Original Research

RECALL OF DISCOMFORT DURING TRACHEAL EXTUBATION FOLLOWING GENERAL ANAESTHESIA: A PROSPECTIVE OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTRE

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ABSTRACT

Background: Tracheal extubation is a critical phase of general anaesthesia during which patients may experience discomfort or partial awareness. Although intraoperative awareness has been widely studied, recall of discomfort during extubation remains underexplored.

Aim: This study aimed to estimate the proportion of patients who recall discomfort during tracheal extubation and to evaluate its characteristics.

Methods: This prospective observational study was conducted in a tertiary care hospital and included 308 adult patients (ASA I–II) undergoing elective surgeries under general anaesthesia. Standard anaesthetic protocols were followed for all patients. Postoperatively, patients were interviewed using a structured questionnaire to assess recall of extubation, presence of discomfort, type, intensity (Numeric Rating Scale, NRS), and duration of symptoms. Data were analyzed using descriptive statistics.

Results: Out of 308 patients, 10 (3.2%) reported recall of the extubation process, while 298 (96.8%) had no memory of the event. Discomfort during extubation was reported by 4 patients (1.3%), whereas 304 (98.7%) experienced no discomfort. Among those with discomfort, the most common symptom was sore throat (50%), followed by coughing (25%) and choking or breathing difficulty (25%). The intensity of discomfort was mild (NRS 1–3) in all patients (100%), with no cases of moderate or severe discomfort. The duration of symptoms was less than 5 minutes in all cases (100%), indicating transient and self-limiting discomfort.

Conclusion: Recall of discomfort during tracheal extubation is rare (1.3%) and, when present, is typically mild and short-lived. Standard anaesthetic practices appear effective in minimizing both awareness and distress during extubation. These findings provide reassurance regarding patient comfort and support the safety of routine extubation techniques.

Keywords: Tracheal Extubation, General Anaesthesia, Recall, Discomfort, Postoperative Experience, Airway Management.

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INTRODUCTION

Tracheal extubation, the removal of an endotracheal tube (ETT) following general anaesthesia, represents a critical yet often underappreciated phase of anaesthetic management. While perioperative focus is traditionally directed towards induction and maintenance of anaesthesia, the emergence phase—particularly extubation—is

equally significant due to its association with physiological instability and heightened patient sensitivity. During this transition from unconsciousness to awareness, patients may experience a range of sensations, from mild throat irritation to severe coughing, pain, or even recall of discomfort related to airway manipulation. These experiences can influence immediate postoperative recovery, patient satisfaction, and overall perception of anaesthetic care [1,2] . The presence of an endotracheal tube, although essential for airway protection and ventilation, is inherently invasive, as it maintains direct contact with the delicate mucosa of the larynx and trachea. As anaesthetic depth decreases, sensory perception begins to return, making patients increasingly susceptible to discomfort such as coughing, sore throat, or distressing sensations like choking and breathlessness, which in some cases may be consciously recalled [3,4].

Recall of discomfort during tracheal extubation occurs when patients regain partial awareness while the airway device is still in situ or during its removal. Although distinct from intraoperative awareness involving surgical events, this phenomenon remains clinically relevant due to its potential psychological impact. Patients may report sensations of suffocation, throat tightness, or an urgent need to breathe, often accompanied by an inability to communicate, making the experience particularly distressing. Even brief episodes of such awareness can contribute to postoperative anxiety, fear, or aversion to future anaesthesia, thereby affecting patient trust and satisfaction [5]. Several factors influence the likelihood and severity of this phenomenon, including premature lightening of anaesthesia, inadequate analgesia, residual neuromuscular blockade, and suboptimal sedation at the time of extubation. Additionally, procedural factors such as extubation technique, airway handling, duration of intubation, and patient-related factors like anxiety and airway sensitivity further modulate the perception and recall of discomfort [5,6].

