

COMPARATIVE OBSERVATIONAL STUDY TO ASSESS THE GRADES OF GLOTTIC VIEW WITH THE USE OF HEIGHT ADJUSTABLE PILLOW IN PATIENTS UNDERGOING ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA WITH ENDOTRACHEAL INTUBATION

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Abstract

Background: Difficult airway poses great challenge to anaesthesiologists especially in ICUs, casualty, emergency surgeries requiring general anaesthesia. Positioning the patient plays a crucial part in easing the airway access. Study was done to determine whether the use of height adjustable pillow would provide an ideal position that would lead to easier intubation by providing better glottic view. The objective is primary objective was to determine whether the use of height adjustable pillow will better the view of the glottis. **Materials and Methods:** A total of 60 patients with modified Mallampati classification grade-1 to grade 3 and without any anticipated difficult airway were enrolled after informed consent is given. A height adjustable pillow was put under the nape of the neck and occiput. After induction of anaesthesia and muscle paralysis laryngoscopy was performed by an experienced anaesthesiologist without heightening the pillow and Cormack lehanne grading noted and then heightening the pillow up to the best glottic view without external pressure or till the external auditory canal was elevated till the level of sternal notch. The best glottic view without external pressure was noted. Grading of glottic opening visualisation with Cormack Lehane grade was done before and after the use of height adjustable pillow. **Result:** The use of height adjustable pillow improved glottic view when the positioning was done so as to elevate the head till external auditory canal was at level of sternal notch. There was an improvement in grade 3 to grade 2 level of CL grading in 83%, an improvement in grade 3 to grade 1 of CL grading in 16% (cumulative improvement of 99% in patients having grade 3). **Conclusion:** There was overall betterment and improvement in glottic views with the use if height adjustable pillow. Further studies with large population and other population with other difficult airway features have to be studied to understand complete usefulness of the height adjustable pillow.

INTRODUCTION

The ‘sniffing the morning breeze position’, better termed ‘ear-to-sternal notch’ positioning, is a combination of atlanto-occipital extension and neck flexion (neck flexion of 35° and face plane extension of 15° is cited as ideal) and is considered optimal for direct laryngoscopy, this position was originally described by Chevalier Jackson as the “Boyce-Jackson” position in 1913, the position was termed the sniffing position by Magill in 1936.

Bannister and MacBeth proposed the 3-axis alignment theory in 1944. They proposed that the optimal position for direct laryngoscopy brings the laryngeal axis, the pharyngeal axis and the axis of the mouth into alignment with the line of vision.^[1] Two curve theory proposed by Keith Greenland says, primary curve is the oropharyngeal curve, secondary curve is the pharyngo-glottotracheal curve point of inflection is the base of the epiglottis, the tangent of this point is the laryngeal vestibule axis.^[2] Successful laryngoscopy and tracheal intubation require alignment of both curves with the

line of sight and the trachea. In this study we try to achieve these alignments using a height adjustable pillow and compare the glottic view for intubation with or without the pillow.

MATERIALS AND METHODS

Study received approval from an Institutional ethical committee, and we obtained written informed consent from all the patients involved in the study.

Source of Data:

Study Design: An Observational study.

Study Period: September 2018- December 2018

Place of Study: BGS medical college, Bangalore.

Sample size: Based on incidence of difficult intubation of previous studies,^[3] Sample size was $n = z^2 p(1-p)/d^2$

Where, $Z = 1.96$ at 5% level of significance, $p = 18\%$ (incidence of difficult laryngoscopy),^[3] $d = 10\%$ - allowable error.

$n = (1.96)^2 (0.18)(0.92)/(0.1)^2$,^[2] 57 sample size was obtained, rounded off to 60 patients.

Inclusion Criteria

In this study we included 60 patients belonging to American Society of Anaesthesiologists (ASA) Class 1 and 2, aged between 20 and 60 years, with modified Mallampati grading of 1, 2 and 3, who were undergoing elective abdominal surgeries with endotracheal intubation under general anaesthesia.

