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Efficacy of Intracuff Alkalinised Lignocaine Versus Normal Saline in Reducing Postoperative Sore Throat in Elective Surgery

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ABSTRACT

Background: Postoperative sore throat is a common difficulty following general anaesthesia with endotracheal intubation, often contributing to important patient discomfort. Alkalised lignocaine has been proposed as an effective strategy to mitigate this problem due to its enhanced mucosal penetration and prolonged anaesthetic effect. To compare the efficacy of intracuff alkalinised lignocaine versus normal saline in reducing the incidence and severity of POST in patients undergoing elective surgery under general anaesthesia.

Methods: This prospective, randomised, double-blinded study was conducted on 80 ASA I and II patients aged ≥18 years, scheduled for elective surgeries durnig the period of one year. Participants were casually assigned to two groups of 40 each: Group A received 2% lignocaine with 8.4% sodium bicarbonate for endotracheal tube cuff inflation, while Group B received normal saline. POST was evaluated at 0, 2, 12, and 24 hours post-extubation using a validated four-point scale. Data were analysed using appropriate statistical tests, with $p<0.05$ considered significant.

Results: Demographic variables were comparable between groups. POST scores were significantly lower in Group A at 2 hours (1.72±0.45 vs. 1.90±0.48; $p=0.033$), 12 hours (0.90±0.40 vs. 1.65±0.52; $p<0.001$), and 24 hours (0.28±0.45 vs. 1.02±0.57; $p<0.001$) compared to Group B. No adverse effects were reported in either group.

Conclusion: The study concludes that alkalinised lignocaine is significantly more effective than normal saline in reducing postoperative sore throat (POST) after endotracheal intubation.

Key-words: Alkalinised lignocaine, Endo-tracheal tube, General anaesthesia, Normal saline Postoperative sore throat, Randomised controlled trial

INTRODUCTION

Postoperative sore throat remains one of the most frequently reported difficulties following general anaesthesia with endotracheal intubation. Even though generally self-limiting, POST can cause important discomfort to patients, important to dissatisfaction with perioperative care and negatively impacting regaining [1].

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It is reported to occur in about 21–65% of patients experiencing general anaesthesia with endotracheal intubation, depending on numerous factors such as the duration of intubation, size of the endotracheal tube, cuff pressure, and type of airway instrumentation [2]. The trauma caused by the endotracheal tube pathophysiology of POST is primarily attributed to powered, resulting in inflammation, mucosal injury, and local irritation. Subsequently, there has been an important concentration on identifying effective prophylactic methods to minimise this difficulty [3].

Among the numerous pharmacological and non-pharmacological measures discovered for reducing POST, the use of lignocaine, a local anaesthetic agent, has gathered considerable attention. Lignocaine, known for

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its membrane-stabilising and analgesic properties, has been employed in numerous forms, including intravenous, topical, gel, and endotracheal applications [4]. Despite general use, mainly due to their short duration of action, the effectiveness of conventional lignocaine preparations in preventing POST has been unpredictable, and a potential for systemic absorption leading to adverse effects [5].

Recent investigations have focused on alkalinisation of lignocaine as a potential method to improve its efficacy and overcome the limitations of standard lignocaine preparations. Alkalinised lignocaine refers to the addition of sodium bicarbonate to lignocaine, thereby increasing its pH and shifting the equilibrium toward the non-ionised, lipid-soluble form of the drug [6]. This modification is supposed to improve the drug's penetration across mucosal membranes and nerve protection, resulting in faster onset, greater depth, and prolonged duration of local anaesthesia. In addition, alkalinisation reduces the pain related to lignocaine injection and may improve its acceptability when used in the airway [7].

When administered intratracheally, a method known as intra-tracheal administration, alkalinised lignocaine can be used as a local anaesthetic effect directly on the tracheal mucosa, which is the primary site of irritation during intubation and extubation. The drug acts by attenuating the local inflammatory response, reducing nociceptor activation, and providing mucosal anaesthesia, thereby minimising the incidence and severity of sore throat postoperatively [8]. Numerous studies have suggested that intra-Administration of alkalinised lignocaine may significantly reduce the frequency and intensity of POST when compared to placebo or normal saline, making it a promising interference in routine anaesthetic practice.

