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ORIGINAL RESEARCH

The Efficacy of Combined Regional Nerve Blocks in Awake Nasotracheal Fiberoptic Intubation in Anticipated Difficult Airways

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ABSTRACT

Background: Awake nasotracheal fiberoptic intubation (FOI) is essential for managing patients with anticipated difficult airways, allowing continuous airway visualization and preserving spontaneous respiration. Although effective, awake FOI can be distressing, necessitating the use of regional anaesthesia to enhance patient comfort. Combined regional nerve blocks, targeting the glossopharyngeal, superior laryngeal, and recurrent laryngeal nerves, have shown promise in reducing patient discomfort and improving procedural outcomes. **Methods:** This prospective observational study involved 30 adult patients with anticipated difficult airways requiring awake nasotracheal FOI. All patients underwent combined regional nerve blocks using 10% lignocaine spray, injection2% and 4% lignocaine to anesthetize the targeted nerves. Hemodynamic parameters, intubation time, patient comfort, and satisfaction were assessed during and after the procedure. **Results:** Significant hemodynamic changes were observed during intubation, with heart rate, systolic, diastolic, and mean arterial pressures all increasing notably from baseline ($p < 0.001$). However, these parameters returned to near-baseline levels within 10 minutes post-intubation. The mean intubation time was 2.2 minutes. Most patients (56%) exhibited minimal discomfort, and 90% reported high satisfaction, indicating the procedure's effectiveness and tolerability. **Conclusion:** Combined regional nerve blocks during awake nasotracheal FOI are effective in managing anticipated difficult airways. The procedure results in transient hemodynamic changes, minimal patient discomfort, and high satisfaction, supporting its use as a safe and efficient method for airway management.

Keywords: Awake fiberoptic intubation, regional nerve blocks, difficult airway, patient comfort, hemodynamic stability.

INTRODUCTION

Awake nasotracheal fiberoptic intubation (FOI) is a vital technique in the management of patients with anticipated difficult airways. It allows for continuous visualization of the airway while maintaining spontaneous respiration, thereby minimizing the risk of airway compromise during the procedure [1]. Despite its advantages, awake FOI can be distressing for patients, often necessitating the use of regional anaesthesia to ensure both comfort and cooperation [2].

Combined regional nerve blocks have emerged as an effective anaesthetic strategy during awake FOI, particularly in patients with challenging airways. These blocks typically involve the glossopharyngeal, superior laryngeal, and recurrent laryngeal nerves, providing targeted anaesthesia to the pharynx, larynx, and trachea [3]. The use of these nerve blocks has been associated with significant reductions in patient discomfort and stress responses. In fact, studies report a reduction in heart rate by approximately 15% and systolic blood pressure by up to 20% during awake FOI when nerve blocks are used [4].

Since Murphy's pioneering use of a fiberoptic bronchoscope for nasal intubation in 1967, the procedure has seen significant advancements [5]. For instance, the integration of combined regional nerve blocks has been shown to improve the intubation success rate by up to 30% and reduce intubation time by an average of 1.5 minutes compared to traditional methods [6,7]. In a study by Chatrath et al., the use of combined regional nerve blocks during awake FOI resulted in a 90% patient satisfaction rate, with minimal hemodynamic fluctuations and a significant reduction in the incidence of postoperative complications [8].

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This study aims to evaluate the efficacy of combined regional nerve blocks in awake nasotracheal FOI for patients with anticipated difficult airways. By examining hemodynamic changes, patient comfort, and success rates, this research seeks to bolster the existing evidence supporting the utility of these nerve blocks in improving the safety and effectiveness of airway management.

MATERIALS AND METHODS

Study Design: This study was a prospective observational study conducted at the Department of Anaesthesia of tertiary care hospital of central India shri Shankaracharya institute of medical sciences Bhilai Chhattisgarh. It was designed to evaluate the efficacy of combined regional nerve blocks during awake nasotracheal fiberoptic intubation (FOI) in patients with anticipated difficult airways.

