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Original Research Article

Comparison between Lignocaine Nebulization and Airway Nerve Block for Awake Fiber Optic Guided Nasotracheal Intubation

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Abstract

Background and Aim: A variety of techniques are currently used for airway anesthesia including Topical Anesthesia or Airway Nerve Blocks. Airway Nerve Blocks are frequently used for awake fiberoptic intubation because they provide rapid and deep anesthesia. The Aim of our study is to compare the effectiveness of 2 methods of anesthetizing the upper airway for awake fiberoptic guided nasotracheal intubation namely Airway Nerve Block versus Airway Nebulization.

Material and Methods: This is a observational prospective clinical study to compare two methods of airway anesthesia for awake fiberoptic nasotracheal intubation in the terms of Ease of intubation, Vocal cord position, Cough severity, Patient comfort, Patient satisfaction and Hemodynamic variability. Patients were divided in two groups. Group N (Patients receiving nebulization), Group B (Patients receiving Nerve Block). All patients were observed for: Assessment of intubating conditions, Hemodynamic conditions and complications.

Results: Among both the groups, the intubating conditions were better for group B patients than group N patients. Among both the groups, patients of group B had less cough then in group N. 27 patients had no cough in group B while 20 had no cough in Group N (P=0.02). There was no significant difference in both the groups regarding hemodynamic changes.

Conclusion: Airway Nerve Blocks is gold standard for airway anesthesia as we get maximum benefit with minimum dose of local anesthetic as compare to Lignocaine Nebulization for awake fiberoptic bronchoscopy-guided nasotracheal intubation, in terms of ease of intubation and patient satisfaction. However, Lignocaine Nebulization can be used as an alternative technique for airway anesthesia when a nerve block is not feasible as we did not observe any case of failure of awake fiberoptic intubation or any complications in group of nebulization.

Keywords: Airway Nerve Blocks, Lignocaine Nebulization, Nasotracheal intubation, Topical Anesthesia

Introduction

The first known attempt to visualize the larynx was made by a Spanish music teacher Manuel Garcia with the help of dental mirror. Alfred Kirstein was the first to report the direct visualization of vocal cords in 1985. Shigeto Ikeda invented the flexible bronchoscope in 1966 [1]. The flexible scope initially employed fiberoptic bundles requiring an external light source for illumination. Later Flexible bronchoscope developed and gained popularity because of easy access to distal portions of tracheobronchial tree, rapid learning curve and less patient discomfort.

Also due to its innate ability to enter through very limited oral or nasal openings, glide along aberrant structures, and follow the contour of the airway in patients with anybody position, body habitus, or age, flexible fiberoptic bronchoscope (FOB) is very much helpful in management of difficult airway (DA) [2].

Dr. Macewen in 1880 accounts in the British Medical Journal of the first awake endotracheal intubation and describes a patient suffering from glottic edema. The patient underwent an awake manual endotracheal intubation using a metallic endotracheal tube (ETT). This technique was performed without benefit of anesthesia and without topical or regional blocks, sedatives, or analgesics.

Although one may perceive this as brutal, Dr. Macewen was aware, more than 130 years ago, that despite the patient's discomfort, the safest method for securing the airway was to perform an awake intubation (AI) rather than to provide comfort at the risk of further compromising the airway.

During awake intubation, laryngospasm and coughing in response to intubation can be troublesome. Thus, effective topical airway anesthesia is mandatory for the comfort of the awake patient and subsequent successful airway instrumentation. Profound topical anesthesia of the airway also reduces the need for higher doses of sedatives and analgesics such as Midazolam and Fentanyl [3].

A prerequisite for awake fiberoptic intubation is appropriate anesthesia of the nose, oropharynx, larynx, and trachea, to suppress airway reflexes and prevent patient discomfort during bronchoscopy and intubation.

