

Effect of Topical Ropivacaine on the Response to Endotracheal Intubation and Emergence from General Anaesthesia

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Abstract: Introduction: Patients undergoing general anaesthesia can have post operative airway problems like cough, sore throat, & hoarseness of voice. The purpose of this study was to assess whether topical ropivacaine spray can increase the tolerance to endotracheal tube and minimise post operative cough, sore throat & haemodynamic responses. Aims and Objectives: 1) To assess the effect of topical ropivacaine spray on the response to endotracheal intubation and emergence from general anaesthesia. 2) To find out the impact of topical ropivacaine spray in reducing post operative airway problems like cough and sore throat. Materials and Methods: This was a randomized double blind controlled study. It was conducted on 60 patients undergoing surgery under general anaesthesia. Patients were randomly allocated into group R or group C. Patients under group R received 6 ml of 0.5% ropivacaine spray and patients under group C received 6ml of normal saline spray before intubation. Results: On intergroup comparison, the change in heart rate between the two groups were statistically comparable. ($p > 0.05$), the increase in mean systolic blood pressure was significantly more in group C at T2, T3, T5 & T6. ($p < 0.05$) and in mean diastolic blood pressure, increase was significantly more in group C at T2, T5 & T6. ($p < 0.05$) There was statistically significant increase in MAP at T2, T5 & T6 in group C. ($p < 0.05$). The incidence of post operative cough was more in group C and it was statistically significant at 8 hrs & 12 hrs ($p < 0.05$). Patients who complained of sore throat were significantly more in group C at all the recorded timings ($p < 0.05$). Conclusion: Topical ropivacaine spray during induction of anaesthesia increases the tolerance to endotracheal tube. It minimises the haemodynamic fluctuations during extubation, incidence of post operative sore throat, cough, and hoarseness of voice.

Keywords: Cough, Endotracheal tube, 0.5% Ropivacaine, Topical spray, post operative sore throat

1. Introduction

Endotracheal intubation is a widely used and reliable method for airway management during general anaesthesia. It ensures patient ventilation throughout surgical procedures but is associated with certain perioperative complications that can affect patient safety and comfort. Common postoperative airway issues include sore throat, coughing, and hemodynamic changes such as hypertension and tachycardia, caused by airway irritation and sympathetic stimulation during intubation and extubation.⁽¹⁾

Postoperative sore throat is reported in over 50% of patients and results from mucosal damage caused by airway devices. During emergence from anaesthesia, coughing and agitation can increase intracranial, intrathoracic, and intra-abdominal pressures, potentially causing bronchospasm, wound dehiscence, and bleeding. Other laryngeal complications such as hoarseness, dysphonia, and dysphagia may also occur, adversely impacting patient satisfaction.⁽²⁾

Various strategies exist to mitigate these adverse events, including systemic and topical administration of anaesthetic agents. Lidocaine, commonly used as a topical airway anaesthetic, suppresses cough and hemodynamic responses but has a limited duration of action and may wear off during prolonged surgeries. Opioids and dexmedetomidine have also been used but carry risks such as respiratory depression and postoperative nausea.^(5,6,7,8,9)

Recently, ropivacaine- a long-acting local anaesthetic with less cardiotoxicity compared to bupivacaine—has gained

interest for its efficacy in reducing extubation responses. Its prolonged action, sensory-motor nerve blockade, and vasoconstrictive properties make it suitable for topical airway anaesthesia. Studies indicate that ropivacaine reduces cough incidence, stabilizes hemodynamic parameters, and decreases postoperative throat pain. It also penetrates mucosal membranes effectively and maintains therapeutic blood levels for extended periods.⁽¹⁰⁾

2. Materials and Methods

This study was conducted in the department of Anaesthesia and Critical Care, Christian Medical College & hospital, Ludhiana on patients undergoing elective surgeries under general anaesthesia.

Inclusion Criteria: Adult patients of ASA 1 and II category belonging to age group between 18 to 75 years scheduled for elective surgeries under general anaesthesia.