Study Population: The study included 30 adult patients aged 18-65 years who were classified as American Society of Anaesthesiologists (ASA) Grade I–II. All participants had a restricted mouth opening of 2 fingers or less, which necessitated awake nasotracheal intubation. Patients with coagulopathy, local infection at the site of nerve blocks, or known allergies to local anaesthetics were excluded from the study.

Nerve Block Procedure: Patients received three regional nerve blocks: bilateral glossopharyngeal nerve block, bilateral superior laryngeal nerve block, and recurrent laryngeal nerve block. The nerve blocks were performed using lignocaine 10 % spray and injection 2%,4 % lignocaine.

1. Glossopharyngeal Nerve Block: The glossopharyngeal nerve was blocked bilaterally using 10% lignocaine spray. Two puffs were sprayed on both sides at the base of the tonsillar pillars, and the patient was asked to gargle the excess solution.
2. Superior Laryngeal Nerve Block: The superior laryngeal nerve was blocked bilaterally by gently displacing the hyoid bone towards the side to be blocked. A 2 ml injection of 2% lignocaine was administered just below and medial to the greater cornu of the hyoid bone.
3. Recurrent Laryngeal Nerve Block: The recurrent laryngeal nerve was blocked after identifying the cricothyroid membrane. A 22G needle was passed through the membrane, followed by an injection of 3 ml of 4% lignocaine after aspiration of air.

Intubation Procedure

In the operating room, an intravenous (IV) line was established, and standard monitoring was instituted, including electrocardiogram (ECG), oxygen saturation (SpO2), and non-invasive blood pressure (NIBP). Patients were positioned supine for nasal intubation. The patent nostril was identified using an occlusion test, and 2 drops of 0.1% oxymetazoline, a vasoconstrictor, were instilled into both nostrils. This was followed by the application of 2% lignocaine jelly to the selected nostril, which the patient was instructed to sniff. Patent nostril was dilated by nasal airways of different sizes like 6,6.5,7,7.5 and 8 according to patients.

The fiberoptic bronchoscope was then used to perform the nasotracheal intubation under direct visualization. The success of intubation, patient comfort, and hemodynamic changes were carefully monitored throughout the procedure.

Data Collection

Vital parameters, including heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP), were recorded at one-minute intervals until the completion of intubation. Post-intubation readings were taken every two minutes for ten minutes. Other parameters recorded included the intubation score, patient comfort score, intubation time, number of intubation attempts, intraoperative complications, and postoperative patient satisfaction scores.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics version 28.0. Descriptive statistics were used to summarize patient characteristics. The paired t-test was employed for intragroup comparisons of parametric data. A significance level of $P < 0.05$ was considered statistically significant, and $P < 0.001$ was deemed highly significant.

Ethical Approval

Ethical approval for the study was obtained from the Institutional Ethics Committee of SSIMS Bhilai. Informed consent was obtained from all patients prior to their participation in the study.

RESULTS

Table 1: Hemodynamic Changes During Fiberoptic Intubation

Parameter	Basal Value (Mean ± SD)	Maximum Increase (Mean ± SD)	Mean Change from Basal Value	P Value
HR	78.84 ± 9.12	98.06 ± 9.31	15.22 ± 6.07	0.001
SBP	125.15 ± 10.03	142.76 ± 8.66	23.31 ± 5.83	0.001
DBP	71.52 ± 6.24	85.68 ± 4.97	14.33 ± 5.11	0.001
MAP	89.42 ± 4.98	104.15 ± 5.20	15.01 ± 4.45	0

HR: Heart Rate, SBP: Systolic Blood Pressure,
DBP:Diastolic Blood Pressure, MAP: Mean Arterial Pressure

