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Comparison of Ultrasound / Anatomical landmark guided technique for superior laryngeal nerve block along with Topical Anesthesia for awake nasal intubation in various Oral& faciomaxillary & Dental surgeries

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Study Design: Randomized comparative observational study
Study period: March 2018-Nov2019

ABSTRACT:

Background: Endotracheal intubation is gold standard of general anesthesia. various oral, Maxillofacial, Dental surgeries are carried out in high-risk patients having chances of difficult intubation. If we give sedation or general anesthesia, we can be trapped in critical airway accidents.

Aims & objectives: To access & compare efficacy of anatomical landmark guided/ Ultrasound guided superior laryngeal nerve block associated with topical Anesthesia & transtracheal block for awake blind nasal intubation.

Method:

Group A: Anatomical landmark guided superior laryngeal nerve block given(n=30)

Group B: ultrasound guided superior laryngeal nerve block(n=30)

In both groups topical Anesthesia & transtracheal block for awake blind nasal intubation was given.

Results: upper airway block provide clinical ease to facilitate blind nasal awake intubation. ultrasound guided block has less adverse reactions.

Conclusion: Both methods provide good quality of Endotracheal intubation, but ultrasound guided block is more efficient & scientific method to block superior laryngeal nerve for awake nasal intubation.

Key words: Awake nasal intubation, anatomical landmark guided block, Superior laryngeal nerve block, Ultrasound assistance for block

INTRODUCTION:

Mostly Oral & faciomaxillary & Dental surgeries include trismus, oral injuries and oral tumours with inadequate mouth opening, predicted difficult airway, restricted neck movement and anatomical deformities which can attribute difficult intubation. The American Society of Anaesthesiologists Task Force describes difficult airway as the clinical situation in which an anaesthetist experiences difficulty with facemask ventilation, difficulty in supraglottic device ventilation, difficulty in tracheal intubation or all three. The largest class of causes leading to mortality and serious morbidity in anaesthesia are from airway complications. Failure to intubate and ventilate are responsible for about one third of all anaesthetic deaths. Newer techniques like awake blind nasal intubation, fibreoptic intubation and video laryngoscopy

have been introduced to tackle such situations. Awake blind nasal intubation and fibre-optic intubation are established airway management protocols in the management of the difficult airway. Awake intubation causes discomfort to patients so several techniques have been described to administer upper airway anaesthesia, in order to do an awake intubation in patients with anticipated difficult airway. The objective of the ideal technique is the use of the lowest possible dose of the local anaesthetic agent, to achieve a successful block that facilitates the intubation conditions, and increases the safety and tolerability of the patient. The Superior Laryngeal Nerve has originated from the vagus nerve and it divides into external and internal branches at the level of hyoid bone. The latter transmits the sensory stimulus of the upper mucosa of the vocal folds, the posterior mucosa of the epiglottis, the folds of the arytenoids and the base of the tongue. The rest of the sensory information of the larynx (glottis, cricothyroid membrane, and tracheal mucosa) are the responsibility of the internal laryngeal branch of the recurrent laryngeal nerve. Both internal laryngeal branches of the recurrent and the superior laryngeal nerves join just below the grater horn of the hyoid bone. Ultrasound as a tool for superior laryngeal nerve block has several advantages: to standardize an ultrasound landmark that is ensuring the successful injection of the local anaesthetic and the spread into the target nerve and to avoid puncturing vascular structures and reduce the risk of intoxication with local anaesthetics and to reduce the likelihood of failed blocks, as compared to techniques using anatomic landmarks, by visualizing the needle and the spread of the anaesthetic into the indicated landmark.

METHOD:

This comparative observational study was done in tertiary care hospital during March on2018 to Nov 2019 on 60 adult patients with ASA grade I / II. Patient counselling was done regarding procedure and written informed consent was obtained from each patient.

Inclusion Criteria

Adult patients with ASA grade I/II, of either sex, of 20-60 yrs. of age with BMI<30 undergoing various d**ental, Oral, faciomaxillary surgeries.**

Exclusion criteria

Uncooperative patients, patients with known allergy to local anaesthetics, patients with a history of epilepsy, asthmatics, patients with deranged coagulation profile, hemodynamic instability or with an infection at local site were excluded from the study. Preoperative evaluation including a complete airway assessment was done. Standard fasting guidelines along with anti-aspiration prophylaxis with tablet ranitidine 150 mg were prescribed. Patients were divided randomly in two groups.