Exclusion Criteria:

- 1) Pregnant patients.
- 2) History of allergy to local anaesthetics,
- 3) Patients with chronic obstructive pulmonary disease and bronchial asthma.
- 4) Patients with G6PD (Glucose 6 phosphate dehydrogenase) deficiency.

After institutional research and ethics committee approval, informed consent was taken, a detailed history and complete physical examination was done. Relevant investigations were checked. All the patients were kept nil per orally for 6 hrs

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prior to induction. They were premedicated with tab alprazolam 0.25 mg HS and in the morning.

Group Allocation

This study was a prospective, patient and investigator blinded randomised controlled study. The patients were randomly divided into Group R or Group C with a 1:1 allocation using computer generated random number. Patients under group R received 6ml of 0.5% ropivacaine spray and patients under group C received 6 ml of normal saline spray. Group assignments were sealed in sequentially numbered opaque envelopes. The anaesthetist who was not involved in the study prepared the experimental drugs according to group assignment in topical spraying devices which had no difference in appearance.

On arrival to operation theatre, an i.v line was secured and 500 ml of NS was given. Patient was attached to Electrocardiography monitor, Non-invasive blood pressure, pulse oximeter and baseline parameters were recorded.

All the patients were induced with iv propofol 1- 2 mg/kg, O₂, N₂O, and isoflurane. Inj. vecuronium was given for muscle relaxation and patient was ventilated via facemask.

After the muscles were fully relaxed, glottis was sprayed with 6 ml of 0.5% Ropivacaine or NS as per group allocation. Assisted breathing was performed via face mask for 2 minutes before intubation.

Patients were intubated with appropriately sized endotracheal tube and anaesthesia was maintained with O₂, N₂O, isoflurane and intermittent boluses of injection vecuronium. Injection fentanyl was used for intra-op analgesia in doses of 1-2microgram/kg.

The time of starting of anaesthesia & surgery was recorded. The systolic, diastolic and mean arterial pressures were recorded at different timings as per the protocol. At the end of surgery, patients were extubated after reversing with inj. glycopyrrolate & neostigmine and the time of completion of surgery and anaesthesia was recorded.

A note was made of coughing & breath holding during extubation.

Patients were followed up for 12 hr after surgery to record the degree of post operative sore throat, cough, hoarseness of voice & dysphagia.

Post operative cough was graded as

Grade 0- no cough

Grade 1- mild cough

Grade 2- moderate cough (more than 1 episode of unsustained coughing (<5secs)

Grade 3- severe cough (>5secs bouts of coughing)⁽¹¹⁾

The data collected was analysed.

3. Results

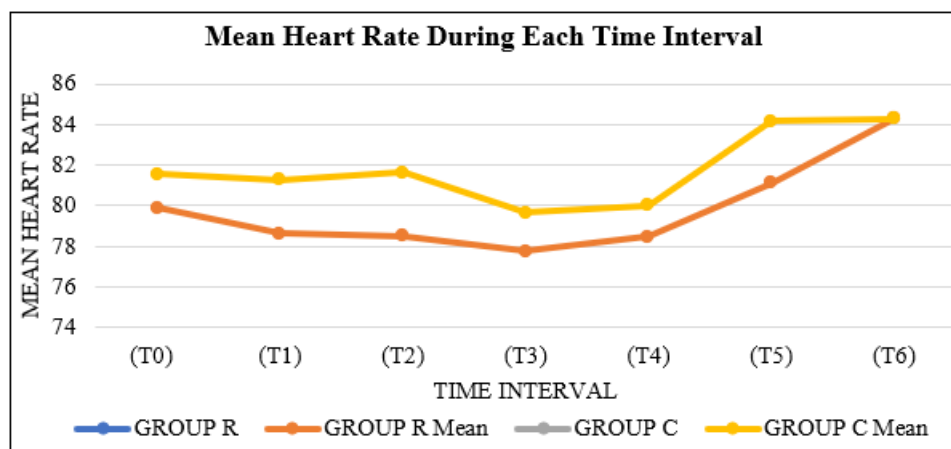


Figure 1: Comparison of mean heart rate between group R and group C

Both the groups were comparable.

