample is a population that meets the inclusion criteria and exclusion criteria of the population reached by consecutive sampling method with a minimum sample calculated based on the minimum sample formula. minimum sample calculated based on the minimum sample formula. The data taken were extracted into a research form and analyzed using a computer.

This study was conducted after obtaining approval from the ethics commission The ethics committee of the Faculty of Medicine, University of North Sumatra - H. Adam Malik Hospital will assess the feasibility of the research proposal. Patients were previously given an explanation of the purpose, benefits, and risks and

matters related to the study. Then asked to fill out a willingness to be a research subject (informed consent) form. The actions taken in this study are actions that are commonly done to patients in the hospital. If cardiac, pulmonary and cerebral emergencies occur during treatment in the ICU and the research process takes place, then immediate anticipation and treatment are carried out according to the patient's condition at that time, emergency equipment and drugs have been prepared in advance.

The study questionnaire included seven validated measurement instruments: Age, Gender, Intubation difficulty, Wilson's classification, Cormack lehane classification, Intubation pillow and Intubation time.Age is a life span measured by years, assessed based on patient identity sheets with medical record sources. The scores are classified in five category. The scale presented as ordinal. Gender is the patient identity according to his physiological or physical, assessed based on the patient identity sheets with medical record scource. The scores are classified in two category. The scale presented as nominal. Intubation Difficulty is the level of difficulty experienced when performing intubation based on observations during intubation with an assessment of grading the level of difficulty. The scores are classified in five grade. The scale presented as ordinal. Wilson's Classification is a criterion used for evaluation based on criteria from physical characteristics to predict difficult intubation with an assessment in the form of observations during intubation with the Wilson Score measuring instrument. The Cormack-Lehane classification is a classification used to describe the appearance of the larynx during laryngoscopy with an assessment in the form of observations during intubation with the Cormack-Lehane Score measuring instrument. Intubation pillow is a tool used to lift the subject's head with an assessment in the form of being placed under the subject's head during intubation with a measuring tool in the form of a pillow made of foam with a height of 7cm. Intubation time is the duration required for intubation by assessing the time from the beginning of intubation until the ETT is installed with a measuring instrument using a stopwatch and the measurement results are expressed in duration counts in seconds.

Descriptive statistical analysis using Kolmogorov Smirnov test was used for demographic data. Chi Square analytic statistical analysis was used for categorical data while T-test or Mann Whitney was used for numerical data. The data were statistically analyzed with the help of the Windows SPSS (Statistical Product and Science Service) computer program version 26.0. Differences were considered statistically significant when $p<0.05$.

RESULTS

The research subjects were obtained from patients undergoing elective surgery with general anesthesia at Haji Adam Malik Hospital Medan. The study subjects were part of the study population who met the inclusion and exclusion criteria totaling 24 people.

In this study, the basic characteristics reported in this study consisted of age, gender, BMI, and duration of intubation. In table 1, it is known that the age of group 1 has a mean + SD value of 49.4 ± 12.1 years and group 2 has a mean + SD value of 44.3 ± 14.4 years. Distribution according to gender in group 1 is known to be a population of 7 male subjects and 5 female subjects, while in group 2 it is known to be 5 male subjects and 7 female subjects. The BMI distribution of group 1 has a mean + SD value of 21.0 ± 1.65 kg/m2 with a range of 19.79-24.30 kg/m2 and group 2 has a mean + SD value of 21.8 ± 1.85 kg/m2 with a range of 17.92-24.46 kg/m2. The majority of ASA distribution in group 1 was in ASA 1 while in group 2 both ASA 1 and ASA 2 had the same frequency. However, there was no significant difference between the two groups. In predicting the difficulty of intubation carried out with Wilson's score, it was found that the research subjects generally predicted intubation to be easy and not too difficult where in both groups without pillows and with pillows the research subjects were normally distributed.

