A COMPARATIVE STUDY BETWEEN TWO MONITORING TECHNIQUES OF AWAKE BLIND NASAL INTUBATIONS IN CASES OF RESTRICTED MOUTH OPENING

Key points: Intubation: Awake blind nasal: Two monitoring techniques.

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Abstract

Background: Intubating a patient with limited or nil mouth opening is always a challenge, particularly when fibreoptic laryngoscope is not available. Awake Blind Nasotracheal Intubation[ABNI] is one of the options for intubating such patients. It requires sufficient patient cooperation and comfort. Presently available short acting analgesics and amnesias are excellent choices for this exercise.

Aims: The present study was to compare the two techniques while performing nasotracheal intubation: monitoring by spontaneous respiratory movement in rebreathing bag of breathing circuit, with monitoring by $EtCO_2$ tubing attached to breathing circuit while performing [ABNI].

Study Design: This prospective randomized study of 60 patients undergoing Commando surgery with anticipated difficult airway. They were randomly assigned into two groups of 30 each according to the method used for [ABNI]. After complete airway block, Group (A) patients were monitored by spontaneous respiratory movement in rebreathing bag of breathing circuit while performing [ABNI] and while Group (B) patients were monitored by EtCO2 tubing attached to breathing circuit while performing [ABNI]. 20 patients were intubated at first attempt, 6 at second and 4 patients at third attempt in Group A, while 21were intubated at first, 5 at second and 4 at third attempt in Group B. These differences were insignificant. The mean time required for successful intubation was in Group A (2.47± 0.068) min. and in Group B (2.42±0.057) min. which was insignificant. Also, success rate, hemodynamic changes and complications and severity score were comparable in both groups.

In conclusion: This study showed that both the techniques in performing [ABNI] are equally valuable. There was no significant difference between the success rates of both techniques. [ABNI] under topical anesthesia may provide an alternative safe method in anticipated difficult intubation, particularly if fiberoptic bronchoscope is not available.

Key words: Intubation: Awake blind nasal:Two monitoring techniques.

Introduction

Secure airway is an essential part during the management of anaesthesia. Airway difficulties during induction of general anesthesia are a concern for anesthesiologists. The incidence of difficult intubations has been reported to be 5.8%–6.2% in patients who have undergone general surgery[1]. In cases of nil or restricted mouth opening (<1.5 cm) a number of techniques are available which include blind nasal intubation, retrograde intubation using a guide wire,

intubating with the help of a fiberoptic laryngoscope and tracheostomy[2]. Blind nasal intubation is a readily available technique for management of difficult airways, such as those in patients with a restricted mouth opening or damaged teeth[3]. If services of flexible fiber optic bronchoscope are not available, blind nasotracheal intubation is performed. [ABNI] has been widely described in the literature[4].Blind nasal intubation was introduced in 1928 by Stanley Rowbotham and Evan Magill[5].

Here we present astudy on different technique of performing Awake Blind Nasal Intubation.

Material and Methods

A prospective and randomized study of 60 patients with anticipated difficult airway with ASA physical status I- III was taken. After approval from the Research and Ethical Board G C S Medical College, Hospital and Research Centre, Ahmedabad, a detailed preoperative evaluation and all routine investigations were done. In patients having obstructive breathing, nasal obstruction was ruled out by detailed local examination, X-ray paranasal sinus, X- ray neck antero-posterior and lateral view taken to rule out shift of larynx, trachea. Written informed consent for surgery, anaesthesia, blood transfusion, crico-thyroidotomy and tracheostomy was obtained. Main purpose of preoperative visit here is airway evaluation and meaningful communication with patient as cooperation of patient is prime importance for success of this technique. Patient should be made to understand that –a) we are doing blind nasal awake intubation as conventional method is not possible and his/her to follow instructions given to him /her during the procedure; -b) his /her cooperation plays an important role.