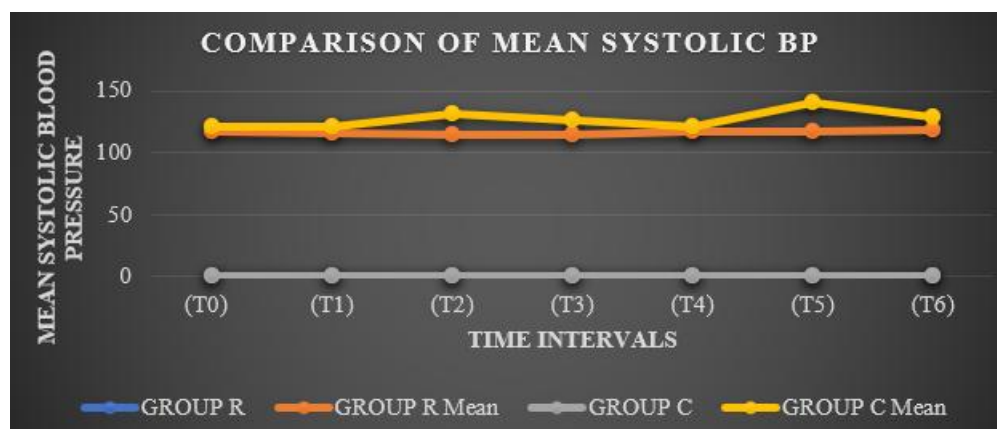


Figure 2: Comparison of mean systolic bp between group R and group C

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The mean systolic blood pressure recorded at all the observed timings was compared between the two groups. The increase in mean systolic blood pressure was significantly more in group C at T2, T3, T5 & T6 ($p < 0.05$).

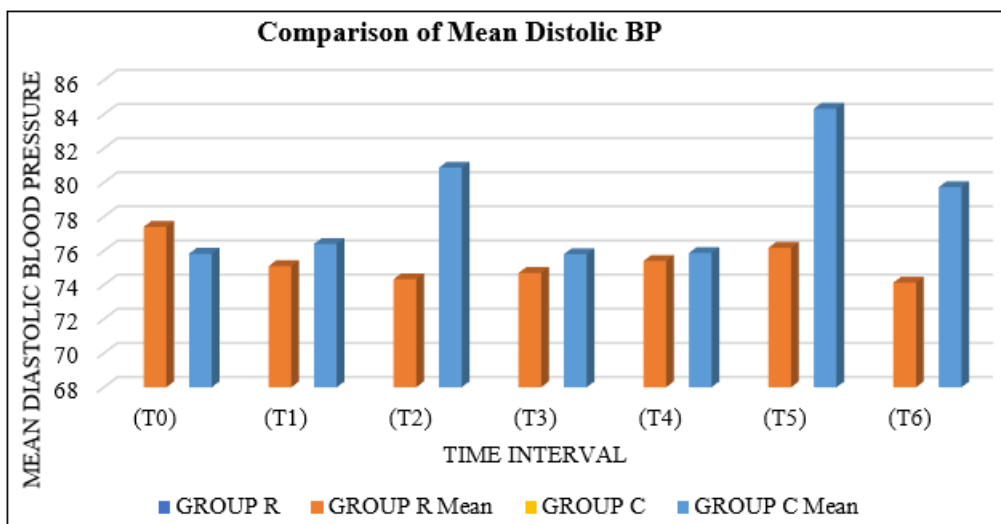


Figure 3: Comparison of mean diastolic blood pressure between group R and group C

The mean diastolic blood pressure recorded during the above-mentioned time intervals was compared between the two groups. It was observed that the increase in mean diastolic blood pressure was significantly more in group C at T2, T5 & T6 ($p < 0.05$).