Normal saline, by contrast, serves as a neutral comparator in many clinical studies evaluating the efficacy of numerous pharmacologic agents. Its deficiencies no inherent analgesic, anti-inflammatory, or anaesthetic properties [9]. When administered intratracheally, saline may provide minimal hydration or lubrication to the tracheal mucosa but is generally considered inert for POST inhibition. Its part is mainly that of a control, to differentiate the physiological effects of the interference under study from the baseline response.The comparison between alkalinised lignocaine and normal saline is predominantly appreciated, as it allows for the evaluation of the true therapeutic benefit of the former in a controlled setting [10].

The intra-administration of both agents, alkalinised lignocaine and normal saline, represents a minimally invasive, cost-effective, and easily implementable approach during general anaesthesia. Assuming the simplicity of the method and the potential for improving postoperative comfort, it has attracted the attention of anaesthesiologists aiming to enhance patient outcomes in the perioperative period [11]. However, while preliminary evidence favours the use of alkalinised lignocaine, the quality and consistency of data remain variable. Differences in study design, patient populations, dosage, timing of administration, and consequence measurement contribute to the heterogeneity in results.

This study search for to fill this hole by conducting a focused comparative analysis of the efficacy of intracellular alkalinised lignocaine versus normal saline in reducing postoperative sore throat among patients undergoing elective surgeries under general anaesthesia [12]. By isolating these two interferences, the study purposes to provide a clear understanding of whether alkalinised lignocaine offers a tangible benefit over a neutral control in real-world clinical surroundings. In doing so, it contributes to evidence-based anaesthesia practice and supports informed decision-making regarding the prophylactic management of POST [13].

Moreover, measuring these two interventions aligns with the broader goal of improving patient comfort and satisfaction in the postoperative period, an important quality metric in modern surgical care. As healthcare systems increasingly prioritize patient-reported consequences, even minor postoperative symptoms like a sore throat gain importance. Effective methods to mitigate such symptoms not only improve recovery but may also reduce the need for additional pharmacological interventions, hospital stay duration, and associated healthcare costs [14].

The use of intra alkalinised lignocaine represents a novel and potentially superior method to address the enduring issue of postoperative sore throat [15]. By comparing it directly with normal saline, a standard control, this study aims to generate robust evidence that can inform clinical protocols and improve anaesthetic outcomes for patients undergoing elective surgeries.

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MATERIALS AND METHODS

Research Design- This prospective, randomised, double-blinded comparative study was conducted at a tertiary care hospital during the period of one year. A overall of 80 adult patients were included following arrangement for elective surgical measures under general anaesthesia, with approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants for study inclusion and possible future publication. The study followed the procedures outlined and complied with Good Clinical Practice standards. Participants were randomly assigned to two groups (n=40 each) using a computer-generated list and the sealed envelope technique. Group A received ETT cuff inflation with 2 mL of 2% lignocaine plus 4 mL of 8.4% sodium bicarbonate, while Group B received 6 mL of normal saline. Drug preparation and intraoperative management were performed by different blinded investigators to maintain double-blinding. Standard ASA monitors were applied. Anaesthesia induction followed institutional protocol. Intubation was performed with un-lubricated, high-volume, low-pressure cuffed polyvinyl ETTs. Cuff inflation followed group-specific solutions. Leak checks were done post-intubation, and cuff volumes adjusted if necessary. Anaesthesia maintenance and extubation followed standard protocols. Postoperative sore throat was evaluated using a validated four-point scale at 0, 2, 12, and 24 hours post-extubation. The patients in the lignocaine-bicarbonate group reported lower POST scores at all measured intervals (0, 2, 12, and 24 hours), indicating better postoperative comfort and airway tolerance. The addition of sodium bicarbonate likely enhanced lignocaine's penetration and local anaesthetic effect, helping to minimise mucosal irritation caused by the ETT cuff. In contrast, the use of normal saline, which lacks anaesthetic or anti-inflammatory properties, was associated with a higher proportion of patients reporting sore throat, especially within the initial postoperative period. This reinforces the clinical value of using alkalinised lignocaine as a simple and cost-effective intervention to improve patient satisfaction and reduce throat-related morbidity after general anaesthesia with intubation (Table 1).

Table 1: Effect of Alkalinised Lignocaine Versus Normal Saline for Endotracheal Tube Cuff Inflation on Postoperative Sore Throat

Score	Severity	Description
0	No sore throat	No complaint of sore throat, even upon direct questioning
1	Mild sore throat	Reports of sore throat only when specifically asked
2	Moderate sore throat	Complaints of sore throat spontaneously
3	Severe sore throat	Sore throat accompanied by voice changes, hoarseness, or throat pain while coughing

Inclusion Criteria

- Patients aged ≥18 years
- Classified as ASA physical status I or II
- Scheduled for elective surgery under general anaesthesia with an expected duration of 2–3 hours.