A variety of techniques are currently used for airway anesthesia including Topical Anesthesia or Airway Nerve Blocks. Airway Nerve Blocks are frequently used for awake fiberoptic intubation because they provide rapid and deep anesthesia. Nebulization of local anesthetics is another promising technique, in which the airway is anesthetized completely without the need for multiple painful injections and also helpful with those patients in which nerve blocks are impossible due to structural deformity and it is not associated with an inadvertent IV injection of Lignocaine. But nebulization technique need high dose of topical anesthetic so they are associated with higher chance of systemic toxicity [4-6].

When carried out under minimal sedation these techniques help to allay anxiety so the patient is more cooperative during the procedure.

In our study, we used Inj. Midazolam and Inj. Fentanyl for procedural sedation which results in stable hemodynamic profile and prevent desaturation by preserving respiratory function of the patients. Therefore, we compared Airway Nerve Block, which is considered the standard technique for achieving rapid and effective airway anesthesia, with Lignocaine Nebulization, which constitutes a simple, painless, and comfortable alternative for anesthetizing the airway before awake fiberoptic bronchoscopy-guided intubation.

The Aim of our study is to compare the effectiveness of 2 methods of anesthetizing the upper airway for awake fiberoptic guided nasotracheal intubation namely Airway Nerve Block versus Airway Nebulization.

Material and Methods

This is a observational prospective clinical study to compare two methods of airway anesthesia for awake fiberoptic nasotracheal intubation in the terms of Ease of intubation, Vocal cord position, Cough severity, Patient comfort, Patient satisfaction and Hemodynamic variability.

After obtaining the permission from the Institutional Review Board, we included 60 patients in the age group of 20 to 50 years belonging to ASA grade I and II physical status and Mallampatti airway grade I to II posted for elective surgeries under General anesthesia at L.G. Hospital, Maninagar, Ahmedabad during the period of June 2018 to Oct 2020

Thorough pre anesthetic examination was done, patients were informed about the study procedure and an informed written consent was obtained. Investigations included CBC, Blood grouping and Rh typing, Renal function tests(RFT), Liver function tests(LFT), Serum Electrolyte, Chest X- ray, ECG. Patients belonging to ASA III and IV, patient refusal, patients with coagulopathies, patients with local infection in the nose & significantly deviated nasal septum were excluded from the study. All the patients meeting the criteria underwent awake fiberoptic intubation via nasal route under local anesthesia.

Patients were divided in two groups.

- Group N (Patients receiving nebulization)
- Group B (Patients receiving Nerve Block)

On the day of surgery, in pre-operative area, all the monitors were applied & IV line is secured.

Both the group patients received Xylometazoline nasal drops. Group N patients received 10 ml of 4% Lignocaine topical via an electric nebulizer for 20 min. Inside the operation theatre, all the monitors applied and baseline vitals noted. Premedications in the form of Inj. Glycopyrrolate 0.004 mg/kg, Inj. Ondensatron 0.15 mg/kg, Inj. Midazolam 0.02mg/kg, Inj. Fentanyl 2mcg/kg were given. Vitals noted after 5 min of premedication In group B patients received bilateral superior laryngeal nerve block and bilateral glossopharyngeal nerve block injecting 2% of Lignocaine 0.5-2 ml per site along with 10% Lignocaine nasal spray (one puff ≈ 20mg).

Both groups' patients received transtracheal instillation of 3 ml of 4% Lignocaine. Adequate local anesthesia was confirmed by the heaviness of the tongue in group N patients and by hoarseness of the voice in group B patients. Intubation time was defined as the time from passing the flexible fiberoptic bronchoscope tip through the nostril to the placement of (ETT) after viewing the carina. Patient satisfaction was noted 24 hours postoperatively.