Normality test was performed using the Shapiro-Wilk test because the number of research subjects <50. In the normality test results section, if the p-value of normality> 0.05 is declared normally distributed data, and vice versa. Based on the normality data, it is known that age and BMI data are normally distributed while

gender and intubation duration are not normally distributed. In the test analysis, the Independent T test was performed on normally distributed data and the Mann-Whitney test on data that was not normally distributed.

Table 1. Table of Data Characteristics

Characteristics		Without the Use of Pillows	With the Use of Pillow	*p-value**
Age, mean ± SD		49,4 ± 12,1	44,3 ± 14,4	0,231[a]
Gender, n (%)				
Male		7 (58,3%)	5 (41,6%)	0,001[b]
Female		5 (41,6%)	7 (58,3%)	
BMI, mean ± SD		21,0 ± 1,65	21,8 ± 1,85	0,186
PS-ASA Status		11,8 ± 3,3	11,5 ± 3,1	0,007
1		8	6	0,418
2		4	6	
Wilson's Score				
< 2	Easy Intubation Prediction	5	6	
3 – 7	Intubation Prediction Not Too Difficult	6	4	0,370[b]
> 8	Difficult Intubation Prediction	1	2	

Noted: a, Independent T test; b, Mann-Whitney test

Table 2. Relationship between Intubation Pillow Use and Intubation Difficulty Rate Tabel

		Intubation difficulty level				*p-value**
		Easy Intubation	Intubation with little assistance	Intubation with assistance	Total	
Use of intubation pillow	Not using an intubation pillow	5	6	1	12	0.097
	Using an intubation pillow	10	2	0	12	
Total		15	8	1	24	

**Chi-square*

Table 3. Relationship between Intubation Pillow Use and Intubation Duration Table

	Not using intubation pillow	Using intubation pillow	Normality Test[a]	*p-value**
Intubation duration (seconds)	15.9±1.6	10.8±1.8	0.175	0.001

a, Shapiro-Wilk bT-test Independent

Table 4. Relationship between Intubation Pillow Use and Cormack-Lehane Score Table

		Cormack-Lehane Score				*p-value**
		Grade 1	Grade 2	Grade 3	Total	
Use of intubation pillow	Not using intubation pillow	3	7	2	24	0.04
	Using intubation pillow	11	1	0	12	
Total		14	8	2	24	

**Pearson Chi-Square*

Table 2 shows that patients who did not use intubation pillows were most often intubated with little assistance and the majority of patients who used intubation pillows were easily intubated. However, there was no significant difference between the two groups ($p>0.05$).

Table 3 shows that patients who do not use intubation pillows have a mean value of 15.9 ± 1.6 and those who do not use intubation pillows have a mean value of 10.8 ± 1.8. In this variable, the normality test

was found to be normally distributed (p>0.05) using the Shapiro-Wilk test so that the hypothesis test used was the independent T-test. There was a significant difference between the two groups (p<0.05).

In Table 4, the Cormack-Lehane score was found that the majority of patients who did not use intubation pillows were at degree 2 and the majority of patients who used intubation pillows were at degree 1. There was a significant difference between the two groups (p<0.05)

DISCUSSION

In this study, out of 24 research subjects, the highest gender was found to be male in the group with the use of pillows, namely 41.6% and female in the group without the use of pillows at 41.6%.

The height of the pillow results in a better and easier intubation position because the axis is straighter. Another study stated that the use of an intubation pillow that can be pumped and adjusted in height results in a better position for intubation because it achieves a straight axis from the mouth, pharynx, and larynx so that it is easier to perform intubation actions and a higher success rate compared to standard intubation pillows. The results of this study showed that the percentage of successful endotracheal intubation using an intubation pillow was slightly better than intubation without the aid of an intubation pillow.