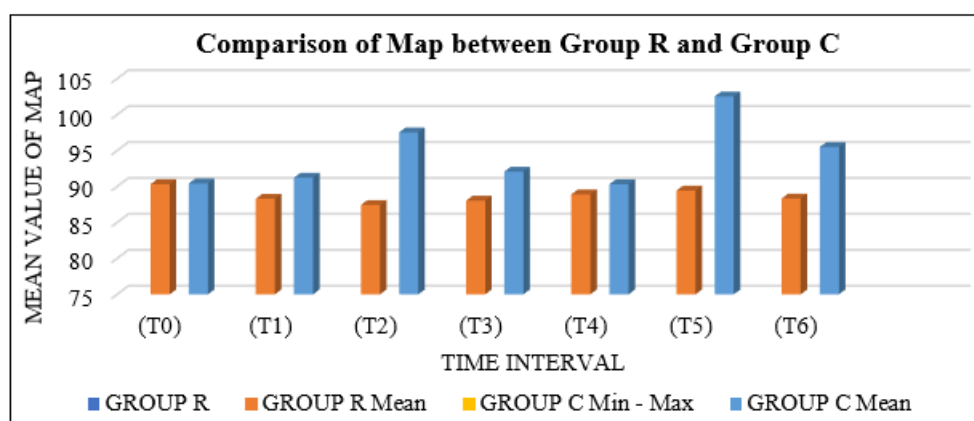


Figure 4: Comparison of mean values of MAP between group R and group C

Similarly the MAP recorded at specified time intervals showed a statistically significant increase at T2, T5 and T6. ($p < 0.05$)

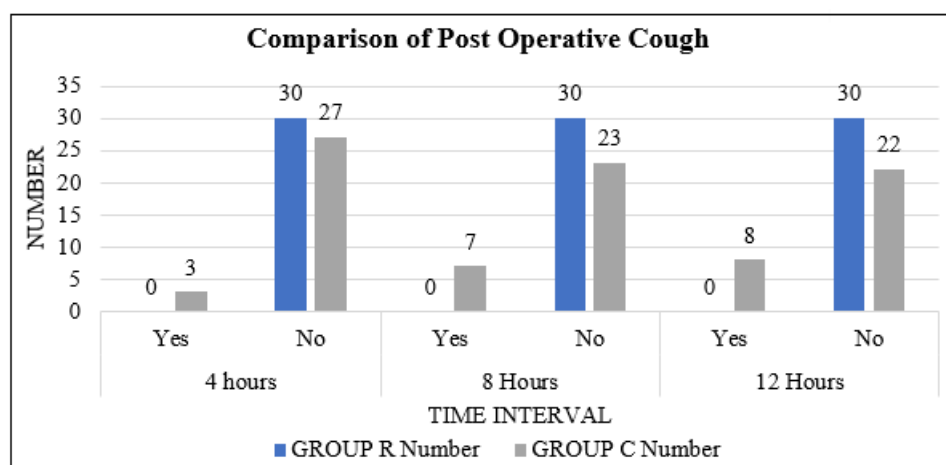


Figure 5: Post-operative cough in group R and group C

In group R, none of the patients had post operative coughing at 4hrs, 8 hrs and 12 hrs post extubation. In group C, 3 patients (10%) had cough at 4 hrs, 7 patients (23.3%) had cough at 8 hrs and 8 patients (26.7%) had cough at 12 hrs. Hence the incidence

of post-operative coughing was more in group C patients and the difference was statistically significant at 8 hrs & 12 hrs ($p < 0.05$).

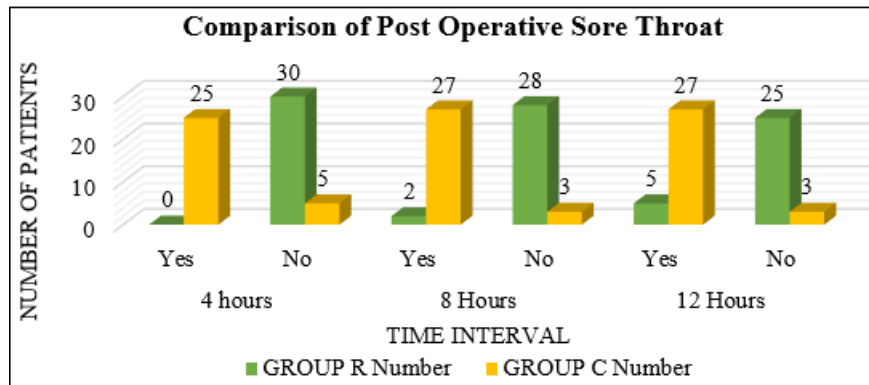


Figure 6: Comparison of post operative sore throat between group R and group C

Post operative sore throat was assessed after surgery. Initial assessment was done at 4 hours after surgery. In group R, no one complained of sore throat at 4 hrs, 2 patients (6.7%) had sore throat at 8 hours and 5 patients (16.7%) complained of sore throat at 12 hours.

