Original Research Article

Comparison of Airway Maneuvers Manual in line stabilization[MILS],Modified Jaw thrust, Conventional maneuver for Oro tracheal Intubation during Direct Laryngoscopy

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Abstract

Background: During performing orotracheal intubation with direct laryngoscopy adequate laryngeal visualization depends on proper airway maneuvers. There are different type of airway maneuvers. **Aim:** This study aimed to compare airway maneuvers ; MILS, jaw thrust , conventional maneuver to assess better laryngeal visualization and ease of intubation among them and associated complications. **Material & Methods:** This observational study was conducted in 90 adult patients. Patients divided in to three groups. Laryngoscopy and intubation in group M was done in MILS and in group J jaw thrust , In Group C as conventional maneuver performed. Laryngeal visualization assessed using modified Cormack lehane (CL)grading and ease of intubation assessed by usingintubation time, number of attempts between these three groups. The data were compared using Anova test, chi-square test. **Results:** While comparing between these groups better laryngeal visualization seen in jaw thrust group while the MILS maneuver worsen the view. **Conclusion:** The present study concluded that jaw thrust maneuver improved the laryngeal visualization and conventional maneuver made intubation faster and easy.

Keywords: airway maneuver, laryngeal visualization, intubation, direct laryngoscopy.

Introduction

Laryngoscopy and tracheal intubation is the key step for general anaesthesia . Proper airway management considered golden step and its failure may lead to various adverse outcomes. Most important step prior to performing intubation is to place head and neck in proper place and various airway maneuvers applied for that. Recently very few studies examined the effects of different airway maneuvers such as MILS, jaw thrust and conventional maneuvers on tracheal intubation.

This study aimed to compare various airway maneuvers the MILS, jaw thrust, conventional maneuver to assess better laryngeal visualization and ease of intubation among them. Secondary aim to assess any related complication to these airway maneuvers.

While performing MILS, an assistant grasp patient's mastoid with fingers of both hands and limit the movement of head and cervical spine. During performing jaw thrust assistant place fingers behind each of mandible, displacing mandible forward and using thumbs to open the mouth. During performing conventional position anaesthetist applies flexion of neck with extension at atlanto-occiput joint by placing non compressible pillow (8cm) under the patient head. While performing intubation: intubation time number of attempts, Cormack lehane grading(CL) and overall success rate will be noted in each of these maneuvers. Very few studies investigated to compare these three manoeuvers in existing knowledge.

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Head extension considered potentially dangerous in patients with cervical spine injuries and failure to restrict head and neck movement increase incidence of secondary neurological deficit so MILS and jaw thrust maneuver done in neutral position to avoid cervical spine injury[1].

Jaw thrust maneuver relieves airway obstruction caused by posterior displacement of tongue into oropharynx during general anaesthesia[2] and improve visualization of larynx during laryngoscopy and makes intubation easy. The present study found ease of intubation and overall success rate among these three groups with the objective of number of attempts and intubation time taken during laryngoscopy in each group and comparison of laryngeal visualization using Cormack lehane grading among each group

In this study compared these three maneuvers in adult patients with normal airway that is also very useful for emergency intubation,cervical spine injury, RTA patients, obstetrics patients,obese and patients with difficult intubation[3]. Under general anaesthesia due to decrease muscle tone chances of airway obstruction increase so maneuvers to open airway required like jaw thrust, head tilt, chin lift and BURP can be added to improve laryngeal view[4,5]. Application of BURP, McCoy laryngeal blade and mandibular advancement make difficult laryngoscopy easy[6,7,8].

Material & methods

This observational study approved by hospital ethical committee. After taking ethical clearance this study was conducted at VMMC and Safdarjung Hospital, New Delhi, India. A total of 90 adult aged 18-60yrs with ASA (American society of Anaesthesia)physical status I or II undergoing elective surgery under general Anaesthesia with orotracheal intubation were included in the study. Patients with

anticipated difficult intubation, modified mallampati oropharyngeal view class 3/4, neck swelling, burns and neck contracture, face abnormalities, obesity, pregnant females, short neck, patients with history of snoring and bronchial asthma, difficult bag & mask ventilation excluded from the study. After taking written informed consent from each patient all patients total sample size n= 90 were allocated into three groups : group I – MILS:(n=30), group II : jaw thrust (n=30), group III : conventional (n=30). .

Group M – manual in line stabilization (MILS)

A trained assistant applied MILS from left side grasping the patient's mastoid with fingers of both hands and limit the movement of head & cervical spine during tracheal intubation.

Group J – jaw thrust

A trained assistant applied jaw thrust by placing fingers behind each side of mandible , displacing mandible forward and using thumbs to open mouth.

