Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

Comparision of Dexmedetomidine, I.V. Lignocaine and Ett/Ambu-Lma Exchange for Smooth Emergence in Tympanoplasty Surgery: A Randomized Prospective Study

S. Sivakumar[1*], Vinodh Mani[2], R. Sankar Anand[3], R. Paul Rafson Jani[4]

[1,2,3]Associate Professor, Department of Anesthesia, Tagore medical college and hospital, Chennai, India.
[4]Assistant Professor, Department of Anesthesia, Tagore medical college and hospital, Chennai, India.
Corresponding Author: S. Sivakumar

(Received: 11 June 2024 Revised: 16 July 2024 Accepted: 10 August 2024)

KEYWORDS

Ambu laryngeal mask airway (AMLA), Endotracheal tube (ETT), Dexmedetomidine, I.V lignocaine , Smooth extubation, Postoperative nausea vomiting (PONV).

ABSTRACT:

Background and Aim: Exchange of the endotracheal tube (ETT) with laryngeal mask airway (LMA) before emergence from anaesthesia, use of dexmedetomidine infusion due to its anxiolytic, analgesic qualities and less respiratory depressant effects, and I.V Lignocaine has long been used to modulate unwanted airway and circulatory reflexes, reduced the complications during extubation with better surgical outcome especially in otolaryngology surgeries. Aim of this randomized-prospective study is to compare the effectiveness of ETT/ ambu laryngeal mask ALMA) exchange , dexmedetomidine and I.V lignocaine for smooth extubation in patients undergoing elective tympanoplasty.

Methods and Materials: 60 patients undergoing elective tympanoplasty under general anaesthesia were randomly divided into three groups- 20 patients in each group. Group I: ALMA (ambu laryngeal mask airway) used for ETT/LM exchange Group II: Dexmedetomidine 1.0 mcg/kg given 10 minutes before the end of surgery and group III : I.V lignocaine 2mg/kg given 10 minutes before end of the surgery.

Results: 18 patients in group I, 17 patients in group II and 14 patient in group III had smooth extubation. All cases in Group I, Group II and Group III maintained a regular respiratory pattern during the study without desaturation and maintaining adequate tidal volume. There was insignificant difference in hemodyamic parameter between the groups.

Conclusion: ETT/ALMA exchange and dexmedetomidine 1.0 µg/kg along with sevoflurane produced better smooth emergence than I.V lignocaine in patients undergoing elective tympanoplasty surgery.

Introduction

A smooth tracheal extubation without haemodynamic changes, bucking/coughing is one of the main goals of anaesthesiologist during general anaesthesia in neurosurgeries, ENT surgeries, and ophthalmological surgeries. The main objective of tympanoplasty surgery are to obtain an intact tympanic membrane, to eliminate pathology in the middle ear and mastoid and to reconstruct the sound transmission [1]. The tympanic membrane graft should be intact without dislodgement after surgery for atleast 6 months. Factors influencing the success rate of tympanoplasty surgery are age, graft type, non-displaced intact graft, Eustachian tube function, size of perforation, smoking habit, bilateral ear disease and nasal septal deviation [2]. Deep extubation is defined as extubating the patient who is breathing spontaneously and deeply anesthetized to suppress laryngeal reflex. This method is useful in tympanoplasty surgery for whom smooth emergence is ideal for graft non-dislodgment. Several methods have been adopted to

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

conduct a smooth extubation, including dexmedetomidine use. Dexmedetomidine could be an attractive alternative for smooth extubation because of its analgesia-anxiolytic qualities and lack of respiratory depression. Dexmedetomidine suppresses airway reflexes and reduction of volatile agent requirements. Dexmedetomidine (1 ug/kg) given at the end of the surgery along with sevoflurane was reported in previous studies to attenuate airway and circulatory reflexes during extubation, without delaying recovery [3]. Lignocaine attenuates the hemodynamic response to tracheal extubation by its direct myocardial depressant effect, central stimulant effect, and peripheral vasodilatory effect and finally, it suppresses the cardiovascular and airway reflexes, an effect on synaptic transmission [5]. Various studies have advocated the exchange of endotracheal tube (ETT) with laryngeal mask airway (LMA) before emergence from anaesthesia. This had minimised complication during extubation without losing airway control. This ETT/laryngeal mask airway (LMA) exchange method is simple and easy to perform and advantage of minimizing complications during extubation with control over airway. There is a general hesitation to perform ETT/LMA exchange because this method involves jeopardize a secure airway.