Physiologically, extubation is associated with stimulation of airway reflexes, leading to coughing, laryngospasm, and sympathetic activation, which may manifest as tachycardia, hypertension, and increased intracranial or intraocular pressure. These responses are mediated by stimulation of laryngeal and tracheal receptors that remain sensitive during emergence, necessitating a careful balance between adequate anaesthetic depth and timely recovery to ensure patient comfort and safety [6,7]. Various pharmacological and non-pharmacological strategies, including the use of lidocaine, opioids, sedatives, and gentle airway manipulation techniques, have been employed to minimize these responses and reduce discomfort [7,8]. However, the subjective nature of discomfort and its recall makes it difficult to quantify and predict, and although most patients do not remember extubation, a small proportion report unpleasant experiences that can negatively impact postoperative satisfaction [9]. Achieving a smooth extubation—characterized by minimal coughing, stable hemodynamics, and absence of recall—remains a key objective in anaesthetic practice and requires meticulous planning, appropriate drug selection, and close monitoring. The present study was therefore undertaken to evaluate the recall of discomfort during tracheal extubation following general anaesthesia.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Postgraduate Department of Anaesthesiology and Critical Care at Government Medical College Srinagar, in collaboration with surgical units of a tertiary care teaching hospital. The study aimed to evaluate recall of discomfort during tracheal extubation following general anaesthesia.

Study Duration

The study was carried out over a period of 18 months, including phases of patient recruitment, data collection, and analysis.

Study Population

A total of 308 adult patients undergoing elective surgical procedures under general anaesthesia were included in the study.

Inclusion Criteria

- Patients aged ≥18 years
- ASA physical status I or II
- Undergoing elective surgery under general anaesthesia
- Extubated on the operating table
- Able to communicate effectively in the postoperative period

Exclusion Criteria

- Age <18 years
- ASA physical status ≥III
- Emergency surgeries
- Requirement of postoperative ventilatory support
- Cognitive impairment or psychiatric illness
- Inability to communicate effectively

Sample Size Calculation

The sample size was calculated based on an estimated prevalence of recall of discomfort of 3%, with a 95% confidence level and 2% margin of error.

$$n = \frac{Z^2 \times p \times (1-p)}{d^2}$$

The calculated sample size was approximately 280, which was increased by 10% to account for potential data loss, resulting in a final sample size of 308 patients.

Sampling Technique
A consecutive purposive sampling method was used. All eligible patients during the study period who provided informed consent were included.

Anaesthetic Technique
All patients received standardized anaesthetic management as per institutional protocol:

- **Premedication:** Midazolam and glycopyrrolate as required
- **Induction:** Intravenous propofol and an opioid (fentanyl), followed by a neuromuscular blocking agent (atracurium)
- **Maintenance:** Volatile anaesthetic agents (isoflurane, sevoflurane, or desflurane) with oxygen and nitrous oxide
- **Reversal:** Neostigmine and glycopyrrolate
- **Extubation:** Performed on the operating table after ensuring adequate spontaneous respiration, airway reflexes, and consciousness

No additional interventions were introduced to modify extubation characteristics.

Study Variables
Primary Outcome

- Recall of discomfort during extubation, defined as conscious recollection of unpleasant sensations during or immediately after removal of the endotracheal tube

Secondary Outcomes

- Presence or absence of discomfort
- Type of discomfort (sore throat, coughing, choking, breathlessness, chest discomfort)
- Intensity of discomfort (Numeric Rating Scale, NRS 0–10)
- Duration of discomfort
- Effect on patient satisfaction

Data Collection
Data were collected using a pre-designed structured questionnaire developed after pilot testing. The questionnaire included:

- Demographic variables (age, sex, residence, ASA status)
- Surgical and anaesthetic details
- Recall of extubation
- Presence and characteristics of discomfort

Patients were interviewed on the first postoperative day during routine ward rounds, ensuring that they were alert, oriented, and free from residual sedative effects. Interviews were conducted in a quiet environment, and responses were recorded verbatim to minimize bias.

Operational Definitions

- **Recall:** Patient reporting memory of extubation
- **Discomfort:** Any unpleasant sensation such as sore throat, coughing, choking, or breathlessness
- **Intensity:** Assessed using NRS (0 = no discomfort, 10 = worst imaginable discomfort)
- **Duration:** Categorized as <5 min, 5–15 min, 15–30 min, >30 min

Statistical Analysis
Data were entered into **Microsoft Excel** and analyzed using **SPSS version 20.0 (IBM Corp., USA)**.

- Continuous variables were expressed as mean ± standard deviation
- Categorical variables were expressed as frequency and percentage
- Results were presented in tables and charts
- A p-value <0.05 was considered statistically significant (where applicable)

Ethical Considerations
Ethical approval was obtained from the Institutional Ethics Committee, Government Medical College Srinagar. Written informed consent was obtained from all participants. Confidentiality of patient data was maintained, and the study adhered to the principles of the Declaration of Helsinki (2013 revision).