Randomization: It was done by odd& even number in seal opaque envelope, execution of Randomization at time of doing awake blind nasal intubation.

Monitoring including electrocardiography, non-invasive blood pressure, pulse oximetry was applied in all patients. An intravenous line was secure and Ringer's lactate was started at 10ml/Kg. After recording baseline heart rate, blood pressure and oxygen saturation, injection glycopyrrolate 5-10 mcg/kg I.M. (before 30 mins), inj. midazolam 0.05-0.15 mg/kg I.V. and inj. fentanyl 1/kg I.V. was given as premedication.

Topical Anaesthesia For anaesthetizing the nasal cavity, nasopharynx, oral cavity and oropharynx, a mixture of plain lignocaine (2%) 5 ml, lignocaine + adrenaline (2%) 5 ml and xylometazoline 8-10 drops was prepared. 2 nasal wicks soaked in it were placed one in each nostril of the patients. Nebulisation with 3-4 ml of the prepared mixture 30 minutes before induction was done. The patients were asked to gargle with the remaining mixture. Lignocaine used during topical application of local anaesthetic to the upper airway results in plasma concentrations well below those that cause symptoms of toxicity (toxic level 6 mcg/ml). Symptoms of lignocaine toxicity include circumoral numbness, facial tingling, restlessness, vertigo, tinnitus, slurred speech among others and severe toxicity may also lead to convulsions, respiratory failure and circulatory collapse. Lipid emulsion therapy should be started at the earliest sign of lignocaine toxicity. 20% intralipid administered in a bolus dose of 1.5 ml/kg lean body mass followed by infusion of 20% intralipid at 15 ml/kg/hr up to a maximum dose of not more than 12 ml/kg should be administered. Oxygen supplementation was given throughout the procedure.

Superior laryngeal nerve block:

In anatomical landmark technique in Group A, the patient's head was extended as much as possible in supine position with the help of a head ring and a sandbag. The patient's skin was cleaned with an appropriate antimicrobial solution. The cornu of the hyoid bone was located below the angle of the mandible. One hand was used to displace the hyoid bone contralaterally, bringing ipsilateral cornu and internal branch of superior laryngeal nerve closer. A 1.5″, 23-gauge needle was inserted in an anteroinferior medial direction until the lateral aspect of the greater cornu was touched. The needle was walked downward toward the midline (1–2 mm) off the inferior border of the greater cornu, the thyrohyoid membrane was pierced the syringe was then aspirated and after confirming negative aspiration for air and blood, 2 ml of LA (2% lidocaine) was injected to block the internal branch of superior laryngeal nerve. Same procedure was repeated on opposite side.

In ultrasound technique in Group B the linear prob was used. Under aseptic precautions, the probe was placed over the submandibular area with parasagittal orientation. The greater horn of hyoid bone and thyroid cartilage were identified as hyperechoic structures. The thyrohyoid muscle and thyrohyoid membrane were between these two structures. SLN space was defined as that bounded by hyoid bone cephalad, thyroid cartilage caudally, thyrohyoid muscle anteriorly and thyrohyoid membrane and pre-epiglottic space posteriorly. By the out-of-plane approach, 2 mL 2% lignocaine was injected using 23-gauge hypodermic needle between the greater horn of hyoid bone and thyroid cartilage just above the thyrohyoid membrane. We have also kept thyrohyoid membrane as a landmark for space like T. Stopar-Pintaric, etal (11). The procedure was repeated on the opposite side.

Transtracheal Block:

Technique for blocking the sensory input of the recurrent laryngeal nerve is by transtracheal block. In this technique, the cricothyroid membrane was located in the midline of the neck. It was located by the three-finger palpating the thyroid prominence and proceeding in a caudal direction. The cricothyroid membrane was identified as the spongy fibromuscular band between the thyroid and cricoid cartilages. After sterile skin preparation, a 23-gauge needle on a syringe with 4 ml of 2% lidocaine was passed perpendicular to the axis of the trachea piercing the membrane. While the needle was advanced, the syringe was continuously aspirated. The needle was advanced until air was freely aspirated, signifying that the needle was in the trachea. Instillation of LA at this point invariably leads to coughing. Through coughing, the LA was dispersed diffusely blocking the sensory nerve endings of the recurrent laryngeal nerve. Now the patients had received topical anaesthesia and two regional blocks.