Both the standard intubation pillow and the modified intubation pillow produce a sniffing position that provides a better direct laryngoscopy view by enlarging the occipito-atlanto-axial angle and enlarging the submandibular space so as to make the larynx, pharynx, and oral access in a straight line, but intubation using a modified intubation pillow is expected to increase convenience because it is more dynamic than the standard pillow in creating the most ideal intubation position.[14,15]

The results showed that the intubation time using an intubation pillow was 11.5 ± 3.1 seconds, while without a pillow was 11.8 ± 3.3 seconds. These results indicate that the length of time required for endotracheal intubation using a pillow is faster than without a pillow. Intubation is a dynamic action, each individual who performs intubation will not produce the same results, therefore the modified intubation pillow will be more flexible and dynamic to produce a better intubation position due to the achievement of a straight axis of the mouth, pharynx, and larynx so that it is easier to perform intubation actions and a higher success rate than the standard intubation pillow. Indeed, in practice, the difference of 1-3 seconds is not too significant because the ultimate goal is patient safety itself, but with results like this, it shows that the modified intubation pillow helps provide better visualization. This study is in accordance with research on the use of intubation pillows providing better time than without a standard intubation pillow.

In this study, it was found that patients who did not use intubation pillows were most often intubated with little assistance and the majority of patients who used intubation pillows were easily intubated and there was no significant difference between the two groups (p>0.05). This is in accordance with other studies where it was found that the majority of patients who used intubation pillows were predicted to be easily intubated (p=0.0006). Another study also showed a similar thing where in patients who performed head elevation the majority were predicted to be easily intubated (p=0.13). The difference in this study is due to the previous researcher dividing the intubation difficulty prediction group into 2, namely easy and difficult.

In this study, it was found that patients who did not use intubation pillows had a mean duration of 15.9 ± 1.6 and those who did not use intubation pillows had a mean duration of 10.8 ± 1.8. In this variable, the normality test was found to be normally distributed (p<0.05). This is quite different from other studies where the mean duration was 26.6 seconds and in patients who used intubation pillows the mean duration was 22 seconds. This study is different from other studies because other studies did not uniform the height of the pillow used and only uniform the position of the external auditory meatus (EAM) and sternal notch (SN) aligned.[16] Using the Cormack-Lehane score, it was found that the majority of patients who did not use intubation pillows were at degree 2 and the majority of patients who used intubation pillows were at degree 1. There was a significant difference between the two groups (p<0.05). This is quite different from other studies where no difference was found between the two groups. 47.6% of patients who did not use an intubation pillow had a Cormack-Lehane score >1.[17] This difference was due to the difference in head elevation height of 7

cm in this study (mehmooda akhtar). In other studies, differences were also found where the majority of patients who did not use intubation pillows were at degree 2 and the majority of patients who used intubation pillows were at degree 3. This difference is influenced by the field of view of the larynx and the anesthesiologist's discomfort during intubation to make the optimal pillow height. It should not be too high to prevent insertion of the laryngoscope blade or too low to prevent head extension. There is variability in fat deposits on the upper back and in the neck of the patient, leading to a lower head position if no or only one pillow is used during laryngoscopy.[18] Another study found that sniffing position with an intubation pillow height of 4.5 cm provides the best laryngoscopic picture. This is due to the flexion achieved with a 4.5 cm pillow that can move the larynx posteriorly during laryngoscopy so that the angle between the line of sight and the laryngeal axis can be reduced and the occipitoatlantoaxial extension angle can increase.[11]

CONCLUSION

The results of the analysis test showed that patients who did not use intubation pillows were most often intubated with little assistance and the majority of patients who used intubation pillows were easily intubated but there was no significant difference between the two groups ($p>0.05$).

DECLARATIONS

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CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

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COMPETING INTERESTS

The authors declare that there is no conflict of interest in this report.