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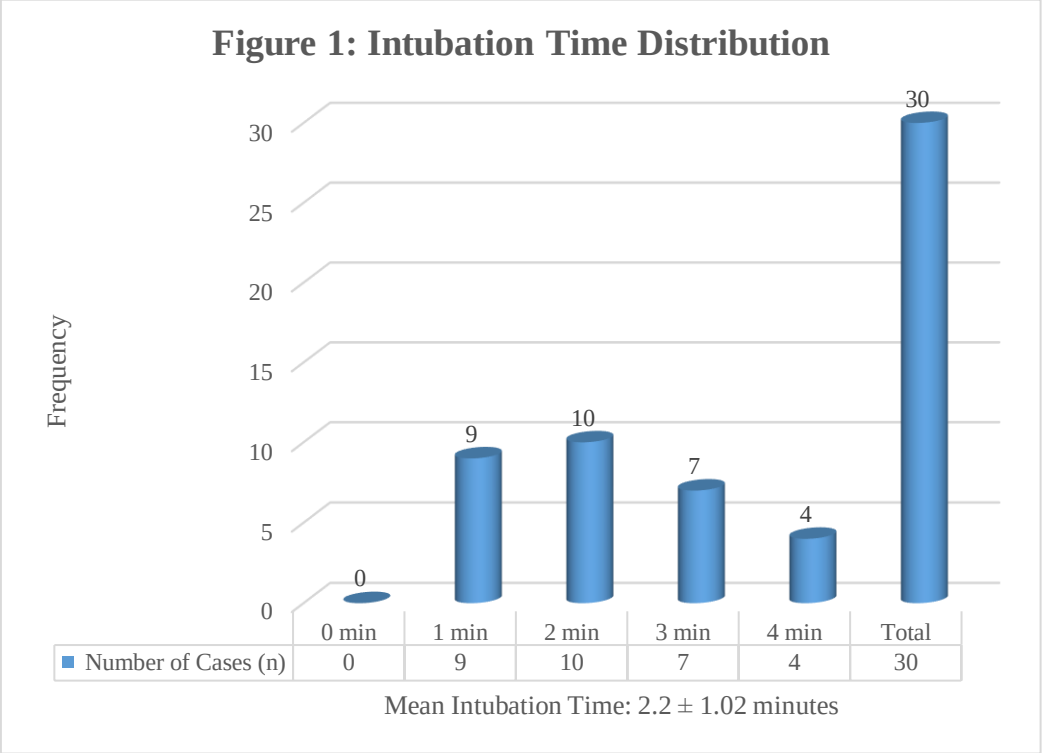
There was a significant increase in all measured parameters from their basal values. Heart rate (HR) increased from 78.84 ± 9.12 to 98.06 ± 9.31, with a mean change of 15.22 ± 6.07. Systolic blood pressure (SBP) rose from 125.15 ± 10.03 to 142.76 ± 8.66, showing a mean change of 23.31 ± 5.83. Diastolic blood pressure (DBP) increased from 71.52 ± 6.24 to 85.68 ± 4.97, with a mean change of 14.33 ± 5.11. Mean arterial pressure (MAP) also increased from 89.42 ± 4.98 to 104.15 ± 5.20, with a mean change of 15.01 ± 4.45. All changes were statistically significant (P = 0.001 for HR, SBP, and DBP; P < 0.001 for MAP) (Table 1).

Table 2: Hemodynamic Changes at 4- and 10-Minutes Post-Intubation

Parameter	Basal Value (Mean ± SD)	Changed Value at 4th Minute (Mean ± SD)	P Value	Changed Value at 10th Minute (Mean ± SD)	P Value
HR	78.84 ± 9.12	79.18 ± 7.95	0.493	73.18 ± 6.79	0.001
SBP	125.15 ± 10.03	126.02 ± 9.43	0.249	117.52 ± 8.08	0.001
DBP	71.52 ± 6.24	73.16 ± 6.79	0.068	66.34 ± 5.16	0.001
MAP	89.42 ± 4.98	90.03 ± 5.22	0.352	84.03 ± 5.22	0.001

HR: Heart Rate, **SBP:** Systolic Blood Pressure,
DBP: Diastolic Blood Pressure, **MAP:** Mean Arterial Pressure

At 4 minutes, there were minor increases in heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) compared to basal values, with P values indicating no significant changes (HR: 0.493, SBP: 0.249, DBP: 0.068, MAP: 0.352). However, by 10 minutes, significant decreases were observed for HR (73.18 ± 6.79, P = 0.001), SBP (117.52 ± 8.08, P = 0.001), DBP (66.34 ± 5.16, P = 0.001), and MAP (84.03 ± 5.22, P = 0.001), reflecting a return towards baseline values over time (Table 2).