Exclusion Criteria

- Patients were excluded if they had a sore throat or a history of sore throat within the preceding 72 hours
- Rhinitis, asthma, COPD
- BMI >30 kg/m²
- Anticipated difficult airway, or were pregnant or lactating.

Statistical Analysis- Data were collected in Microsoft Excel (version 2021) and analysed using SPSS software (version 21, IBM Corp., NY, USA). Quantitative variables were expressed as mean±standard deviation, while categorical variables were presented as frequencies and percentages. The Chi-square test was used for the comparison of categorical variable quantity, and Student's t-test was employed for normally distributed continuous variables. In cases of non-normally distributed data, Fisher's exact test was used. A p-value<0.05 was considered a significant difference.

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RESULTS

The demographic and baseline clinical parameters of the two groups were comparable, confirming effective randomisation. The average age in Group A was 44.88 years, with both groups exhibiting a similar distribution across age categories. The proportion of patients aged 46–60 years was the highest in both groups, followed by patients in the 31–45 age range. Anthropometric data exposed no significant differences in mean weight, height, or body mass index between the alkalinised lignocaine and normal saline groups. Gender distribution also showed significant differences, ensuring balanced representation of males and females (Table 2).

Table 2: Baseline Demographic and Anthropometric Characteristics (n=80)

Age Group (years)	Group A (n=40)	Group B (n=40)	Total (n=80)
18–30	8 (20%)	9 (22.5%)	17 (21.25%)
31–45	11 (27.5%)	10 (25%)	21 (26.25%)
46–60	12 (30%)	13 (32.5%)	25 (31.25%)
>60	9 (22.5%)	8 (20.0%)	17 (21.25%)

The comparison of POST scores at various time intervals exposed a clear benefit of using alkalinised lignocaine over normal saline for endotracheal tube cuff inflation. At baseline (0 hours), both groups had comparable POST scores (p=0.55), representing similar immediate postoperative conditions. However, from 2 hours onward, statistically significant differences emerged. At 2 hours, the mean POST score was significantly lower in the alkalinised lignocaine group (1.72±0.45) compared to the normal saline group (1.90±0.48) with p=0.033, suggesting early symptomatic relief. The effect became more noticeable at 12 and 24 hours post-extubation, where the POST scores were significantly reduced in the lignocaine group (0.90±0.40 and 0.28±0.45) compared to the saline group (1.65±0.52 and 1.02±0.57), with p<0.001 at both intervals (Table 3).

Table 3: POST Scores at Different Time Intervals (n=80)

Time (h)	Group A (Alkalinised Lignocaine) (Mean±SD)	Group B (Normal Saline) (Mean±SD)	p-value
0	2.23±0.46	2.18±0.47	0.559
2	1.72±0.45	1.90±0.48	0.033*
12	0.90±0.40	1.65±0.52	< 0.001*
24	0.28±0.45	1.02±0.57	< 0.001*

DISCUSSION

Postoperative sore throat is a frequent, up till now often underestimated, difficulty following general anaesthesia with endotracheal intubation. It not only contributes to postoperative discomfort but also unfavourably affects patient satisfaction and the overall perioperative experience. In this study, we specifically compared the efficacy of intra-alkalinised lignocaine versus normal saline in preventing or reducing the incidence and severity of POST in patients undergoing elective surgeries under general anaesthesia. The results of this study reveal significant differences in consequences between the two groups, with alkalinised lignocaine demonstrating superior efficacy in minimising both the occurrence and intensity of sore throat in the immediate postoperative period [16].

The improved performance of alkalinised lignocaine can be attributed to its improved pharmacological properties resulting from alkalinisation. By raising the pH of lignocaine with sodium bicarbonate, a higher proportion of the drug exists in its non-ionized, lipid-soluble form, which facilitates more rapid and effective penetration into neuronal membranes and tracheal mucosa. This biochemical transformation enhances both the onset and duration of anaesthetic action at the site of application, leading to sustained mucosal anaesthesia during and after endotracheal intubation.

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The clinical relevance of this effect is evident in the reduced reports of sore throat among patients who received alkalinised lignocaine compared to those who were administered normal saline [17].

In contrast, normal saline, used as a control in this study, absences any anaesthetic, anti-inflammatory, or mucosal protective properties. Its effect, if any, may be limited to transient lubrication or mild hydration of the tracheal mucosa. As expected, patients in the saline group demonstrated a higher incidence and greater severity of POST. This result reinforces the hypothesis that POST is predominantly an inflammatory and nociceptive response to mechanical trauma caused by the endotracheal tube, which requires more than passive interventions like saline to mitigate [18].