After that awake nasal intubation done with appropriate size nasal ET tube, patient ask to take deep breath and breathe sound was followed for advancement of ET tube and tube was pushed which slips through vocal cord during deep inspiration. ET tube confirmation was done with $ETCO_2$ and clinical auscultation of breath sounds bilaterally in chest. After confirmation of ET tube, Induction of anaesthesia was done with Inj. propofol 2mg/kg and Inj. atracurium 0.4-0.5mg/kg iv. Anaesthesia was maintained on nitrous oxide, oxygen and sevoflurane.1 MAC. Muscle relaxation and respiration was controlled with inj. atracurium 0.08-0.1 mg/kg iv. Intraoperative period was uneventful. Inj. Dexamethasone 8 mg iv was given to reduce reactionary airway oedema due to manipulation. Patients in whom we failed to intubate were excluded from the study. Vital parameters (HR, BP, SPO_2) were recorded at baseline and thereafter an interval of 1 min until intubation & then periodically upto 10 min after intubation and thereafter all throughout till extubation to access hemodynamic changes perioperatively. Other parameters recorded were intubation score, patient’s comfort score, intubation time, intubation attempts in following manner. Patients were also monitored for anticipated post procedure complications

Intubation Score

It was Assessed during the passage of ET tube to assess the efficacy of airway blocks.

Coughing & limb movements for each

1.None

2.Slight

3.Moderate

4.Severe

Patient’s Comfort Score Intraoperatively was assessed using the following scores

5-Point patient Comfort Score-

1. No reaction
2. Slight grimacing
3. Heavy grimacing
4. Verbal objection
5. Defensive movement of hands or head.

After surgery, neuromuscular blockade was reversed with inj. glycopyrrolate 0.4 mg iv and inj. Neostigmine 0.05 mg/kg iv. Extubating was uneventful. Vital parameters were monitored throughout procedure. Patients were shifted to recovery room with oxygen mask.

Results:

Table 1
Demographics

Parameters	GroupA(n=30)	GroupB(n=30)	P value	Significance
Age(years)	35+/-13	34+/-12	>0.05	NS
Male: female	15:10	14:11	>0.05	NS
ASA grade l/ll	13:12	12:13	>0.05	NS
BodyMassIndex BMI (no.)	25+/-4	26+/-3	>0.05	NS
Duration of surgery(min)	64+/-13	58+/-16	>0.05	NS

Table 2
Intubation parameters

Parameters	Group A(n=30)	Group B(n=30)	P value	Significance
Intubation score(no.)	3.5+/-0.3	2.4+/-0.4	<0.05	S
Patient comfort score(no.)	2.0+/-0.2	1.2+/-0.3	<0.05	S
Intubation time(sec)	110 +/-10	65+/-18	<0.05	S
Intubation attempts(no.)	2+/-0.5	1+/-0.2	<0.001	HS

Table 3
Hemodynamic Parameters

There was a gradual increase in HR, systolic BP (SBP) and diastolic BP (DBP) at each minute during intubation in both groups. Maximum changes were seen at the time of intubation from the basal value, which was significant and gradually normalized towards the basal levels after 3rd min of intubation and even lesser until 10th min of monitoring. Up to20% deviation from the baseline vitals, no pharmacological intervention was done. The SpO2 was well maintained throughout the procedure with insignificant falls seen during intubation.

Time at which parameters taken after intubation	HR GrA (Mean) (n=30)	HR GrB (Mean) (n=30)	SBP GrA (Mean) (n=30)	SBP Gr B (Mean) (n=30)	DBP Gr A (Mean) (n=30)	DBP Gr B (Mean) (n=30)	MAP Gr A (Mean) (n=30)	MAP GrB (Mean) (n=30)	P value (Mean)
Baseline	74	72	118	116	74	72	84	86	>0.05

1 min	96	95	146	144	92	92	110	108	>0.05
3min	90	91	142	140	90	88	96	92	>0.05
5min	84	83	134	130	82	80	90	89	>0.05
7 min	82	80	122	126	80	78	88	86	>0.05
10 min	76	74	120	121	78	76	86	84	>0.05

Complications: Regarding complications we haven't encounter any anticipated complications & adverse effects of drug used in present study.

