Effectiveness of transtracheal lidocaine as an adjunct to general anesthesia in providing patient immobility during total parotidectomy: A comparison with dexmedetomidine infusion

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Abstract

**Background and Aims:** Dexmedetomidine and propofol infusions are increasingly being used to ensure intraoperative patient immobility in the absence of muscle relaxants during parotidectomy. The primary aim of our study was to assess the effectiveness of transtracheal block as an adjunct to general anesthesia in providing patient immobility during total parotidectomy, as compared to dexmedetomidine infusion.

**Material and Methods:** This prospective, randomized study was conducted in 58 patients. Group A patients received a transtracheal injection of 4 ml of 4% lidocaine before induction whereas in Group B, dexmedetomidine 1 mcg/kg was administered intravenously. Following induction and intubation, anesthesia was maintained with oxygen, nitrous oxide, and isoflurane and dexmedetomidine was administered in Group B at a rate of 0.7 mcg/kg/h. In both the groups, if the patient moved, bucked, or if there were signs of inadequate depth of anesthesia, plane of anesthesia was deepened with a bolus of propofol 0.5 mg/kg intravenously. Mann–Whitney U-test and Fisher’s exact test were used for statistical analysis.

**Results:** The number of patients who moved in the transtracheal group was significantly less as compared to dexmedetomidine group (3 vs. 11). Mean heart rates (HRS) were comparable in both groups till 10 min, but between 15 and 180 min, Group B had significantly low HR. Systolic blood pressure (SBP) was significantly high at 10 min following dexmedetomidine bolus in Group B. Though Group B showed low SBP values as compared to Group A from 10 min following induction, the difference became significant between 45 and 180 min. Changes in mean arterial blood pressures followed a similar trend as with SBP.

**Conclusion:** Transtracheal lidocaine ensured patient immobility with hemodynamic stability during total parotidectomy with nerve stimulation studies as compared to intraoperative dexmedetomidine infusion.

**Keywords:** Dexmedetomidine, parotidectomy, transtracheal lidocaine

Introduction

The lurking danger during total parotidectomy is facial nerve injury as dissection of the nerve and its branches forms an integral part of this surgery. The risk may be reduced to a great extent by utilizing nerve identification techniques such as nerve stimulation studies.[1] Muscle relaxants are avoided during these procedures as these drugs interfere with nerve identification. Dexmedetomidine and propofol infusions are increasingly being used to ensure intraoperative patient immobility in the absence of muscle relaxants. Transtracheal block has been suggested as an alternative to propofol infusion to provide patient immobility without hemodynamic instability during total parotidectomy.[2]

The primary aim of our study was to assess the effectiveness of transtracheal block as an adjunct to general anesthesia in providing patient immobility during total parotidectomy,
as compared to dexmedetomidine infusion when muscle relaxants are not used. The secondary objective was to assess hemodynamic stability during the procedure when these two techniques were employed.

**Material and Methods**

This was a prospective, randomized, controlled study. The study population included 58 patients of both sexes, aged 18–60 years, of American Society of Anaesthesiologists (ASA) physical status I and II, who were scheduled to undergo total parotidectomy under general anesthesia with endotracheal intubation (EI).

Patients belonging to ASA III and above, those with uncontrolled hypertension, coronary artery disease, congestive heart failure, renal or hepatic impairment, allergy to lidocaine or dexmedetomidine, chronic obstructive pulmonary disease/bronchial asthma, bleeding disorders, swelling in front of neck, and tracheal pathologies were excluded.

After obtaining approval from the hospital’s Ethical Committee, consenting patients were randomly allocated into two equal groups using computer-generated sequence of random numbers.

Patients were kept nil orally 8 h prior to surgery. After shifting the patient to operation theater and securing an intravenous (IV) access (18 G) pulse-oximeter, electrocardiogram and noninvasive blood pressure (BP) monitors were connected. All patients received glycopyrrolate 0.2 mg, midazolam 2 mg, and morphine 0.2 mg/kg body weight IV.

After recording the baseline vitals, Group A patients received a transtracheal injection of 4 ml of 4% lidocaine, whereas Group B patients did not receive the transtracheal block. No other intervention was done in Group A for 10 min. During this period, in Group B, an IV bolus of dexmedetomidine 1 mcg/kg body weight was administered over 10 min.

Following preoxygenation with 100% oxygen for 3 min, anesthesia was induced with propofol 2.5 mg/kg body weight followed by suxamethonium 2 mg/kg body weight IV to facilitate laryngoscopy and intubation. EI was performed with 7–8 mm cuffed endotracheal tube. A bite block was kept to prevent biting of the endotracheal tube in case the plane of anesthesia became light intraoperatively. Anesthesia was maintained with oxygen (33%), nitrous oxide (66%), and isoflurane (1% end tidal concentration) with mechanical ventilation to maintain end-tidal carbon dioxide levels between 30 and 35 mmHg. In Group B, IV infusion of dexmedetomidine was administered intraoperatively at the rate of 0.7 mcg/kg/h following the initial bolus and in the presence of hypotension, infusion dose was reduced to 0.5 mcg/kg/h.

In both the groups, if the patient moved, bucked on endotracheal tube, or if there were signs of inadequate depth of anesthesia such as tachycardia (heart rate [HR] >100/min) or hypertension (systolic BP >140 mmHg), the plane of anesthesia was deepened with a bolus of propofol 0.5 mg/kg IV. It was repeated in both groups, if required.