The mechanism through which alkalinised lignocaine reduces POST probably involves several physiological processes. First, by anesthetising the tracheal mucosa, it diminishes the irritation caused during intubation and extubating. Second, its anti-inflammatory action helps to suppress the local cytokine response triggered by mucosal injury. Lastly, prolonged mucosal anaesthesia delays the onset of symptoms long enough to allow for some natural mucosal healing during the initial recovery period. All these factors collectively contribute to the improved outcomes observed in the alkalinised lignocaine group [19].

Our results align with several previous studies that have investigated similar interventions. Research conducted by Estebe et al. and others has shown that alkalinised lignocaine, whether administered intra-cuff or intra-tracheally, significantly reduces POST compared to placebo or normal saline. Some studies also report that alkalinised lignocaine reduces coughing during emergence, further supporting its role in enhancing airway comfort. The consistent results across studies lend credence to the clinical utility of alkalinised lignocaine in routine anaesthetic practice [20].

Despite the promising results, this study has a few limitations that must be acknowledged. Firstly, the evaluation of sore throat is inherently subjective, relying on patient-reported consequences that may vary based on individual pain thresholds, communication ability, and expectations. Even though validated scoring systems were used, subjective bias cannot be eliminated. Secondly, the duration of follow-up was limited to the initial postoperative period. While this captures the peak occurrence of POST, it may not reflect the full duration or late onset of symptoms in some cases. In addition, factors such as endotracheal tube size, cuff pressure, duration of intubation, and patient comorbidities were standardised as much as possible but could still introduce variability in consequences [21].

The alternative important consideration is the safety profile of alkalinised lignocaine. While the drug is generally safe at the doses used, systemic absorption and potential toxicity, predominantly in patients with cooperated hepatic function or cardiovascular instability, must always be considered. In this study, no adverse effects attributable to alkalinised lignocaine were observed, supporting its safety in otherwise healthy individuals undergoing elective procedures. However, additional research is needed to estimate its safety in high-risk populations and in combination with other airway management methods [22].

From a clinical perspective, the use of alkalinised lignocaine offers a simple, low-cost, and effective method to reduce POST, which could be easily implemented in routine anaesthetic protocols. Its administration requires minimal additional time or equipment and does not interfere with standard anaesthesia induction practices. The improved patient comfort, reduced need for postoperative analgesics, and improved complete pleasure make it an appreciated adjunct in modern perioperative care [23].

In results of this study establish that intra-tracheal administration of alkalinised lignocaine is significantly more effective than normal saline in reducing the incidence and severity of postoperative sore throat in elective surgery patients. Assuming its favourable safety profile, ease of use, and clinical benefits, alkalinised lignocaine should be considered a viable prophylactic intervention for POST, predominantly in surgeries requiring endotracheal intubation. Upcoming research should focus on optimising the dose, timing, and method of administration, as well as discovering its role in high-risk or emergency procedures [24].

CONCLUSIONS

The study concludes that alkalinised lignocaine is effective than normal saline in reducing postoperative sore throat (POST) after endotracheal intubation. Although both groups had similar baseline characteristics, the lignocaine group showed lower POST scores from 2 hours, with the effect becoming more

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pronounced at 12 and 24 hours. These findings suggest that alkalinised lignocaine provides faster and long-lasting symptomatic relief. Intracuff alkalinised lignocaine reduces both the frequency and severity of postoperative sore throat compared to normal saline in patients undergoing elective surgeries under general anaesthesia. The improved patient results observed in the lignocaine group can be attributed to its improved mucosal absorption and sustained local anaesthetic action, leading to better tolerance of endotracheal intubation and reduced airway irritation post-extubation, results easy administration, cost-effectiveness, and safety, also represents an efficient strategy to enhance patient comfort and satisfaction. Future study will include different surgical populations, optimise dosage and delivery, to measure efficiency in emergency cases.

CONTRIBUTION OF AUTHORS

Research Concept- Dr Chintan B Patel
Research Design- Dr Chintan B Patel
Supervision- Dr Sumit Parmar
Materials- Dr Chintan B Patel
Data Collection- Dr Chintan B Patel
Data interpretation- Dr Chintan B Patel
Literature- Dr Chintan B Patel
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Critical value- Dr Chintan B Patel, Dr Sumit Parmar
Final approval - Dr Chintan B Patel, Dr Sumit Parmar

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