The majority of cases (63.33%) had intubation times of 2 minutes or less. The most common time was 1 minute, accounting for 30% of cases. As the intubation time increases, the frequency decreases, with only 13.33% of cases taking 4 minutes. The average intubation time was 2.2 minutes with a standard deviation of 1.02 minutes, indicating a moderate variation in the times (Figure 1).

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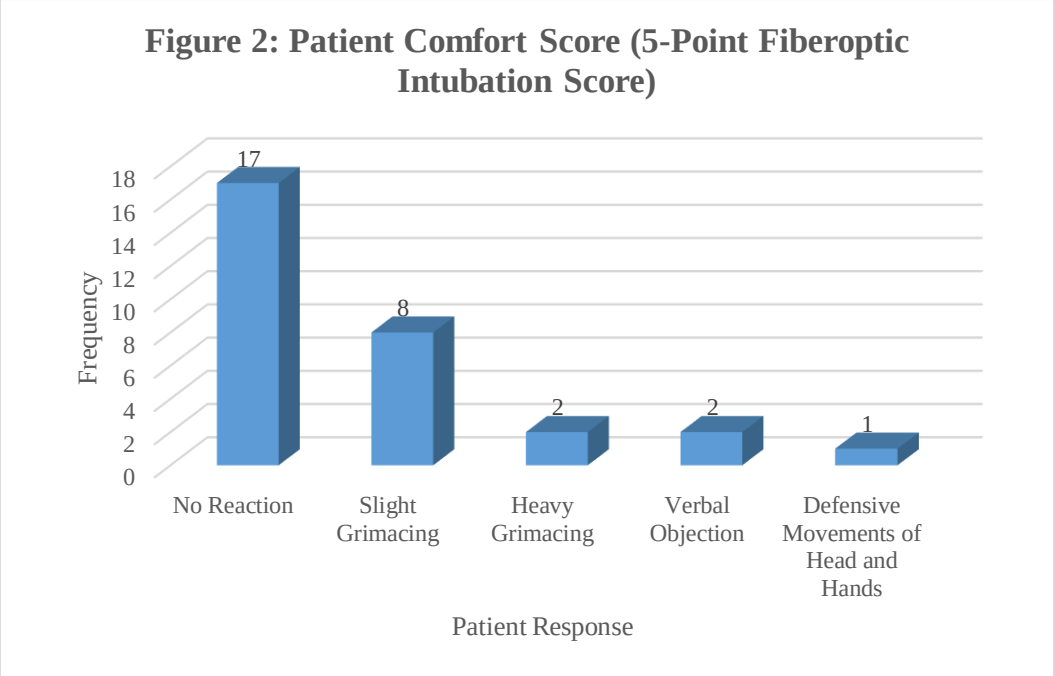

Most patients (56%) showed no reaction, indicating good tolerance. A significant number (27%) exhibited slight grimacing, suggesting mild discomfort. Fewer patients displayed more pronounced discomfort, such as heavy grimacing, verbal objections, or defensive movements, with these responses collectively accounting for only 17% of cases. This suggests that while most patients experienced minimal discomfort, a small proportion showed notable signs of discomfort during the procedure (Figure 2).