All the procedure from nebulization, decongestant drop, superior laryngeal nerve block, transtracheal block, position etc. were explained to the patient,and in worst scenario consent for the tracheostomy, was also taken. Our goal was a dry anesthetizedairway and calm patient

Local anasethesia for nasal-tracheal airway:-

1) 4% Lignocaine 4 ml in nebulization for topicalization before 20 min. and advised to take deep breath.
2) Nasal mucosal decongestant drops of Xylometazoline 0.1% was used to clear passage and reduced chance of bleeding.
3) Superior laryngeal nerve block-After identifying the greater cornu of hyoid, depress the carotid artery laterally and posteriorly by index finger of non dominant hand. With dominant hand, a 24 G needle is 'walked off' the cornu of hyoid bone in an anterior – inferior direction, aiming toward the middle of thyrohyoid membrane. A slight resistance is felt as the needle advanced through the membrane, usually at a depth of 1 to 2 cm. The needle at this point has entered the pre-epiglottic space. After confirming with negative aspiration of air or blood, Inj. 2 % Lignocaine 3 ml was injected to block superior laryngeal nerve. The block was repeated on other side also.
4) Translaryngeal (Transtracheal) Block

The patient is asked not to talk, swallow or cough until instructed. The midline of cricothyroid membrane is identified. The index and thumb of non dominant hand was used to stabilize the trachea. A small skin wheal was raised by injecting small volume of Inj.2% Lignocaine by 24 G needle in midline in crico-thyroid membrane. A 22G Viggo(catheter over

needle) attached to a 5 ml syringe contained 3 ml saline was advanced through the skin perpendicularly or slightly downward by continuously aspirating. When air is freely aspirated, catheter is advanced over the needle. After removing needle again, check the aspiration of air through the catheter, Inj. 2% Lignocaine 4ml containing 5 ml was injected after aspiration of air. The patient is warned to expect vigorous coughing on injection and local anaesthetic is injected rapidly during inspiration.

Various nasal airways, nasal endotracheal tubes, retrograde intubation kit, endotracheal tube exchanger, cricothyroid set, tracheotomy set for emergency situation were kept ready.

Patients were randomly allocated in two group of A and B of 30 each.

In Group A -patient was monitored by spontaneous respiratory movement in rebreathing bag of breathing circuit while performing [ABNI] and

In Group B- patient was monitored by $EtCO_2$ tubing attached to breathing circuit while performing [ABNI].

Patient was shifted to OT and all monitors (ECG, NIBP, SPO_2 and $ETCO_2$) were applied. I/V line were secured and ringer lactate solution was started at 10ml/m. Patient was premedicated with Inj Midazolam 0.02 mg/kg I/V and Inj. Glycopyrolate 0.05mg/kg I/V after establishing monitoring. Inj. Rantac150 mg and inj. Ondansetron 4mg I/V were given for aspiration prophylaxis. No more sedatives/analgesics or anaesthetic agents were used.

A big pillow was kept under the shoulder and ring was kept under head and instructed to keep head in extended position, to achieve sniffing position. The portion of head side of table should be elevated 5 degree.

Patient was preoxygenated with 100% O2 for 5 mins. Then a jelly lubricated nasal airway no. 6.0 to 8.5 was passed through each nostril to know which passage is clear. Now North Pole Nasal Endotracheal cuff tube with soft ivory material - Portex , soft, cuffed 7mm ID endotracheal was advanced through wide more patent nostril. Here patient was instructed to take deep breadth from nose and keep mouth close while advancing the tube into oropharynx.

In Group A - endotracheal tube was attached to breathing circuit with O2 flow of 4 L/min. to monitor respiratory movement on the bag and,

In Group B- endotracheal tube was attached to breathing circuit with $EtCO_2$ guide tube via T piece with oxygen flow of 4 L/min attached to monitor respiratory wave form and $EtCO_2$ value.

Usually we could hear breath sounds through the tube, or respiratory movement on bag in Group A or breath sound and $ETCO_2$ wave on monitor in Group B. If too much jelly or secretary sounds were there, then suction catheter was passed through other nostril and secretions were to be removed. Under the guidance of monitoring, we advanced the endotracheal tube in inspiration. When monitoring got lost or diminished, then little withdrawal of the tube and again advancing the tube with minor change in direction i.e. change in head extension or flexion by adding or removing a support behind the chest or adding support to ring below head, change in head side to side rotation was also tried. Tube was advanced into epiglottic opening with maximum breath sounds/ $EtCO_2$ tracing. Position of tube in trachea was confirmed by

EtCO2 weaves at least >6, respiratory movement in circuit, speech ability after inflation of cuff. Bilateral equal auscultation was also confirmed.