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REFERENCE

1. Pignaton W, Braz JRC, Kusano PS, Módolo, MP, et al. Perioperative and anesthesia-related mortality: an 8-year observational survey from a tertiary teaching hospital. Medicine, 2016; 95 (2):1
2. Morgan GE, Butterworth JF, Mackey DC, Wasnick JD, Morgan Mikhail's clinical anesthesiology. 2018
3. Effendi R, Perdana A, Firdaus R. Prediktor kesulitan intubasi pada ras melayu di RSUPNCM: perbandingan antara rasio tinggi badan terhadap jarak tiromental, skor mallampati dan jarak tiromental. Universitas Indonesia; 2013.
4. Hagberg C A, Artime CA. Airway management in the adult. Dalam: Miller RD, penyunting. Edisi ke-8. Philadelphia: Elsevier Saunders. 2015.
5. Roth D, Pace NL, Lee A, Hovhannisyan K. Airway physical examination tests for detection of difficult airway management in apparently normal adult patients. Cochrane Database of Systematic Reviews, 2018; 5.
6. Vidhya S, Sharma B, Swain BP, Singh UK. Comparison of sensitivity, specificity, and accuracy of Wilson's score and intubation prediction score for prediction of difficult airway in an eastern Indian population - A prospective single blind study. Journal of Family Medicine and Primary Care, 2020; 9 (14): 36-41.

7. Cook TM, Mac Dougall SR. Complications and failure of airway management. British Journal of Anaesthesia. 2012; 109 (suppl 1): i68 – i85.
8. Bergesio L. Difficult Airway Management in Patients Submitted to General Anesthesia. Is it a Matter of Devices or Predictive Scores? International Journal of Anesthetics and Anesthesiology. 2016; 3 (1): 1-6.
9. Siswanti H, Karyati S, Hidayah NF. Hubungan Lamanya Puasa Pre Anestesi Dengan Status Hemodinamik Pada Pasien Operasi Elektif. 2020; 379-384.
10. Gede M, Senapathi TGA. Buku Ajar Ilmu Anastesi dan Reanimasi. Jakarta: Indeks Jakarta. 2010
11. Dhawan I, Tewari A, Sehgal S, Sinha AC. Medication errors in anesthesia: unacceptable or unavoidable? Brazilian Journal of Anesthesiology (English Edition), 2017; 67 (2): 184 – 192.
12. Harahap AM, Kadarsah RK, Oktaliansah E. Angka kejadian hipotermia dan lama perawatan di ruang pemulihan pada pasien geriatri pascaoperasi elektif bulan oktober 2011– maret 2012 di Rumah Sakit Dr. Hasan Sadikin Bandung. Jurnal Anestesi Perioperatif, 2104; 2 (1), 36 – 44.
13. Hong HJ, Yun M, Kim SH, Hwang JW, Lee HC. A pillow of 8 cm height did not improve laryngeal view and alignment of airway axes but increased anesthesiologist discomfort compared to a pillow of 4 cm height during tracheal intubation in adult patients. Korean J Anesthesiol. 2016; 69 (2): 138 - 42.
14. Kitamura Y, Isono S, Suzuki N, Sato Y, Nishino T. Dynamic interaction of craniofacial structure during head positioning and direct laryngoscopy in anesthezied patients with and without difficult laryngoscopy. Anesthesiology. 2007; 107 (6): 875 – 83.
15. Park SH, Park HP, Jeon YT, Hwang JW, Kim JH, Bahk JH. A comparison of direct laryngoscopic views depending on pillow.
16. Chun EH, Chung MH, Kim JE, Kim KM, Lee HS, Son JM, et al. Efects of head-elevated position on tracheal intubation using a McGrath MAC videolaryngoscope in patients with a simulated difcult airway: a prospective randomized crossover study. BMC Anesthesiology. 2022; 22: 166.
17. Akhtar M, Hassam N, Mehdi S, Wani GM, Mir AH. A Randomized Study Comparing the Sniffing Position with Simple Head Extension for Glottis Visualization and Difficulty in Intubation during Direct Laryngoscopy. Anesthesia: Essays and Researches. 2017; 11: 762-6.
18. Shah K, Thakkar J, Vaidya D. Comparison of Glottis Views with Fixed‐Height Pillow versus Adjustable ‐Pillow Height by Pressure Infusion Bag for Successful Intubation. Bali Journal of Anesthesiology. 2020; 4: 35-8.