A majority of patients rated their experience as "Excellent" (54%), reflecting high overall satisfaction. A substantial portion also rated it as "Good" (36%), indicating a generally positive experience. Fewer patients rated their satisfaction as "Reasonable" (8%) or "Poor" (2%), suggesting that while most patients were satisfied, a small percentage had less favourable opinions. Overall, the high proportion of excellent and good ratings suggests that the majority of patients were satisfied with the procedure (Figure 3).

DISCUSSION

The present study evaluated hemodynamic changes during fiberoptic intubation and assessed patient comfort and satisfaction scores, offering insights into the efficacy and safety of this technique in managing anticipated difficult airways.

Hemodynamic Changes

Our study results show significant hemodynamic alterations during fiberoptic intubation. Notably, there were substantial increases in heart rate (HR), systolic

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blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) from basal values. These findings align with existing literature indicating that fiberoptic intubation, especially in patients with anticipated difficult airways, can provoke notable cardiovascular responses due to sympathetic stimulation and stress associated with airway manipulation [9, 10].

The peak increases observed in SBP and DBP (23.31 ± 5.83 mmHg and 14.33 ± 5.11 mmHg, respectively) are consistent with studies by Wong DT et al., which reported similar hemodynamic spikes during fiberoptic intubation [11]. The significant rise in HR (15.22 ± 6.07 bpm) is corroborated by a study by Langeron O et al., which emphasized the importance of monitoring cardiovascular parameters closely during such procedures [12]. MAP changes also reflect the impact of intubation on systemic vascular resistance, which is crucial for anaesthesiologists to manage [13].

Post-Intubation Hemodynamic

In this study, at 4 minutes, the parameters remained relatively stable compared to baseline, but by 10 minutes, significant reductions were noted, indicating a return towards baseline values. This transient nature of hemodynamic responses suggests that while fiberoptic intubation is acutely stressful, the body tends to stabilize relatively quickly [14].

The decrease in HR and blood pressure by the 10th minute is consistent with findings from studies like those of Lee A et al., who observed a similar trend in hemodynamic recovery post-intubation [15]. This implies that despite initial increases, the procedure's long-term cardiovascular impact is minimal.

Intubation Time

Our study results reveals that the majority of intubations were completed within 2-3 minutes, with a mean intubation time of 2.2 ± 1.02 minutes. These findings are in line with other studies indicating that fiberoptic intubation is a time-efficient procedure for managing difficult airways when performed by experienced practitioners [16]. The quick intubation times underscore the technique's efficiency, though variability exists, which might reflect different levels of operator skill or patient anatomy.

Patient Comfort and Satisfaction

In our study the majority of patients exhibited no reaction or slight grimacing, with only a small percentage showing more severe discomfort. This relatively high level of comfort is indicative of the procedure's effectiveness in minimizing discomfort, corroborating studies by Brimacombe J et al., which found that modern fiberoptic techniques often lead to satisfactory patient comfort levels [17].

The high satisfaction rate (90%) reported in this study is consistent with literature suggesting that fiberoptic intubation, while invasive, generally results in good patient outcomes and satisfaction [18]. The low percentage of poor satisfaction (2%) emphasizes the overall positive reception of this technique among patients, reflecting its safety and effectiveness in clinical practice.

CONCLUSION

Fiberoptic intubation is an effective and well-tolerated technique for managing anticipated difficult airways, demonstrating significant but transient hemodynamic changes that return to baseline within minutes post-procedure. The procedure is efficient, with the majority of intubations completed within a clinically acceptable time frame. Patient comfort and satisfaction scores are high, indicating minimal discomfort and a positive overall experience. These findings support the use of fiberoptic intubation as a safe and effective method in airway management when performed by skilled practitioners.

Limitations

This study has several limitations. The small sample size of 30 patients and single-institution setting may affect the generalizability of the results. The observational design does not account for potential biases or unmeasured variables. Additionally, long-term outcomes and complications were not assessed, which could provide a more comprehensive evaluation of fiberoptic intubation. Future research with larger, multicentre studies and longer follow-up is needed to address these limitations.

Conflict of interest

The authors declare no conflicts of interest related to this study.

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