Then, Inj. Fentanyl 100 mcg +Inj. Propofol 100 mg + Inj. Atracurium 25 mg.were given intravenously. Cuff waschecked after giving relaxant for any leak. Then patient were kept on ventilator and routine anaesthesia were conducted. Nasogastric tube was passed from other nostril.

During the study we have recorded Time duration of intubation, no. of attempts, and hemodynamic parameters were recorded. If Intubation time > 3 min or patient refuses or SpO2 is <90 or cardiovascular variable changed >20% of base line value, then second attempt was attempted after 3 min. and 3 intubation attempts limited to 3 min each. After a gap of 3 min in between were allowed for intubation. Intubation time was noted from tube insertion to nostril to confirmation of tracheal placement.

During the whole procedure, base line (after giving topicalization, Superior laryngeal nerve block and transtracheal injection), pre intubation, post intubation hemodynamics and SpO_2were recorded.

Nasal bleeding, SpO_2<90,patient discomfort, hemodynamic changes, (20% changes in basal), strider, cough, bronchospasm, laryngospasm were observed intra operatively. Postoperative complication like sore throat and hoarseness of voice were also recorded. Retrograde acceptance level of patient were asked and noted as severity score.

Rest of the management anaesthesia was in conventional way. And patient was shifted to ICU for observation.

Data were collected, tabulated and results were analysed statistically using Student's t test and chi square test and probability values $p<0.05$ were taken as significant.

Observations and Results

Majority of the patients in this study, were for Commando Surgeries or for release of trismus. There was no significant difference with respect to age, sex, weight, height in demographic characteristics of both the Groups (Tab.1).

Tab. No. 1 - Demographic data

Data	Group A	Group B	p value
Age	45.8±15.3	47.3±13.2	0.6547
M:F	24:6	23:7	0.4553
Wt.(Kg)	62.90± 6.23	60.73± 5.43	0.917
Ht(cm.)	150.93±5.94	148.83±5.42	0.921

Awake nasal blind intubation was successful in all 60 patients. The number of attempts was statistically insignificant between both the groups (Tab. 2). 20 were intubated at first attempt, 6 were intubated at second attempt and 4 were intubated at third attempt in Group A, while in

the Group B, 21,5,4 were intubated at first attempt, second attempt, third attempt respectively.

Tab.2. No of attempts

No of attempts	Group A (%)	Group B (%)	P value
1	20(66.6)	21(70)	0.7813
2	6(20)	5(16.6)	0.7386
3	4(13.3)	4(13.3)	NS

The mean time required for successful intubation was comparable. In Group A it was 2.47 ±0.068 min and in Group B it was 2.42±0.057 min. Majority of patients in both the groups took <3min.

Tab. 3. Time for intubation

Time(min)	Group A (%)	Group B (%)	p value
≤3	20(66.6)	21(70)	0.7813
4-7	10(33.3)	9(30)	0.7813
Mean time	2.47±0.068 min	2.42±0.057 min	N S

There was no significant difference at baseline, after airway block as regards to heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure and arterial oxygen saturation. While heart rate, mean arterial blood pressure were significantly increased

immediately after successful intubation in both the groups with insignificant difference. (Tab. 4.)

Tab. 4. Hemodynamic variables

Parameters	Group A	Group B	p value
Pre op HR	81.29±10.3	84.6±11.63	0.6594
Post Intubation HR	94.39±16.3	91±14.43	0.5844
Pre op SBP	118.34±15.3	121±12.23	o.5699
Post Intubation SBP	130.15±16.36	136±14.63	0.5414
Pre op DBP	76.6 ±5.3	74.6.3±6.2	0.8114
Post Intubation DBP	85.7± 6.3	86.3± 5.85	0.35097
Pre op Mean BP	90.50± 8.63	90.08±8.20	0.4236
Post intubation Mean BP	100.5±9.65	102.86±8.77	0.161
Pre op SpO_2	97±3.6	96±4.2	0.163
Post Intubation SpO_2	100±0	100±0	1