RESULTS

1. Baseline Characteristics of Study Participants
A total of 308 patients undergoing elective surgery under general anaesthesia were included in the study. The majority of patients belonged to the 41–60 years age group (39.6%), followed by 20–40 years (32.8%). The gender distribution was equal, with males and females each constituting 50% of the study population.
Most participants were classified as ASA II (68.2%), indicating mild systemic disease. A significant proportion of patients were from rural areas (42.2%), followed by urban (30.5%) and sub-urban (26.9%) regions. General Surgery accounted for the largest share of cases (31.2%).
Nearly half of the participants (45.8%) had no co-morbid conditions, while hypertension (14.3%), diabetes mellitus (12.7%), and combined hypertension with diabetes (14.6%) were the most common co-morbidities.

Table 1: Combined Demographic and Clinical Profile (n = 308)

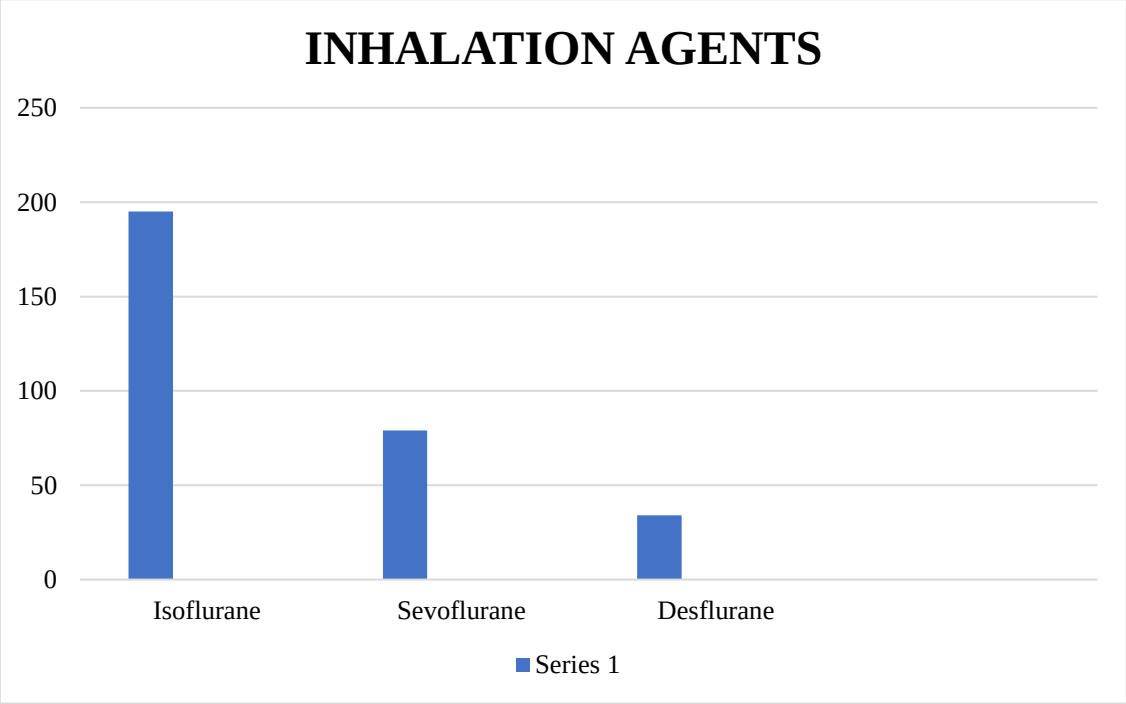
Variable	Category	n	%
Age	<20	12	3.9
	20–40	101	32.8
	41–60	122	39.6
	61–80	73	23.7
Sex	Male	154	50.0
	Female	154	50.0
Residence*	Rural	130	42.2
	Sub-urban	83	26.9
	Urban	94	30.5
ASA	I	98	31.8
	II	210	68.2

*n = 307

2. Anaesthetic Characteristics

Isoflurane was the most commonly used inhalational agent (63.3%), followed by sevoflurane (25.6%) and desflurane (11.0%).

Figure 1: Inhalational Agents Used (n = 308



3. Recall of Extubation

Only 3.2% (n = 10) of patients reported recall of the extubation process, whereas the majority (96.8%) had no memory of the event.