All patients were observed for:

Assessment of intubating conditions

Grade	Intubation conditions	Vocal cord position	Cough severity	Patient comfort during intubation	Post intubation assessment	Patient satisfaction
1	Optimal (no hold up of tracheal tube with vocal cords)	Relaxed/ glottis open	No cough	No reaction	Cooperative/ smooth	Excellent
2	Suboptimal (hold up relieved by one rotation of tube)	Moving/ glottis partially open	Slight cough (<2 cough)	Grimacing	Restless/ minimal resistance	Good
3	Difficult (hold up requiring more than one rotation of the tube)	Adducted/ glottis closed	Moderate cough(3-5 cough)	Verbal objection	Severe resistance/ requirement of general anesthesia	Fair
4	Failure (failed attempt at awake fiberoptic intubation)		Severe cough (>5 cough)	Defensive movements		Poor

Grading system used to assess intubating condition, vocal cord position and patient satisfaction [7,8].

Complications like Bleeding, nerve injury, Laryngeal edema, complications related to LA toxicity and others were observed.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Demographic data were similar between the two groups.

Table 1: Demographic data of study participants

Parameter	Groups		P value	Inference
	Group N (Mean±SD)	Group B (Mean±SD)		
Age	37.5±6.84	36±7.72	0.5757	Not significant
Weight	63.8±8.31	63.7±1.13	0.898	Not significant

Gender

Parameter	Groups		P value	Inference
	Group N (Mean±SD)	Group B (Mean±SD)		
Male	17	14	0.4354	Not significant
female	13	16		

ASA Grade

Parameter	Groups		P value	Inference
	Group N (Mean±SD)	Group B (Mean±SD)		
ASA I	23	26	1.0009	Not significant
ASA II	7	4		

There was no statistically significant difference between the groups in relation to age, gender, body weight, or ASA physical status.

The groups were also comparable in terms of airway difficulty, as assessed by modified Mallampatti grade, thyromental distance, and Sternomental distance.

Table 2: Mean Intubation time

Parameter	Groups		P value	Inference
	Group B (Mean±SD)	Group N (Mean±SD)		
Mean intubation time (min)	2.98±0.636	3.583±0.676	0.0001	Highly significant

In both the groups, all the patients were intubated successfully. Mean intubation time for group B was 2.98±0.636 min while mean intubation time for Group N was 3.58±0.676 min Which showed p value 0.0001(Highly significant) Which suggest that mean intubation time was significantly shorter in group B than in group N (Table 2).

Among both the groups, the intubating conditions were better for group B patients than group N patients. Out of total 30 patients, 26 patients had optimal intubating condition in group B while 19 in group N (p=0.036) which was statistically significant. Among both the groups, the Vocal cord positions were better for group B patients than group N patients. Vocal cords were completely open in 27 patients in group B while in 20 patients in group N. (P=0.02) which was statistically significant. Among both the groups, patients of group B had less cough then in group N. 27 patients had no cough in group B while 20 had no cough in Group N (P=0.02). Which was statistically significant.

Table 3: Patient Comfort during intubation

Patient comfort during intubation	Groups		P value	Inference
	Group N (Mean±SD)	Group B (Mean±SD)		
No reaction	19	26	0.036	Significant
Grimace	11	4		
Verbal objection	0	0		
Defensive movements	0	0		

Among both the groups, comfort during intubation was better for group B patients than group N patients. 11 patients in group N had grimace reaction while in group B and only 4 patients showed grimace (p=0.036) which was statistically significant. Among both the groups, post intubation assessment was better for group B patients than group N patients. 27 Patients of group B were cooperative and passage of ETT was smooth during intubation while 20 patients of group N were cooperative. (p=0.02) which was statistically significant.