Discussion

The use of awake blind nasotracheal intubation is well-established and has been extensively supported in the literature for managing the difficult airway. These include, but are not limited, to the following: Compromised airway, restricted or limited neck movement, anatomic deformities, and in general anesthesia where intubation may become highly difficult and challenging in the face of the difficult airway. The difficult airway algorithm which includes a call for help in such a scenario may not be applicable in this case as we do not have much time left after paralyzing the patient.[2] An awake nasal intubation allows the patient to maintain the tonicity of the airway muscles providing a degree of safety that may be lost in the anesthetized, paralyzed patient.[3] Patients' cooperation is very important. Keys to successful intubation include control of secretions by the use of an antisialagogue, adequate sedation to alleviate anxiety, and adequate anesthesia to ensure patient comfort. Through this technique, we blocked the three major reflexes of the patients including gag reflex, cough reflex, and glottis closure reflex by blocking bilateral superior laryngeal, and recurrent laryngeal nerves. In our study, we observed an increase in HR, SBP, DBP and mean arterial pressure during the procedure of intubation (Maximum seen at the time of tracheal intubation) which later on settled until the 3rd to 5th min after intubation was done in both groups which was statistically comparable($p>0.05$).It was similar to that observed by Ovassapian et al[4] while performing nasotracheal intubation in awake patients under LA. In a study conducted by Trivedi and Patil[5] have evaluated airway blocks versus general anesthesia, and concluded that hemodynamic changes were less in airway block patients. In our study by all methods hemodynamic parameters were stable in both groups ($P>0.05$) In our study various intubation parameters like intubation score, patient comfort score are better in group Bas well as intubation time& attempts were also less in group B that is US guided blocks. ($P<0.05$)Kundra et al.[6] compared two methods of anesthetizing the airway for awake fiberoptic nasotracheal intubation which included nebulization with 4 ml of 4% lidocaine and the other received airway block (Trans laryngeal, bilateral superior laryngeal, and lidocaine-soaked cotton swabs in the nose). It was seen that patients who received lidocaine nebulization for airway anesthesia had to undergo significantly higher stress during the insertion of an endotracheal tube through the glottis. The grimace scores, as well as the mean HR and BP in the nebulization group, were significantly higher during endotracheal tube insertion. Gupta et al.[7] showed that patient comfort was better in the nerve blocks group as compared with the nebulization group and also vocal cord visibility and ease of intubation as assessed by the bronchoscopist were better in the nerve block group as compared with the nebulization

group. Trivedi and Patil[5] also showed that postoperative analgesia was better, patients were more calm and required less postoperative nebulization who were given airway block as compared to general anesthesia for taking a laryngeal biopsy. Yu-Chen Liao,etal have given ultrasound guided superior laryngeal nerve block for bronchoscopy (8)
Uday Ambi etal [9]showed that Ultrasound-guided block of ibSLN used as a part of preparation of the airway for awake fiber-optic intubation improves the quality of airway anesthesia and patient tolerance during the procedure.(9)
Regarding complications C H Shu [10] noticed a small, well-circumscribed hematoma, which was contained with manual pressure, and a cuff penetration in a previously intubated patient). Convulsion after receiving left superior laryngeal nerve block, probably caused by accidental injection of local anesthetic into the vertebral artery, was described as another potential complication of superior laryngeal nerve [10].
In our study we haven't encounter any complications or adverse reactions our study, the efficiency and adequacy of the blocks given were assessed by using Intubation score which showed successful application of block in both groups. The further comfort of the patient was assessed by using 5point patient comfort score during the procedure .
Tstopar-pintaric etal [11] mentioned case report, ultrasound was used to help successfully perform the block without diagnosing complications. Therefore, a recent volunteer and cadaver study aimed to develop an anatomical concept for such a technique that is easy to teach, learn and perform. The authors proposed the concept for a new, simpler, consistently reproducible ultrasound-guided block technique, using the thyroid membrane rather than identifying the nerve itself, to define the target plane for low-volume local anesthetic injection [11].

Limitations

-Unavailability of Fiber-optic bronchoscope for intubation at that particular time period, we could not use it for awake intubation

- There was no control group in our study as we want to prepare airway for awake nasal intubation.

Conclusion

In nutshell Superior laryngeal nerve block given by Ultrasound assistance provide better passage of awake nasotracheal intubation then anatomical landmark method.

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