Aim of this randomized-prospective study is to compare the effectivness of ETT/ ambu laryngeal mask airway(ALMA) exchange and dexmedetomidine and I.V lignocaine for smooth extubation in patients undergoing elective tympanoplasty.

Method and Materials

After getting the institutional ethical Committee approval and informed written Consent from each patient, 60 patients (20-70 year old male and female) undergoing elective tympanoplasty surgery were enrolled in our study. Inclusion criteria: ASA I and II patients. Exclusion criteria: Respiratory disorders (COPD, bronchial asthma, URI), smokers, suspected difficult intubation, systemic hypertension (SHT). 20 Patients were randomly allotted to each group. Group I: ALMA (ambu laryngeal mask airway) was used for ETT/LM exchange Group II: Dexmedetomidine 1.0 mcg/kg given 10 minutes before the end of surgery. Group III : I.V lignocaine 2mg/kg given 10 minutes before the end of the surgery. All patients with 8 hour nil per oral status, anesthesia was induced with intra-venous (I.V) glycopyrolate 0.01- 0.02 mg/kg, inj. Fentanyl 2 µg/kg and Inj.propofol 2 mg/kg, and vecuronium 0.1 mg/kg loading dose given during endotracheal intubation. Ondansetron 0.15mg/kg were intravenously given before surgery. Controlled ventilation maintained with N20: 02 - 2:1 ratio and sevoflurane 1.3 MAC. Inj.vecuronium 0.02mg/kg used as maintenance dose. Routine monitors 5 lead E.C.G, Spo2, pulse rate, ETCO2, neuromuscular monitoring were used. For group I patients at the end of surgery N2O was discontinued and sevoflurane was continued with MAC 1. Residual neuromuscular block reversed with neostigmine (0.04 mg/kg) and glycopyrrolate (0.01 mg/kg). Train-of-four(TOF)ratio >0.9 and return of adequate respiratory tidal volume confirms reversal of adequate neuromuscular block. Inserting LMA device, ETT tube was removed. An adequate and regular spontaneous breath was confirmed clinically and by ETCO2. 100% O2 given through ALMA until patient is fully awake. Sevoflurane was discontinued before LMA removal. After ALMA extubation and Patient's response to ALMA removal was recorded. During this period of exchange ETT/LMA, hemodynamic changes (H.R, B.P) and ETCO2 recorded at pre-extubation, post-extubation prior to LMA placement, post-LMA placement, and immediately after at 3, 5 and 10 min of LMA removal. 10 minutes before the end of the surgery, for group II patients inj.dexmedetomide 1.0 mcg/kg and group III patients, Inj. I.V lignocaine 2mg/kg given as loading dose. Inj.neostigmine 0.04 mg/kg and inj.glycopyrolate 0.01mg/kg given as reversal agent. After deflating the ETT cuff, oropharynx was suctioned gently before removing the tube. Sevoflurane was continued after extubation. If needed, guedels airway was inserted and O2 6-8 Lit/min given via a facemask. Smooth emergence is defined as gross absence of purposeful body movement or coughing, during and after endotracheal tube extubation. Patients with breath holding, laryngospasm or coughing immediately after extubation were regarded as not having a smooth tracheal extubation. Assessment of coughing done using a 5-point scoring scale: 1, no coughing; 2, minimal (1-2 times); 3, moderate (3-5 times); 4, severe (6-10 times); and 5, coughing > 10 times. The upper airway was assessed while patient lying in supine position. Criteria for patent airway: SpO2 >95% while receiving oxygen, normal