HR prior to any intervention (baseline or HR 0) after dexmedetomidine bolus or transtracheal block (HRB) and at 5, 10, 15, 30, 45, 60, 90, and 120 min after induction were recorded. Systolic BP (SBP), diastolic, and mean arterial pressures (MAP) were also documented at the same time points. Intraoperatively, the number of patient movements, if any, was noted.

HR <60/min was treated with IV glycopyrrolate 0.2 mg or atropine 0.6 mg according to severity. Fall in SBP <90 mmHg was initially managed by reducing the rate of dexmedetomidine infusion to 0.5 mcg/kg/h and IV fluid bolus of 200 ml. If SBP fall lasted >5 min, phenylephrine 25-50 mcg boluses were given IV.

No publication was available in the existing literature comparing the effect of transtracheal lidocaine with intraoperative dexmedetomidine assessing patient’s immobility and hemodynamic stability. Hence, this study was initiated as a pilot study with 10 patients in each group. Nine in Group A and seven in Group B remained immobile. Based on this observation, using 80% power and 95% confidence interval, a sample size of 29 in each group was calculated to obtain statistically significant results.

Statistical analysis was performed using IBM SPSS Statistics 20.0 (Bengaluru, India). Mann–Whitney U-test was used to compare the demographics, average HR, SBP, diastolic BP, and mean arterial pressure among groups. Fisher’s exact test was used to compare the intraoperative patient movements in both the groups. Probability value ($P \leq 0.05$) was considered statistically significant.

**Results**

Comparison of age, height, weight, sex, and ASA physical status showed no significant difference between the groups. While analyzing the data for comparing the primary objective, patient immobility, it was found that the number of patients who moved in the transtracheal group was significantly less as
compared to dexmedetomidine group [3 vs. 11, \( P = 0.029 \), Table 1].

Mean HRs were comparable in both groups till 10 min, but between 15 and 180 min, Group B had significantly low HR [\( P < 0.05 \), Table 2]. SBP was significantly high at 10 min following dexmedetomidine bolus in Group B. Though Group B showed low SBP values as compared to Group A from 10 min following induction, the difference became significant between 45 and 180 min. During other time points, SBP was comparable in both the groups [Table 3]. Changes in MAP during the study period [Figure 1] also followed a similar trend as the changes in SBP.

### Discussion

About 60.5% of the patients who undergo total parotidectomy develop facial nerve dysfunction during the first postoperative day, in contrast to only 18.2% following superficial parotidectomy. Intraoperative facial nerve monitoring helps surgeons to identify facial nerve and its branches easily and hence, nerve injury during parotidectomy can be avoided. As muscle relaxants interfere with neuromuscular conduction, these agents are to be avoided when nerve stimulation studies are being conducted. Various techniques are employed to ensure patient immobility while nondepolarizing muscle relaxants are not used intraoperatively.

It has been established that the minimum alveolar concentration (MAC) of inhalational agents to provide immobility during intubation, \( \text{MAC}_\text{EI} \), is much higher than MAC incision values. In other words, it means that intubated patients need a deeper plane of anesthesia to remain immobile in the absence of skeletal muscle relaxants. This can be achieved by using higher concentrations of volatile agents, opioids, or additional doses of induction agents or sedatives. Usually, infusion of either propofol or dexmedetomidine is added to the anesthetic regimen for this purpose, as keeping inhalation agents at \( \text{MAC}_\text{EI} \) for long periods could result in dangerous hemodynamic instability or manifestations of other toxic effects of the agent. Infusions of propofol and dexmedetomidine are also associated with various degrees of hypotension and bradycardia, depending on the dose of the drug administered.

Anesthetizing the larynx and trachea blocks the sensory stimuli arising from the larynx and trachea due to the presence of endotracheal tube and thereby reduces the depth of anesthesia required to ensure immobility intraoperatively. Though there are many techniques to block the superior
laryngeal nerve, transtracheal block is the commonly administered airway block as it is technically easy, requires only a small dose of local anesthetic, and provides reliable anesthesia. Transtracheal block has many applications. It provides stable vitals, good conditions for bronchoscopists, and is not associated with any major complications or patient discomfort, when given for diagnostic bronchoscopies.[4] It has been successfully used as an adjunct to general anesthesia during total parotidectomy[2] as well as brachial plexus surgeries[3] to ensure patient immobility in the absence of muscle relaxants.

Dexmedetomidine, a short-acting α2 agonist, has analgesic- and sedative-sparing properties, with hemodynamic stability. It is considered as an attractive choice for deepening the plane of anesthesia intraoperatively. When used in conjunction, it significantly reduces the dose of propofol infusion required to increase anesthetic depth during spine surgery[5] and with concurrent scalp block, it is an effective and safe anesthetic approach for awake craniotomy.[6] It is being frequently used for postoperative sedation,[7] especially following neurosurgical[8] and cardiovascular procedures, and it is considered as a safe adjuvant analgesic for those susceptible to opioid-induced respiratory depression in the postoperative period.[9] The most frequent adverse events following large bolus of dexmedetomidine are bradycardia and hypertension. The disadvantages are that it is an expensive drug to use[10] and has to be given as an infusion under careful monitoring to avoid peaks and troughs in the blood concentration. The need for an infusion pump to enhance the drug infusion accuracy also adds to the cost of treatment.

The limitations of our study include lack of blinding. Various doses of dexmedetomidine could have been studied to find out the minimum effective dose which provides patient immobility in the absence of muscle relaxants.

Conclusion

Transtracheal lidocaine was found to be more effective in ensuring patient immobility with hemodynamic stability during total parotidectomy with nerve stimulation studies as compared to intraoperative dexmedetomidine infusion.

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Conflicts of interest
There are no conflicts of interest.

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