In group C, 25 patients (83.3%) complained of sore throat at 4 hours, 27 patients (90%) had sore throat at 8 hours and 27 patients (90%) had sore throat at 12 hours. On statistical analysis, the number of patients who complained of sore throat were significantly more in group C at all the recorded timings ($p < 0.05$)

4. Discussion

Post operative sore throat frequently occurs after general anaesthesia. While clinicians may view it as minor, patients place high importance on prevention of these issues. The practice of airway instrumentation is a significant risk factor for developing this complication, however various techniques can help to lower its incidence.⁽¹²⁾

The act of extubation is physiologically stressful and has been shown to cause increase in blood pressure and heart rate. Additionally, coughing can raise intrathoracic pressure, potentially interfering with venous return to the heart. Drugs commonly used in preparation for extubation such as glycopyrrolate, can cause tachycardia, increasing myocardial demand and possibly resulting in myocardial ischemia. While transient hemodynamic changes during extubation are generally well tolerated in healthy patients, some individuals exhibit an exaggerated response. Patients who have undergone neurosurgical procedures are particularly sensitive to post operative disturbances in the autoregulation of cerebral blood flow, with hypertension potentially leading to brain haemorrhage/ herniation.⁽¹³⁾

In our study, it was observed that both group R and C were comparable on the basis of their demographic profile and duration of anaesthesia and surgery.

We observed the changes in heart rate, systolic blood pressure, diastolic blood pressure and MAP in response to stress of intubation and extubation. In both the groups, an increase in the heart rate was observed but it was statistically

insignificant and the increase was comparable between the two groups.

Similarly, an increase in systolic blood pressure and diastolic blood pressure was observed in both the groups at various observed timings. It was significantly more in control group. Our results were similar to those of Niu et al who reported a significant difference between the two groups in respect to change in systolic blood pressure and diastolic blood pressure.

A significant increase in MAP was seen in group C compared to group R which correlate to the findings of study done by Meng Y F et al.

The number of patients who experienced cough during extubation in group R and C were statistically comparable.

But the incidence of post-operative cough was significantly more in group C compared to group R. Sixty percent of patients in group C had cough either at 4,8 or 12 hours postoperatively whereas none of the patients had postoperative cough in group R. Fang et al also reported that topical spraying of ropivacaine prior to intubation enhanced tube tolerance and decreased post operative cough without respiratory depression.

We also observed that the incidence of post operative sore throat at 4,8 and 12 hours was significantly lower in ropivacaine group.

Saxena et al compared effect of nebulised ropivacaine and dexmedetomidine for prevention of post-operative sore throat. They observed a significant reduction in the incidence of sore throat in both ropivacaine and dexmedetomidine group compared to control group.

We didn't observe hoarseness of voice in any patients in either of the groups. Our findings are similar to those of Fang et al. However, 3 patients (10%) in group C complained of dysphagia at 8 and 12 hours.

There was no incidence of dysphonia in any patients in either of the groups.

Hence in our study we observed that topical spraying of ropivacaine is beneficial in attenuating the haemodynamic responses at extubation and other complications like cough, sore throat, breath holding etc.

5. Conclusions

Topical ropivacaine spray during induction of anaesthesia is effective in increasing the tolerance to endotracheal tube. It minimizes the haemodynamic fluctuations during extubation and also plays a role in minimising the incidence of post-operative airway complications. Hence topical spraying of ropivacaine is a useful adjunct in patients undergoing general anaesthesia for reducing post-operative airway problems.

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