Group C – conventional (sniffing position)

Anesthetist who intubated trachea applied flexion of neck with extension at atlanto -occiput joint[1] by placing non compressible pillow under the patient head.

One of the maneuvers was applied before intubation which was selected by computer generated random number table then trachea was intubated after direct laryngoscopy .One day prior to surgery pre anaesthetic check up done that documented detailed history & examination. Airway assessment done by noting modified mallampati score, mouth opening (inter incisor gap), thyromental distance & neck circumference. After obtaining written and informed consent patient's characteristics including age,weight,height & BMI were recorded.

On day of surgery following standard monitors and basal parameters like heart rate ,blood pressure,SPO2 and ECG were recorded on arrival to operation theatre. Patient was premedicated with injection midazolam 0.02mg/kg. Each patient was pre oxygenated with 100% oxygen for 3 minutes. General anesthesia induced with intravenous injection fentanyl 1.2-2 mcg/kg and inj. Propofol 1.5-2mg/kg till loss of verbal command. After check ventilation neuro muscular blocking agent inj.vecuronium 0.1mg/kg was given. Haemodynemic parameters including SpO2 and ECG were monitored . patient ventilated with 02(33%),N2O(66%) and isoflurane (0.6-0.8%).

In this study assessment done in two parts. In first part laryngeal visualization done using modified Cormack lehane grading[3,4] during larngoscopy with Mac intosh laryngoscope using one of three maneuvers. The Cormack lehane grades show laryngeal visualization during laryngoscopy[3,4].

The Cormack lehane grade is defined as follows:

1 = vocal cord fully seen

2 = vocal cord partially seen

3a = only epiglottis seen and obscuring the glottis opening but can be lifted up and away from posterior pharyngeal wall

3b = only epiglottis seen and close to posterior pharyngeal wall so there is little space between epiglottis and posterior pharyngeal space

4 = epiglottis obscured

In second part tracheal intubation done with direct laryngoscopy and intubation difficulty assessed using intubation time, number of attempts, failure to intubate. Intubation time was noted as interval from laryngoscopy to confirming tracheal tube position by EtCO2 value or chest auscultation. Total number of attempts noted, only two attempts allowed and after that MILS, jaw thrust removed and next maneuver converted to conventional maneuver to intubate trachea[5,6,7]. If other assistance required like BURP (backward upward right sided pressure),use of stylet, bougie, change of blade (larger blade or Mac coy blade), Fiber optic bronchoscopic intubation, C Mac video laryngoscopy were noted[8,9].

The haemodynemic changes of patient noted during induction, laryngoscopy, intubation, post-intubation (at 5 min and 10 min) and assessed by independent observer. After intubation patient was put on controlled ventilation and anaesthesia was maintained on O2 : N2O (33:67%) with sevoflurane (0.4-0.6%) and top up dose inj. vecuronium given whenever required & ventilated with tidal volume 8ml/kg and EtCO2 maintained 30-35 mmHg. At the end of surgery 100% O2 given and patient reversed with IV neostigmine 50mcg/kg, IV Glycopyrrolate 10 mcg/kg and trachea extubated. Post operatively pulse, BP, SpO2 and ECG monitored.

Statistical analysis

With reference to previous studies statistical analysis were performed using SPSS (statistical package for the social science programme) for windows version 17.0. The minimum required sample size with 80% power of study and 5% level of significance is 15 patients in each study group. To lower the margin of error, sample size of 30 will be taken in each group. Total number of cases in this study taken n=90. Categorical variables presented in numbers, percentage and continuous variables presented as mean+/-SD and median. Quantitative variables were compared using Anova test / Kruskalwallis test and qualitative variables were compared using chi-square /Fisher's exact test. P value <0.05 considered as statistically significant.

Results

Total 90 patient screened and enrolled for the study and no patient drop out reported, all 90 patients participated in this present study. Patients divided in three groups according to airway maneuvers. Among all three groups there were no significant differences and all groups were comparable according to baseline demographic data (age, sex, height, BMI, weight) and airway characteristics { mouth opening, TMD(Thyromental distance),NC(neck circumference), mouth opening and mallampati class} with P value >0.05 presented in table 1.

