

## Comparison of dexmedetomidine with ETT/Ambu-LMA exchange for smooth emergence in tympanoplasty surgery: a randomized prospective study

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### Abstract

**Background and Aim:** Exchange of the endotracheal tube (ETT) with laryngeal mask airway (LMA) before emergence from anaesthesia and use of dexmedetomidine due to its anxiolytic, analgesic qualities and less respiratory depressant effects, 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 and dexmedetomidine for smooth extubation in patients undergoing elective tympanoplasty

**Methods and Materials:** 60 patients undergoing elective tympanoplasty under general anaesthesia were randomly divided into two groups- 30 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.

**Results:** In group I patients 28 patients and 27 patients in group II had smooth extubation. All cases in Group I and Group II maintained a regular respiratory pattern during the study without desaturation and maintaining adequate tidal volume. There was insignificant difference in hemodynamic parameter between the groups.

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

**Keywords:** Ambu laryngeal mask airway (ALMA), Endotracheal tube (ETT), Dexmedetomidine, Smooth extubation, Postoperative nausea vomiting (PONV)

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### 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<sup>[1]</sup>. 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<sup>[2]</sup>. 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 conduct a smooth extubation, including

dexmedetomidine use and 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 µg/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<sup>[3]</sup>. 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 methods involves jeopardize a secure airway.

Aim of this randomized-prospective study is to compare the effectiveness of ETT/ ambu laryngeal mask airway (ALMA) exchange and dexmedetomidine 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). 30 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.

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 N2O: O2 - 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 N<sub>2</sub>O 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 ETCO<sub>2</sub>. 100% O<sub>2</sub> given through face mask until patientis 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 ETCO<sub>2</sub> recorded at pre-extubation, post-extubation prior to LMA placement, post-LMA placement, and after at 3,5and 10min and immediately after LMA removal and after 3,5 and 10 min. For group II patients, at the end of the surgery inj.dexmedetomide 1.0 mcg/kg given as loading dose. Reversal agent's 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 discontinued after extubation. If needed, guedels airway was inserted and O<sub>2</sub> 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: SpO<sub>2</sub> >95% while receiving oxygen, normal breath sounds, regular respiratory rate and rhythm, and a normal ETCO<sub>2</sub> 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, 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 = 30), Group II (n = 30). The demographics data of the groups were presented in Table 1. No significant differences between groupsI and II in terms of age, sex, body weight, anesthesia duration, or dexmedetomidine dosage. In Group I, 28 patients had a smooth extubation (no coughing during extubation), 2 patient had cough (1- mild and 1- moderate cough) (Table 2). In Group II, 27 patients had smooth extubation, 3 patients had cough(1-mild, 1-moderate, and 1-severe cough). The percentage of smooth extubation was the similar in both Group I and II (p>0.05). No patient in Group I or Group II experienced desaturation. No patient required re-intubation. There was a tendency for all patients in Group I and Group II 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 in both 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 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). In the PACU, during observation all patient maintained oxygen saturation and all patient maintained SPO<sub>2</sub> >95%. One 28-year-oldmale in GroupI exhibited agitation, which was treated with midazolam. The time from extubation to awake (eye opening on verbal command) was comparable in both 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 (p < 0.05) (Table 3). Incidence of

post-operative sore throat is identical in both 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.