Table 4: Hemodynamic changes

Time of observation	Parameters	Group N		Group B		P value	Inference
		Mean	SD	Mean	SD		
Baseline	Pulse(/min)	78.8	6.88	80.833	7.97	0.286	Not significant
	SBP(mmHg)	128.73	6.4	128.066	7.93	0.7201	Not significant
	DBP(mmHg)	80.26	6.554	81.4	6.0833	0.4875	Not significant
	MAP(mmHg)	96.422	5.8604	69.95	5.816	0.7263	Not significant
	SPO2(%)	99.866	0.3457	99.866	0.434	1	Not significant
5 Min After Pre-Medication	Pulse(/min)	75.1	5.57	77.63	7.43	0.3133	Not significant
	SBP(mmHg)	121.533	9.4055	122.8	5.71	0.5296	Not significant
	DBP(mmHg)	76.2666	5.818	79	5.375	0.06	Not significant
	MAP(mmHg)	91.3555	4.7415	93.54	4.82	0.08	Not significant
	SPO2(%)	99.433	0.773	99.83	0.46	1	Not significant
Post Intubation 1 Min	Pulse(/min)	90.7	3.26	91.43	4.87	0.497	Not significant
	SBP(mmHg)	130.866	5.888	132.2	3.87	0.3014	Not significant
	DBP(mmHg)	84.266	4.479	84.8	3.88	0.612	Not significant
	MAP(mmHg)	99.8	4.405	100.6	3.19	0.423	Not significant
	SPO2(%)	99.96	0.18	100	0	1	Not significant
Post Intubation 3 Min	Pulse(/min)	84.166	3.16	82.66	3.71	0.111	Not significant
	SBP(mmHg)	127.16	3.19	121	21.39	0.124	Not significant
	DBP(mmHg)	83	4.29	82.4	3.08	0.5362	Not significant
	MAP(mmHg)	97.72	3.35	95.24	7.37	0.099	Not significant
	SPO2(%)	99.96	0.182	99.96	0.18	1	Not significant
Post Intubation 5 Min	Pulse(/min)	79.36	3.488	80.86	3.99	0.126	Not significant
	SBP(mmHg)	122.13	4.36	121.03	6.09	0.424	Not significant
	DBP(mmHg)	79.4	4.14	80.066	3.73	0.681	Not significant
	MAP(mmHg)	93.64	2.94	93.6	3.27	0.954	Not significant
	SPO2(%)	99.96	0.18	99.96	0.18	1	Not significant
Post Intubation 10 Min	Pulse(/min)	74.96	3.91	73.43	4.65	0.17	Not significant
	SBP(mmHg)	117.1	4.685	117.93	7.19	0.6115	Not significant
	DBP(mmHg)	72.4	3.42	73.33	3.45	0.3144	Not significant
	MAP(mmHg)	37.3	3.06	88.2	3.2	0.2709	Not significant
	SPO2(%)	99.966	0.1825	99.96	0.18	1	Not significant

There was no significant difference in both groups regarding hemodynamic changes.

Discussion

Nerve block techniques provide rapid and deep anesthesia with only small dose of local anesthetic drugs. The procedure also involves a risk of accidental intravascular injection, nerve injury and tracheal or laryngeal bleeding. It also required a thorough knowledge of regional anatomy, operator skills and experience but not feasible when there is distorted anatomy, such as massive neck swelling, limited mouth opening and local infection [9]. Nebulization by local anesthetic drugs is an alternative technique that deposits fine droplets of local anesthetic directly over the mucosa, thus anesthetizing the airway and avoid the need of multiple painful injections so patient acceptability is better with nebulization. It also has some disadvantage including the requirement of large dose of LA, a higher chance of failure and a delayed onset of action.

We used a maximum concentration of Lignocaine of 4%, in a possible volume of 10 ml to produce effective anesthesia without causing Lignocaine toxicity. In previous study by Sutherland *et al* [10]. found that Lignocaine Nebulization using a median dose of 512 mg caused toxicity at a plasma concentration above 5 mcg/ml in two of their patients, but that a dose of 370 mg did not lead to toxicity. Gjonaj *et al* [9]. compared 8 mg/kg and 4 mg/kg Lignocaine for nebulization and found both doses to be safe.