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

breath sounds, regular respiratory rate and rhythm, and a normal ETCO2 waveform. If airway obstruction occurs, chin-lift was given. Respiratory pattern, smooth extubation and respiratory complications were assessed. Hemodynamic and respiratory parameters were recorded before anesthesia, during ALMA insertion and removal, Start of dexmedetomidine infusion and I.V lignocaine, at the time of extubation, and at 1, 3, 5, 10, and 15 minutes after extubation. The time from extubation to awake was recored (i.e.,eye opening on verbal command) in PACU. Patients were observed in PACU until they achieved a modified Aldrete score > 9. Assessment of post-operative pain done using A visual analogue scale (VAS) (0–10 scores 0 = no pain,10 = worst pain). If the VAS score was more than 4, a rescue analgesic (IV Fentanyl 1.0 mg/kg) was given. On the first postoperative day (during their hospital stay) regarding post-operative sore throat, PONV and their pain level were recorded.

Results

A total of 60 patients were included in this study, Group I (n = 20), Group II (n = 20) Group III (n = 20). The demographics data of the groups were presented in Table 1. No significant differences between groups in terms of age, sex. body weight, anesthesia duration, or drug dosage. In Group I, 18 patients had a smooth extubation (no coughing during extubation), 2 patient had cough (1-mild and 1- moderate cough) (Table 2). In Group II, 17 patients had smooth extubation, 3 patients had cough(1-mild, 1-moderate, and 1-severe cough). In Group III, 14 patients had smooth extubation, 6 patients had cough(3-mild, 2-moderate, and 1-severe cough). There was only mild difference in percentage of smooth extubation between group I and group II($p>0.05$). No patient in Group I Group II or group III experienced desaturation. No patient required re-intubation. There was a tendency for all patients in Group I Group II and group III to maintain a regular respiratory pattern during study, although the difference between groups did not show statistical significance ($p > 0.05$). The mean arterial pressure(MAP) and HR between study groups in pre LMA time was nearly identical ($P>0.05$). Insignificant difference in MAP(mean arterial pressure) between groups during placement of ALMA, start of dexmedetomidine and I.V lignocaine infusion, at extubation, and at 1,3, 5 and10 min after extubation was noted (Fig. 1). No difference in heart rate (HR) between Groups were noted at 3, 5, and 10 min after extubation ($P > 0.05$) (Table 4, 5, 6). In the PACU, during observation all patient maintained oxygen saturation and all patient maintained SPO2 >95%. One 28-year-old male in Group I exhibited agitation, which was treated with midazolam. The time from extubation to awake (eye opening on verbal command) was comparable between groups (Table 3). More patients in Group I required Fentanyl for analgesia rescue ($p < 0.05$). The incidence of PONV (on the PONV scoring scale 1 or 2) was lower in Group II than in Group I and Group III ($p < 0.05$) (Table 3). Incidence of post-operative sore throat is identical in all study groups. All data in the tables have been presented as mean±standard deviation. Statistical analyse within the group done using paired t-test while those between the groups were analysed using unpaired t-test. Difference between proportions was analysed using chi-square test.

Table 1: Demographic Data

Anesthesia Duration (Min)	122.3±44.4	123.3±48.5	124.4±48.6

Table 2: Extubation characteristics and respiratory pattern

Variables	Group I (n- 20)	Group II (n- 20)	Group III (n- 20)
Smooth extubation	18 (90%)	17 (85%)	14(70%)
Respiratory rate/min	10.6±2.4	11.2±2.2	10.8±2.6

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

End tidal CO2 (mm/Hg)	40.4±10.2	42.2±12.4	38±12.3
Tidal volume (ml)	384.56±140.78	348.45±110.34	362.48±120.48