Complications during intubation were observed in both the groups and were not statistically significant. None of patients develop bronchospasm, laryngospasm, hypoxia, severe tachycardia and hypertension. Cough was there during intubation in 7 Group A and 8 in Group B. Mild bleeding was observed in 6 in Group A and in 5 in Group B. (Tab.no.5)

Tab. 5. Complication during Intubation

	Group A (%)	Group B (%)	p value
Cough	7(23.3)	8(26.3)	0.889
Bleeding	6(20)	5(16.6)	0.1113

No major post operative complications were observed. Mild sore throat and hoarseness of voice were observed in group A and Group B as shown in Tab. No 6, which were not significant. These post operative complications were for short period and resolved in 24hrs.

Tab. No.6. Post operative complications

Postoperative complications	Group A (%)	Group B (%)	p value
Mild Sore throat	12(40)	11(36.6)	0.061 ns
Hoarseness of voice	10(33.3)	9(30)	0.077 ns

Severity score (Retrograde patient acceptability) were tabulated as per Tab. No. 7. Majority of the patients 23 in Group A and 21 in Group B had no unpleasant experience. 7 patients in Group A and 9 patients in Group B respectively experienced mild uncomfortable during

procedure, which was taken care by assurance. But severity score was not significant in both the groups.

Table no 7. Severity score

Severity score	Group A (%)	Group B (%)	p value
Not unpleasant	23(76.6)	21(70)	0.7744
Uncomfortable/unpleasant	7(23.3)	9(30)	0.7655
Most unpleasant/ Intolerable	0	0	1

Discussion

Difficult airways are a major concern for anesthesiologists. Difficulties with tracheal intubation greatly contribute to morbidity and mortality associated with anesthesia[1]. According to an updated report from the ASA Task Force on Management of the Difficult Airway[2], Awake tracheal intubation is indicated when difficulty in both tracheal intubation and ventilation through a facemask is predicted.

For patients with whom tracheal intubation is either difficult or impossible, blind nasal intubation has become an accepted method for securing an airway[2]. [ABNI] usually does not require availability of a special device or appropriate operator training[6].

Presence of blood and secretions do not increase difficulty in blind nasal intubation unlike fiberoptic technique.

Pre-anesthetic evaluation in order to recognize potentially difficult airways is intended to decrease morbidity and mortality related to airway management. Reviewing patient medical records and establishing medical histories are the first steps in the safe control of airways. Physical examination of the anatomical features of the head and neck is useful for detecting physical characteristics that may indicate presence of a difficult airway.

[ABNI] is easier to describe than to perform.

The nasal mucosa should be gently prepared with nasal mucosal vasoconstrictors and local anesthetic agents, especially on awake patients. The patient's head and neck, if not contraindicated, are then placed in the sniffing position. The endotracheal tube should be lubricated and passed along the floor of the nose beneath the inferior turbinate[7].

Once the endotracheal tube has passed into the nasopharynx, the monitoring of breath sounds becomes the key for successful intubation into trachea.

At each inspiratory effort, the tube should be advanced while constantly monitoring breath sounds either by monitoring bag movement of breathing circuit attached to the nasotracheal tube or monitoring bag movement and EtCO2 of breathing circuit attached to the nasotracheal tube. If advancing the tube results in loss of or reduction in breath sounds, then the tube should be withdrawn to the point at which the breath sounds are maximally heard. The endotracheal tube then can be turned slightly and readvanced with each inspiratory effort. Successful tracheal intubation will be detected by continued auscultation of distant breath sounds, some resistance as the tube passes through the vocal cords, the patient coughing, and the capnographyreading and waveform. This is standard technique of blind nasal intubation[5].

If repeated insertions of the endotracheal tube fail to enter the trachea, then the tube should be withdrawn to the point when the breath sounds are heard loudest. At this point, 10 ml of air can be introduced into the tube cuff (this directing the tube tip anteriorly away from the posterior pharyngeal wall) and the endotracheal tube can be advanced a further 2 cm without loss of breath sounds. The cuff is then deflated and the tube advanced further into the trachea[8]. Most commonly, the tube tends to enter the oesophagus. Extending the patient's neck or providing cricoid pressure tends to align the tube with the glottis and may increase the chances the success. Breathing sounds are confirmed and then the tube is advanced into the trachea through the glottis. If unsuccessful, the patient's head is repositioned and the tube is facilitated via optimal external laryngeal manipulation[8].