As we do not have a way to measure plasma concentration of Lignocaine in the study, we limited the maximum dose of Lignocaine to 400 mg and we did not find any case of Lignocaine toxicity in either group. Mean intubation time for group B was shorter than group N which was statistically highly significant (P=0.0001). This was similar to the findings of the study by Gupta *et al* [11]. who compared two methods of airway anesthesia, namely ultrasonic nebulization by local anesthetic and airway blocks, reported a mean intubation time of 123 ±46.7s in a nerve block group which was shorter than the mean intubation time of nebulizaion group 200.4 ±72.4s which was statistically significant (P = 0.047). In the study of Chavan GN*et al* [12]. compared efficacy of airway blocks (AB) over airway spray(AS) found that mean intubation time for AB group (200 ± 146.35s) was shorter then AS group(266.62 ± 115.86s) which was statistically significant(p<0.01).

In our study, out of total 30 patients, 26 patients had optimal intubating condition in group B while 19 in group N. 11 patients of Group N and 4 patients of group B had suboptimal intubating conditions which was statistically significant (p=0.036). While no patient in either group had difficult intubating condition or failure of intubation. M Jha *et al* [13]. assessed intubating conditions by grading system for intubation assessment score, in which they found that intubating conditions were better with group B than group N. (P=0.0006) which was statistically significant. Mathur *et al* [14]. assessed intubating conditions by grading system for intubation assessment score, in which they found that intubating conditions were better with group B than group N. (P=0.001) which was statistically significant. There was not a single patient with closed glottis in either group. M Jha *et al* [13]. observed that vocal cord positions were better (glottis open) in group B then in group N as assessed by grading system for intubation assessment score. (p=0.0007) which was statistically significant. Hassanein *et al* [15]. observed that vocal cord positions were better (glottis open) in group B then in group N as assessed by grading system for intubation assessment score. (p=0.001) which was statistically significant.

27 Patients of group B, while 20 patients of group N were cooperative during intubation. 10 patients of group N and 3 patients of group

B had minimal resistance to the ETT which was statistically significant (p=0.02). Whereas, No patient of any group had severe resistance to ETT. Hassanein *et al* [15] observed that in post intubation assessment showed patients were more cooperative in group B as assessed by patient comfort indices (P=0.001) which was statistically significant. In our study, patient's satisfaction score was excellent for 25 patients in group B and 18 patients in group N.

Patient's satisfaction score was good for 12 patients of group N and 5 patients of group B. which was statistically significant(P=0.04). In our study there was no significant difference in hemodynamic parameters in both the groups There was no sympathetic stimulation during intubation in our study due to use of Midazolam and Fentanyl intravenously before the procedure in both groups which were effective in producing good sedation [16]. and analgesia without marked alteration of the hemodynamic parameters and respiration thus preventing desaturation and hypoxia. Same results were found in study by Gupta *et al* [11] M jha *et al* [13]. Mathur *et al* [14]. and Reasoner *et al* [17]. Adverse effects, such as sore throat, bleeding, hoarseness and laryngeal edema were not found to differ significantly in both the groups. No other adverse effects, like hypoxia, severe hypotension, severe bradycardia, bradyarrhythmia, bronchospasm, or seizures due to Lignocaine toxicity were recorded in either group.

Limitation of the study were Our study included patients with mallampatti grade 1 & 2 only, so the results cannot be directly applied to cases with difficult airways, in which fiberoptic intubation is most often used; thus, further studies are required. We could not measure the plasma Lignocaine levels of our patients due to the non-availability of this facility at our institution. However, we did not observe any LA related toxicity in any patient.

Conclusion

Airway Nerve Blocks is gold standard for airway anesthesia as we get maximum benefit with minimum dose of local anesthetic as compare to Lignocaine Nebulization for awake fiberoptic bronchoscopy-guided nasotracheal intubation, in terms of ease of intubation and patient satisfaction. However, Lignocaine Nebulization can be used as an alternative technique for airway anesthesia when a nerve block is not feasible as we did not observe any case of failure of awake fiberoptic intubation or any complications in group of nebulization. More studies are required to determine the optimum amount of Lignocaine used for the nebulization with serum Lignocaine levels.

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