Table 1: characteristics and airway assessment data in patients undergoing tracheal intubation using MILS, jaw thrust maneuver, conventional maneuvers. Values are mean (SD) or number

	Group M (n=30)	Group J (n=30)	Group C (n=30)	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	35.47 (11.30)	32.67(11.79)	29.43(9.19)	0.103
Height (cm)	162.00 (6.8)	162.33 (9.68)	164.30 (6.90)	0.479
Weight (kg)	53.03 (8.61)	56.47 (10.79)	56.80 (9.49)	0.253
BMI	20.32 (2.68)	21.53 (2.73)	25.83 (6.22)	0.346
Sex; M/F	18/12	16/14	17/13	0.873
Thyromental Distance (cm)	7.10 (0.57)	7.07 (0.42)	7.14 (0.47)	0.844
Mouth Opening (cm)	4.86 (0.33)	4.76 (0.19)	4.82 (0.23)	0.292
Neck Circumference (cm)	35.18 (2.07)	34.47 (2.11)	34.57 (2.14)	0.377
Mallampatti Grading: 1/2	19/11	15/15	18/12	0.424

Basal haemodynamic parameters were comparable among the three groups as no statistically significant differences were seen in haemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure with P value >0.05.

Table 2: Comparison of basal hemodynamic parameters among the group

	Group M (n=30) Mean ± SD	Group J (n=30) Mean ± SD	Group C (n=30) Mean ± SD	P Value
Heart Rate/Min	78.00 ± 12.43	76.83 ± 11.34	76.87 ± 11.91	0.911
Systolic BP(mmhg)	119.00 ± 7.26	118.00 ± 6.45	121.67 ± 6.58	0.245
Diastolic BP(mmhg)	74.60 ± 6.40	71.53 ± 8.80	74.17 ± 6.85	0.229
Mean Arterial BP(mmHg)	89.73 ± 6.33	87.00 ± 6.21	87.93 ± 6.82	0.277

Table 3: Comparison of Cormack lehane grading among the group

Cormack Lehane Grading	Group			Group M vs Group J	Group J vs Group C	Group C vs Group M
	Group M	Group J	Group C			
	Frequency (%)	Frequency (%)	Frequency (%)			
1	0 (0.0%)	23 (76.7%)	19 (63.3%)	0.001	0.399	0.001
2	19 (63.3%)	7 (23.3%)	8 (26.7%)	0.004	1.000	0.009
3a	7 (23.3%)	0 (0.0%)	2 (6.7%0	0.011	0.492	0.146
3b	4 (13.3%)	0 (0.0%)	1 (3.3%)	0.112	1.000	0.353
4	0 (0.0%)	0 (0.0%)	0 (0.0%)	1.000	1.000	1.000
Total	30 (100%)	30 (100%)	30 (100%)	1.000	1.000	1.000

There were statistically significant differences noted in modified CL grade between these airway maneuvers. This study found that jaw thrust maneuver improved the laryngeal visualization most that followed by conventional and MILS maneuver. Modified CL grade 1 was seen in 76.7% patients in group J as against 63.3% patients in group C and 0 patient in group M. More number of patients of modified CL grade 2 & 3 seen in group M as compared to group C & group J.

	Group M (Mean +/- SD)	Group J (Mean +/- SD)	Group C (Mean +/- SD)
Time of 1st intubation attempt	17.77 +/- 2.85	15.30 +/- 2.51	14.03 +/- 1.79
Time of 2nd intubation attempt	18.53 +/- 3.48	NIL	16.00 +/- 2
Number of total attempts1 / 2 /fail	13/17/0	30/0/0	27/3/0

This study results also showed that there was significant difference in intubation time among three groups. The time of intubation with conventional maneuver (14.03sec) was shortest time compared to jaw thrust(15.3 sec) maneuver that followed by MILS(17.7 sec).

Overall success rate of tracheal intubation was not significantly different among the three groups.In group M two patients required Mc coy and two patients require C Mac for tracheal intubation and in group C only one patient require fibre optic intubation and in group J no optimisation required.

Discussion

Adequate laryngeal visualization and smooth tracheal intubation is mainstay of general anaesthesia. Any complication in this may lead to intubation failure. This study evaluated and compared manual in line stabilisation, jaw thrust in comparison to conventional maneuver for tracheal intubation during direct laryngoscopy in adult patients.

In this present study laryngeal visualization assessed by modified CL grade and compared between all three groups and the main result of this study was that jaw thrust improved the laryngeal view and the MILS manoeuver worsened the laryngeal view. Intubation time with the conventional manoeuvre was shorter compare to the other manoeuvre.