Table 3: Recovery parameters in the post-anesthesia care unit and on post-operative Day 1

Variables	Group I (n- 20)	Group II (n- 20)	Group III (n- 20)
Time of awake	10.2±5.3	19.4±3.2	12.4±2.8
Rescue analgesia	16(80%)	10(50%)	14(70%)
PONV	08(40%)	04(20%)	09(35%)
Post-op sore throat	6(30%)	6(30%)	4(20%)

Table 4: Hemodynamic changes during peri-extubation period in Group I

Variable	Heart Rate	Mean Arterial Pressure
Pre-extubation	72±3.6	84±6.6
Immediate extubation	74±2.8	80±8.0
Immediate ALMA	70±4.4	78±9.0
3 minutes post ALMA	80±2.8	86±6.8
5minutes post ALMA	76±3.4	88±8.6
Pre ALMA removal	80±2.6	86±7.8
Immediate ALMA removal	78±2.8	86±6.8
5 min after ALMA removal	76±3.4	88±8.6
10 min after ALMA removal	76±2.4	88±7.0

Table 5: Hemodynamic changes during peri-extubation period in Group II

Variables	Heart Rate	Mean Arterial Pressure
Dexmedetomidine infusion	74±3.6	84±6.6
10 min post infusion	72±2.8	76±8.0
Pre extubation	74±4.4	88±9.0
Immediate extubation	78±2.8	80±6.8

Journal of Chemical Health Risks

www.jchr.org

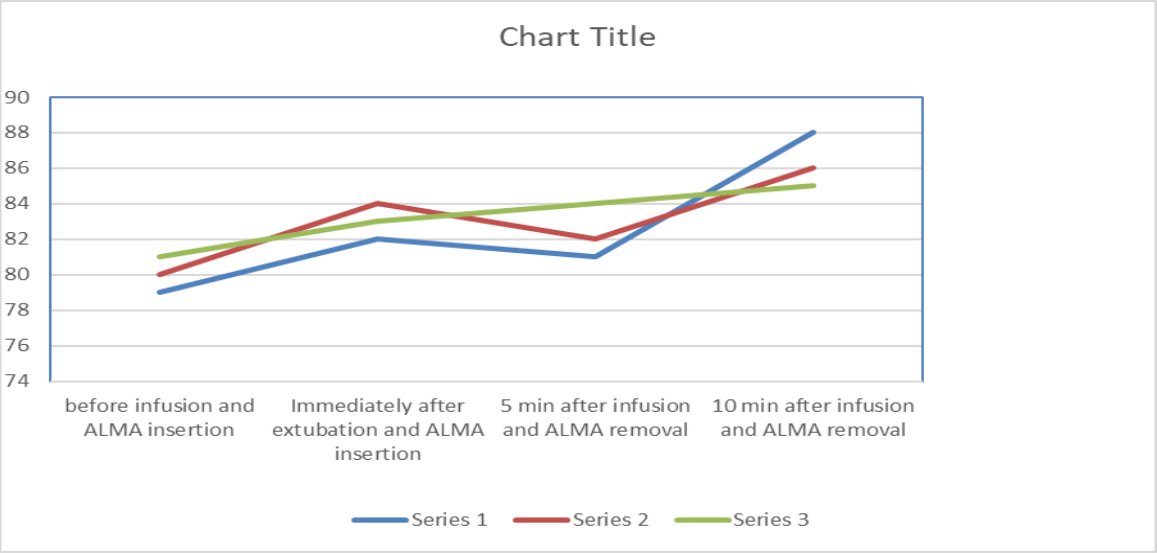
JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

5 minutes after extubation	80±3.4	88±8.6
10 minutes after extubation	76±2.6	86±7.8

Table 6: Hemodynamic changes during peri-extubation period in Group III

Variables	Heart Rate	Mean Arterial Pressure
I.V Ligocaine	80±3.6	84±6.8
10 min post I.V BOLUS	76±2.8	80±8.2
Pre extubation	72±4.0	82±9.2
Immediate extubation	70±2.8	86±6.6
5 minutes after extubation	76±3.0	88±8.4
10 minutes after extubation	74±2.6	86±7.6