In this study we compared the two techniques: 1) by monitoring bag movement of breathing circuit attached to the nasotracheal tube with 2) by monitoring bag movement and EtCO2 of breathing circuit attached to the nasotracheal tube, for performing blind nasal intubation in patients with anticipated difficult intubation. Skill of the physician performing the blind nasal intubation is the main determinant for success. Both techniques provided equal satisfactory results with high degree of success (100%) with no morbidity. In agreement with this study, Davies JAH[9], reached a success rate up to 93% in blind nasal intubation

Average success rate was 71.3% for participating paramedics who previously attempted blind nasal incubation fewer than 4 times[10].

At first attempt, blind nasal intubation was successful in 66.6% in Group A and 70.0% in Group B. In addition, no significant differences observed between both groups in the number of

attempts required for successful intubation as 20% and 13.3% of patients intubated at second attempt in Group A and Group B, while equal number at third attempt in both the groups.

Alain et al[11], in a study including 20 anaesthetized patients wearing a rigid cervical spine collar and breathing spontaneously, found that blind nasal intubation using a cuff inflation technique, was successful in 19 of 20 patients (95%), of them 14 patients was successful in the first attempt (70%).

In contrast, Gold and colleagues[12] found that 40% of their patients required 4-12 attempts for successful blind nasal intubation.

Actually blind nasal intubation is a technique learned only by practice and easily mastered psychomotor skill with a low complication rate[5,13].

Danzl and Thomas[13], reported a success rate of 92% in emergency room patients requiring nasal intubation. The physicians examined had at least 3 months' experience in emergency medicine, but the time taken to intubate and incidence of hypoxia were not recorded.

The high success rate in the present study could be related to ETT selection and proper patient position and communication. Selecting a thin walled, proper curved and slight smaller size ETT, while patient in morning sniff position, be asked to take deep breath during advancing ETT through airway passages could overcome these difficulties. Also, ETT tip could be noticed sticking the lateral laryngeal structures, and should be manipulated accordingly.

In the current study, the mean time required for successful intubation was comparable. In Group A it was 2.47 ±0.068 min and in Group B it was 2.42±0.057 min. Majority of patients in both the groups took <3min for intubation.

Alain VE et al[14]recorded 20.8±23 seconds for intubation using blind nasal when the ETT cuff was inflated in the pharynx.

In present study, there was no significant difference between the two groups regarding hemodynamic parameters. Heart rate and mean arterial blood pressure increased significantly immediately after intubation in both groups which could be attributed to the pressor response of intubation itself, however these changes were within the acceptable clinical range. These change correlates with other studies of blind nasal intubation.

None of patients in the study developed bronchospasm, laryngospasm, hypoxia, severe tachycardia and hypertension. Slight discomfort in 6 and 7 patients respectively in Group A and Group B. Cough was there during intubation in 7 group A and 8 in group B. Mild bleeding was observed in 6 in group A and in 5 in group B. Mucosal trauma with nasal bleeding could be related to the step of blind insertion of ETT through the nasal passages.

No major post operative complications were observed. Mild sore throat and hoarseness of voice were observed in group A[12,10]and Group B[11,9] respectively , which were not significant. These post operative complications were for short period and resolved in 24hrs.

Severity score (Retrograde patient acceptability) were observed in the study. Majority of the patients 23 in group A and 21 in group B had no unpleasant experience. 7 patients in group A

and 9 patients in group B were mild uncomfortable during procedure which was taken care by assurance. But severity score was not significant in both the groups.

Conclusion

Despite the multitude of available airway management techniques, [ABNI] under topical anesthesia may provide an alternative safe technique in cases of anticipated difficult intubation, particularly if the fiberoptic bronchoscope is not available. Its simplicity ensures that it is a less expensive option. Our both techniques are equally good in performance and either can be used for performing [ABNI].

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