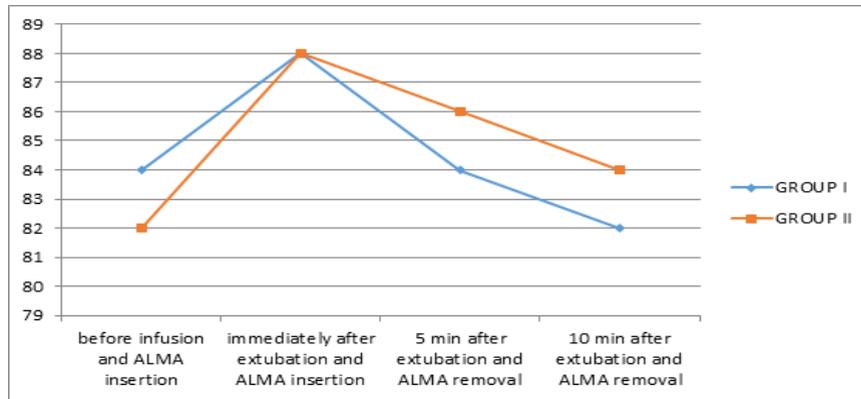


Fig. 1: hemodynamic changes(MAP) during peri-extubation period

Table 1: Demographic Data

Variables	Group I (n-30)	Group II (n-30)
Sex (Male/Female)	18/12	20/10
Age (Years)	45.2±14.3	43.3±13.6
Weight (Kilograms)	64.63±12.4	62.63±14.2
Anesthesia Duration (Min)	121.3±46.4	126.3±50.5
Dose Of Dexmedetomidine	64.8±13.2	63.13±13.8

Table 2: Extubation characteristics and respiratory pattern

Variables	Group I (n- 30)	Group II (n- 30)
Smooth extubation	28 (93%)	27 (90%)
Respiratory rate/min	9.6±2.4	8.2±2.2
End tidal CO <sub>2</sub> (mm/Hg)	42.4±11.2	40.2±14.4
Tidal volume (ml)	387.56±140.78	347.45±100.34

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

Variables	Group I (n- 30)	Group II (n- 30)
Time of awake	10.2±5.3	19.4±3.2
Rescue analgesia	27(90%)	18(60%)
PONV	14(48%)	8(28%)
Post-op sore throat	8(28%)	6(20%)

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

Variable	Heart Rate	Mean Arterial Pressure
Pre-extubation	76.4±4.1	84.4±8.6
Immediate extubation	82.3±3.4	92.2±10.2
Immediate ALMA	78.6±2.8	88.4±9.4
3 minutes post ALMA	78.2±3.6	78.8±6.4
5minutes post ALMA	74.2±2.4	76.6±12.2
Pre ALMA removal	72.8±4.2	78.2±8.2
ImmediateALMA removal	78.6±3.2	82.8±8.8
3 min after ALMA removal	74.4±2.7	84.2±7.4
5 min after ALMA removal	74.2±3.3	82.4±8.2

**Table 5: Hemodynamic changes during peri-extubation period on Group I**

Variables	Heart Rate	Mean Arterial Pressure
Dexmedetomidine infusion	76±3.8	82±6.8
10 min post infusion	70±2.6	78±8.2
Pre extubation	70±4.2	80±9.2
Immediate extubation	80±2.6	88±6.6
3 minutes after extubation	78±3.2	86±8.4
5 minutes after extubation	78±2.8	84±7.6

## 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<sup>[1]</sup>. Coughing during extubation is undesirable in tympanoplasty surgery as it disrupts the repaired graft over tympanic membrane.<sup>[2]</sup> 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. Lignocaine, Fentanyl, beta-blockers (esmolol, metoprolol), calcium channel blocker will control hemodynamic changes but not the cough reflex during extubation<sup>[3]</sup>. Dexmedetomidine has effectively suppressed airway reflexes during awake intubation using flexible bronchoscopy<sup>[4]</sup>. 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<sup>[3,4,5]</sup>. 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.

During our study all patients maintained spontaneous breathe and patent airway without desaturation. 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 had coughing and straining

during endotracheal tube extubation. Airway obstruction/ laryngospasm was not observed in any patients in both group. Koga *et al.*<sup>[10]</sup>, Dob *et al.*,<sup>[12]</sup> study supported the above observations that some few patient have cough during LMA removal. Furthermore, fentanyl as analgesia during postoperative period was required by 27 patients in Group I, but only 18 patients in Group II respectively. Arsian *et al.*<sup>[13]</sup> 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.*<sup>[14]</sup> recommended first-line prophylaxis with dexamethasone and ondansetron to prevent nausea and vomiting in postoperative period. We observed that more no. of patients in group I reported nausea and vomiting than group II during postoperative period. This may be due to the antiemetic and opioid-sparing characters of dexmedetomidine. Post-operative sore throat incidence is less in both groups. No patients exhibited severe post-operative sore throat. ETT will cause more post-operative sore throat than LMA<sup>[13]</sup>. 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 in patients deeply anesthetized with sevoflurane after tympanoplasty surgery. In addition dexmedetomidine produces less PONV due its anti-emetic property than ALMA group. Recovery time is delayed in dexmedetomidine group than ALMA group.

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