In this study most common technique used for tracheal intubation was direct laryngoscopy. Despite recent advances curved laryngoscope blade macintosh remains most popular gold standard device for tracheal intubation.[11,12] Use of macintosh laryngoscope clears the airway combining the effects of jaw thrust and lingual traction although it is difficult to introduce and manipulate its blade if patients have limited mouth opening and neck extension and its use also associated with higher incidence of airway trauma sore throat. MILS of cervical spine is an integral part of airway management for dealing trauma patients[12,13]. Though manual inline stabilization makes laryngoscopy grade higher and required more assistances ,but it is an integral part of airway management when dealing with cervical spine trauma patient to prevent neurological complications , can be use in obese and in neurosurgery patient with traction hence difficult airway kit should always be ready These results also supported by previous studies done by as described by F.von Esmarch[14] jaw thrust performed by grasping and lifting the angles of lower jaw with both hands while displacing mandible forward while clinician facing patient's head[15]. Jaw thrust expands soft tissue around the glottis and improves visualization of the larynx[16] as mandibular advancement lifts the epiglottis upward through the anatomic connection[17]. In conventional maneuver positioning in sniffing position approximate alignment of three anatomic axes oral, pharyngeal and laryngeal with cervical flexion and head extension at atlanto occipital joint. Nolan et al studied in 157 patients and reported significant increase in proportion of Cormack lehane grade 2 & 3 when MILS was used[18]. Health KJ. Studied in 50 patients with MILS and 50 patients without MILS and found that incidence of CL grade 3,4 increased with MILS[19]. Hasting and wood reported that CL grade changed from grade 1 to grade 3 in 14% patients when MILS applied[1]. Santoni et al reported that MILS increase number of attempts and rate of difficult tracheal intubation[20]. All these above studies along with this study assessed that incidence of CL grade 2 and 3 markedly found on application of MILS.

This study also resulted that intubation time was shorter when patients positioned in conventional maneuver compared to jaw thrust and MILS. Although there was no bigger difference in intubation time in between group C and group J.

Mean time taken for of firstattempt in group M was 17.7+-2.85(sec), whereas in group J mean time was 15.3+-2.25sec while in group C mean time taken was 14.03+-1.79sec which was minimum among group .

This study showed that though time taken for intubation is decreased in conventional group but jaw thrust group provide better laryngeal view in 1st attempt as no second attempt required out of 30 cases 100% intubation was in 1st attempt in group J. This study supported by few studies Liu et al found that head in extension position is best position for laryngeal visualization and intubation[21]. although in contrast Park et al found improved view of laryngeal visualization seen during neutral position[22].

Present study also assessed that few alternative techniques required for intubation and no intubation failure reported among any group In group M 13(43.3%) patients got intubated in 1st attempt and 17(56.7%) patient's required 2nd attempt out of 30 patients

respectively. There was no 2nd attempt in group J all 30 patients got intubated in 1st attempt, whereas only 3(10.0%) unanticipated 2nd attempts required in group C rest in 27 patients out of 30 got intubated in 1st attempts.

This study also found that alternative technique assistance including bougie, BURP,bougie+BURP, stylet+BURP were statistically insignificant among the groups with P valve > 0.05. Stylet used in 19(63.3%) patients out of 30 in group M, in group J stylet used in 3(10%) patients out of 30 patients, In group C also 3(10%)patients required stylet as assistance out of 30 patients. Maximum patient in group M required stylet for intubation in each group. Overall success rate among each group was 100% in each group and there was no failed intubation in any of the group.

Limitation

This study has few limitations. First anaesthesiologist could not blinded to airway manipulations and this may lead to potential biases.

Second, this study involved patients with normal airway those not expected to have difficult intubation. It may be possible that these maneuvers may be less successful in patients with difficult intubation.

Third subjective scales used to assess the outcome that may lead to subjective error. Forth trained anaesthetist required to perform these maneuvers.

We concluded that including fiberoptic bronchoscope, C MAC videolaryngoscope, McCoy laryngeal blade, stylet, bougie should always be ready whenever MILS is applied , expert opinion of senior anaesthetist should always be taken. We further conclude that jaw thrust maneuver improves Cormack lahane grade, can be used during anticipated difficult airway situations.

We strongly recommend Proper plan should be made for cervical spine stabilisation cases and more studies should be done over manual inline stabilisation so that it comes into more practise and whenever needed in cervical spine trauma can be performed successfully, airway kit should always be ready including fiberoptic bronchoscope, C MAC video laryngoscope, McCoy laryngeal blade, stylet, bougie whatever available, two parson technique should be taught to junior O.T technicians ,call for help especially in difficult MILS cases expert opinion of senior anaesthetist should always be taken. Proper plan should be formulated before shifting patient of cervical spine injury for surgery.

Conclusion

This present study concluded that jaw thrust maneuver improved the laryngeal visualization than conventional and MILS maneuver, so jaw thrust position may be recommended as the initial airway maneuver for better laryngeal visualization for orotracheal intubation during laryngoscopy. This study also concluded that conventional maneuver made intubation faster and easy compared to jaw thrust and MILS maneuver. Hence this study recommend the conventional maneuver for faster and easy tracheal intubation.

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