Fig. 1 : Hemodynamic changes(MAP) during peri-extubation period



Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

Discussion

Extubation during general anesthesia may be associated with undesirable haemodynamic changes, that may be detrimental for patient with comorbid illness and affects the surgical outcome in otology surgery, eye surgery and neurosurgery[1]. Coughing during extubation is undesirable in tympanoplasty surgery as it disrupts the repaired graft over tympanic memebrane[2]. One way of avoiding such complication in tympanoplasty surgery is to extubate the patient in deep anesthesia plane so that smooth emergence will favour the surgical outcome. This can be done by using higher concentration of inhalational vaporisers or opioid infusion to suppress airway reflexes during extubation, but they may cause delayed recovery time due to their sedative property. Fentanyl, beta-blockers (esmolol, metaprolol), calcium channel blocker will control hemodynamic changes but not the cough reflex during extubation[3]. Dexmedtomidine has effectively suppressed airway reflexes during awake intubation using fexible bronchoscopy[4]. Dexmedetomidine (0.5 μg/kg) infusion at the end of surgery attenuated airway reflexes during extubation. Alternate techniques for smooth extubation is to exchange the ETT with LMA before emergence from general anaesthesia which reduces coughing, and haemodynamic changes associated with extubation [3,4,5]. Studies showed that CLMA is safer extubation airway device' before endotracheal tube extubation and thereafter maintaining airway till patient gets awake. The ALMA is disposal airway device with build-in curve that duplicates the human oral anatomy. The reinforced tip, facilitates insertion easier by pencil technique and without the need of finger guidance technique while inserting this ALMA. Many studies have conducted using CLMA for ETT/LM exchange. Use of AMLA single use disposal device over CLMA will avoid transmission of infections like prion disease and the pencil insertion technique will be beneficial in avoiding unwanted hemodynamic change during LMA placement. The use of I.V. lignocaine is another prophylactic measure that is commonly used by anaesthetists. The mechanism underlying the inhibitory effect of lignocaine on coughing is not completely understood. Many mechanisms have been proposed, including the following: the suppression of airway sensory C fibres,[21] the reduction of neural discharge of peripheral nerve fibres,[22] and the selective depression of pain transmission in the spinal cord[14,15].

During our study all patients maintained spontaneous breath and patent airway without desatuartion. Since we use Sevoflurane during this procedure, ALMA was inserted without difficult and no patients had cough or straining during insertion. 2 patients in Group I had cough after ALMA removal and 3 patients in Group II and 6 patients in Group III had coughing and straining during endotacheal tube extubation. Airway obstruction/ laryngospasm was not observed in any patients in all group. Koga et al. [10]., Dob et al., [12] study supported the above observations that some few patient have cough during LMA removal. Furthermore, fentanyl as analgesia during postoperative period was required by 16 patients in Group I and 14 patients in Group III, but only 10 patients in Group II respectively. Arsian et al.[13] showed that the PONV incidence in otology surgery was 65.7%, and it can be reduced to 22.9% with prophylactic antiemetic injections. Apfel et al.[15] recommended first-line prophylaxis with dexamethosone and ondensetron to prevent nausea and vomiting in postoperative period. We observed that more no. of patients in group I and group III reported nausea and vomiting than group II during postoperative period. This may be due to the antiemetic and opioid-sparing characters of dexmedetomidine[13]. Post-operative sore throat incidence is less in all groups. No patients exhibited severe post-operative sore throat. ETT will cause more post-operative sore throat than LMA[16] . Less postoperative sore throat in our study may be due to smooth emergence without straining during extubation.