Exclusion Criteria

Patients with a prior history of challenging intubation, modified Mallampati class 4, those who had previously undergone head and neck surgery, individuals with loose upper incisors, and patients necessitating rapid sequence induction, emergency surgeries were excluded.

Preanesthetic airway assessment was done in sitting position by an attending anaesthesiologist, who was not involved in the study. Neck circumference at cricoid cartilage and thyromental distance (cm) was measured.

Study

In the operating theatre Standard ASA monitoring (electrocardiogram, pulse oximetry, capnography, and non-invasive blood pressure) was connected. Operation table height was maintained at the patient's forehead to the xiphisternum of the intubating anaesthesiologist. A height adjustable pillow was positioned at the nape of the neck, located between the occiput and the atlantooccipital joint.

Anaesthesia induction was initiated using injection Glycopyrrolate at a dose of 0.2 mg, injection Fentanyl 2micrograms/kg and injection Propofol at 2 mg/kg. To aid in intubation, succinylcholine was administered at a dose of 2 mg/kg as a muscle relaxant. Patients' lungs were ventilated with 100% oxygen via an anatomical face mask for duration of 60 seconds.

All laryngoscopies were performed by the same experienced anaesthesiologist with over 10 years of

experience. The laryngoscopy was performed with a height adjustable pillow. A height adjustable pillow was positioned at the nape of the neck, located between the occiput and the atlantooccipital joint, morning sniffing position was provided during laryngoscopy and the (CL) Cormack and Lehane grading was recorded, the operator used their right hand to adjust the height of the pillow while conducting laryngoscopy with their left hand. Height was adjusted until the alignment of the external auditory meatus (EAM) with the sternal notch was achieved. At this point again the Cormack and Lehane (CL) grading of the glottis was recorded. The time taken for adjusting the pillow height was less than 30 sec in all cases.

After evaluation of laryngoscopy grade, external laryngeal manipulation (ELM) was permitted, if necessary, to facilitate the insertion of the tracheal tube. Oral intubation was done with a cuffed endotracheal tube size 7 for female and size 8 for male patients. If at any time during the study the patient's SpO₂ falls below 94%, then 100% oxygenation was provided by mask ventilation. The rest of the anaesthesia was continued as per standard protocol.

RESULTS

12 cases were having CL Grade of 3 without increasing height of pillow. After adjusting the height of pillow 10 of them changed to grade 2 and 2 of them changed to grade 1. There was an improvement from Cormack Lehane grade 3 to grade 2 in 83% of cases and improvement from grade 3 to grade 1 in 16% cases. Cumulative improvement in CL grade 3 patients to above grades being 100%.

26 cases were having Cormack Lehane grade 2 without adjusting the pillow height. After adjusting the height of pillow in 6 of these cases Cormack Lehane grading improved to grade 1. There was an improvement in CL grading from 2 to 1 in 23% cases.

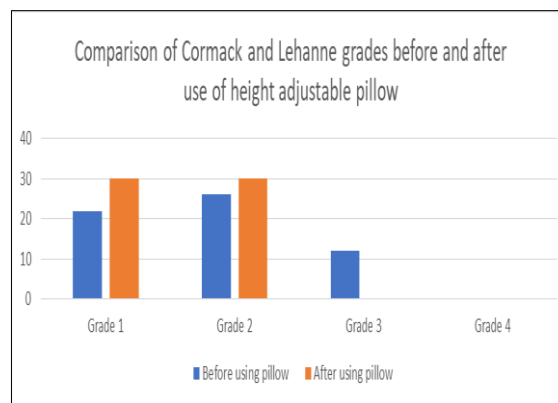


Figure 1: Comparison of Cormack and Lehane grades before and after use of height adjustable pillow