Conclusion

Our study concludes that similar to ETT/ALMA exchange, dexmedetomidine 1.0 μg/kg produced smooth tracheal extubation better than IV lignocaine group in patients deeply anesthetized with sevoflurane after tympanoplasty surgery. In addition dexmedetomidine produces less PONVand needs less rescue analgesia due its anti-emetic and opiod sparing properties than other two group (ALMA and IV lignocaine group). Recovery time is delayed in dexmedetomidine group than in other two groups.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1868-1874 | ISSN:2251-6727

References

1. Valley R, Freid, Bailey A, Kopp V, Gerges L, Fletcher , et al. extubating deeply anesthetised paediatric patients: a comparative study of desfluran and sevofluran Anesth Analg. 2003;96:1320–4.
2. Miller K, Harkin C, Bailey P. Postoperative tracheal extubation. Anesth Analg. 1995;80:149–72.
3. Nho J, Lee Y, Kang J, Kim M, Choi Y, Shin Y, et al. Effects of maintaining a remifentanil on the recovery profiles during emergence of anesthesia and tracheal extubation Br J Anaesth.2009;103:817–21.
4. Takita, Yamane, Morimoto Y, Kemmotsu. The ED (95) of end-tidal sevoflurane conc. for the smooth exchange of ETT with laryngel mask airway is 2.97% Can J Anaesth. 2003;50:184–8.
5.K.S. Savitha, Joylin Stephany D'Souza ANK Attenuation of hemodynamic response to extubation with i.v. lignocaine: a randomized clinical trial J Evol Med Dent Sci, 3 (4) (2014), pp. 838-846
6. Sasan H, Sasano N, Hatori T, Tsubuchi H, Tsud T, Katsuy H. Tracheal tube-laryngeal mask exchange to avoid coughing in lung volume reduction surgeries. Masui. 2000;49:278–81.
7. Berges D, Patrick Benderr S, Mc Sweney D, Fernandezz S, Dwonczyk ,K. A comparation of dexmedetomidin and midazolam awake fiber-optic intubation. J Clin Anesth. 2010;22:35–40.
8. Gulerr G, Akin A, Tosunn Z, Eskitascogglu E, Mizzrak A, Boyaaci A. Single-dose of dexmeditomidine attenuate airway and circulatory reflexe during extubation. Actaa Anaesthesioly Scandd. 2005;49:1088–91.
9. Aldrete A. The post-op recovery scores visited. J Clin Anesth. 1995;7:89–91.
10. Brimaacombee J, Brain AIJ. Philadelphia: W Saunders; 1997. The Laryngeal Mask Koga K, Asai T, Vaughann R, Latto P. Respiratory complication and Time of tracheal extubation and use of the laryngeal mask during emergence from anaesthesia. Anaesthesia. 1998;53:540– 4.
11. Stix S, Boromeo CJ, Sciiortino J, Teague P. Learning of exchange an endotracheal tube for a laryngeal airaway device before to emergence. Can J Anaesth. 2001;48:795–9.
12. Dobb DP, Shanon CN, Bailey M. Efficacy and safe of the laryngeal mask (vs) Guedel airway after extubation. Can J Anaesth. 1999;46:179–81].
13. Arsiann M, Demiir M. Prevention of post-operative nausea and vomiting with mild dose of propofol combination with dexamethason 4 mg or dexamethasonalone 8 mg in patients undergoing elective middle ear surgery: a prospective randomised, doubleblinded trial. Bratiissl Lekk Listy. 2011;112:3332–6.
14.Blockade of airway sensory nerves and dyspnea in humans *Pulm Pharmacol Ther.* 2010; **23**:279-282 Tanelian, D.L. · MacIver, M.B.
15.Analgesic concentrations of lidocaine suppress tonic A-delta and C fiber discharges produced by acute injury *Anesthesiology.* 1991; **74**:934-936
16. Apffel C, Kortila K, Abdala M, Kerrger H, Turran A, Veder I, et al. A factorial study of 6 interventional methods for the preventing post-op nausea and vomiting. N Enngl J Med. 2004;350:2441–5