Table 1: Demographic characters of the patients involved in the study

Characteristics	Minimum	Maximum
Age(yrs)	20	60
Gender(M/F)	Male 30(50%)	Female 30(50%)
Height(cms)	140	170
Weight(kgs)	45	85
Neck circumference	25	38
Body mass index(kg/m2)	18	30
ASA PS	ASA1 - 33	ASA2-27
Modified Mallampati class	Class 1-20,2-12,3-10	
Mouth opening	All more than 3 finger breadth	
Thyromental distance	All more than 6.5 cm	
Range of neck movements	All normal range of neck movements	
Upper lip bite test	All lip bite class 1	

Table 2: Comparison of grades of glottic view before and after using the inflatable pillow

Cormack Lehane Grades	Before using pillow	After using pillow
Grade 1	22	30
Grade 2	26	30
Grade 3	12	0
Grade 4	0	0

DISCUSSION

There are many studies carried out to check for ideal height of pillow for improving glottic views and ease of intubation. In our study we did not measure the height of pillow for intubation but concentrated only on obtaining external auditory canal to sternal notch level. Some studies have concluded that the cushioned pillows did not significantly improve the glottic view in comparison to simple extension in routine tracheal intubation, except in those with restricted neck movements and obese patients.^[4] Studies conducted in Australia and Japan also had similar findings.^[5,6]

On the other hand, studies have consistently shown that raising the shoulder position and elevating the head can enhance the view of the glottis. One study conducted on human cadavers observed a significant increase in the percentage of glottic opening score as the head was progressively elevated to its maximum extent, increasing neck flexion.^[7] In a Malaysian study involving 378 participants, it was found that elevating the head by 7 cm in combination with shoulder positioning resulted in better glottic visualization scores and higher intubation success rates compared to simple head extension.^[8] When the heads of adult patients were elevated by 0, 6, and 10 cm, it was noted that the direct laryngoscopic views improved with increased elevation.^[9] Another study found no difference in glottic view between the two groups (height customisable pillow vs fixed height pillow), except in cases where the modified Mallampati grade was equal to or greater than 3.^[10]

The scientific literature contains a wealth of studies exploring the best position for direct laryngoscopy and intubation. However, there is a significant degree of variation and conflicting viewpoints on this matter, particularly concerning the validity of the shoulder positioning and the three-axis alignment theory, the necessary pillow height and its application, except in cases involving obese or

challenging airway patients.^[11,12] This discrepancy primarily stems from the wide range of assessment techniques and airway definitions, which result in subjective differences in predicting the type and difficulty of airway management.^[13,14]

Another dimension of diverse data pertains to the height of the pillow necessary to obtain the best laryngeal view. While seven centimetres is the most commonly cited measurement in existing literature, research has demonstrated that this height can vary considerably, ranging from 6 cm to 12 cm.^[15,16,17] In 2016, experts affiliated with the All India Difficult Airway Association suggested that the optimal submandibular space can be attained by employing a 10-centimeter thick pillow beneath the patient's head.^[18] These findings underscore the notion that different racial and ethnic groups may necessitate a personalized pillow size, rather than a one-size-fits-all approach. So adjusting the heights according to the individual patients needs by using a height adjustable pillow might be of much help in dealing with and preventing harmful effects of difficult ventilation and intubation.

CONCLUSION

There was overall betterment and improvement in glottic views with the use of height adjustable pillow. Further studies with large population and other population with other difficult airway features have to be studied to understand complete usefulness of the height adjustable pillow. Customizing the pillow height to achieve horizontal alignment between the EAM (External Auditory Meatus) and the sternal notch could offer potential benefits for patients with higher modified Mallampati grades. This adjustment resulted in improved visualization of the glottis.

Limitations

The study population was less and varied characters in different demographic parameters might have caused confounding. Larger studies with control

groups might be required before generalizing the results.

Other limitations include

1. Difficult airway cases belonging to modified Mallampati class 4 were excluded.
2. Heights of pillow were not measured while giving EAC to Sternal notch level position.

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