Table 3: Recall of Extubation (n = 308)

Recall	n	%
Yes	10	3.2
No	298	96.8

4. Incidence of Discomfort During Extubation

A very small proportion of patients (1.3%, n = 4) reported experiencing discomfort during extubation, while 98.7% reported no discomfort.

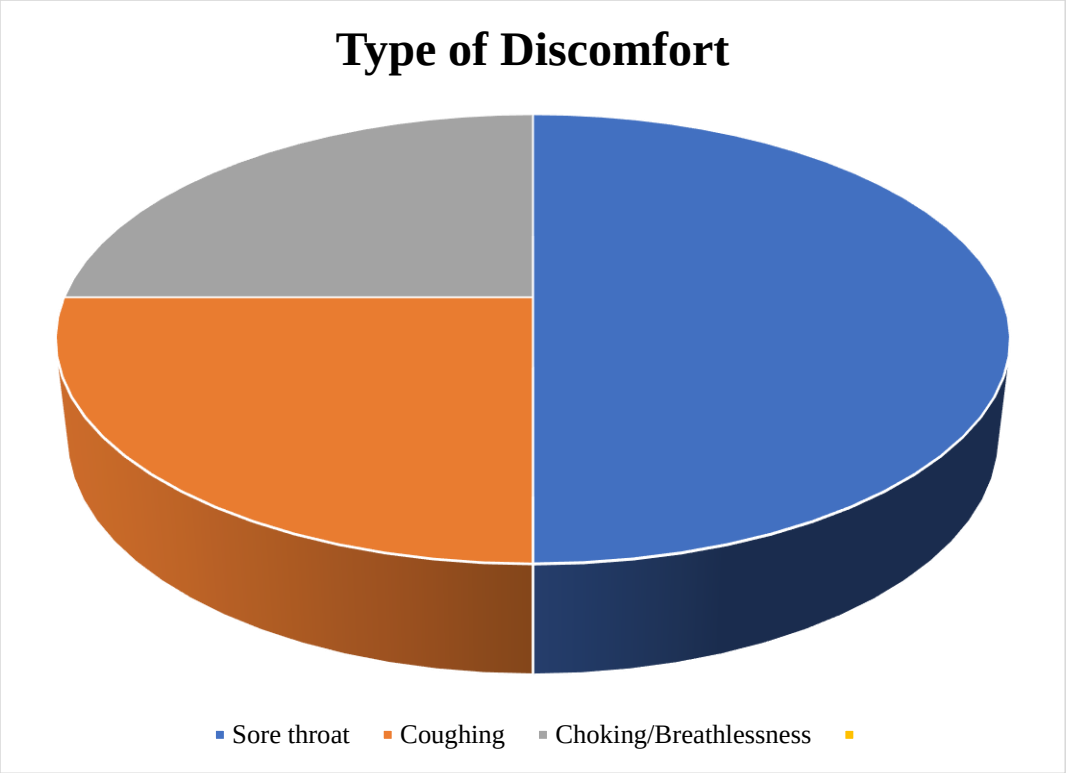
Table 4: Incidence of Discomfort (n = 308)

Response	n	%
Yes	4	1.3
No	304	98.7

5. Type of Discomfort

Among the four patients who experienced discomfort, the most common symptom was sore throat (50%), followed by coughing (25%) and choking/difficulty in breathing (25%).

Figure 2: Type of Discomfort (n = 4)



6. Intensity of Discomfort (NRS Score)

The intensity of discomfort, assessed using the Numeric Rating Scale (NRS), was **mild in all affected patients**. None of the patients reported moderate or severe discomfort, indicating that extubation-related discomfort, when present, was minimal in severity.

Table 6: Intensity of Discomfort (n = 4)

NRS Category	n	%
Mild (1–3)	4	100
Moderate (4–6)	0	0
Severe (7–10)	0	0

7. Duration of Discomfort

The duration of discomfort was **short-lived in all patients**, with symptoms resolving within a brief period following extubation.

Table 7: Duration of Discomfort (n = 4)

Duration	n	%
< 5 minutes	4	100
5–15 minutes	0	0
15–30 minutes	0	0
> 30 minutes	0	0

DISCUSSION

The present prospective observational study evaluated the incidence, nature, and severity of recall of discomfort during tracheal extubation in 308 adult patients undergoing elective surgery under general anaesthesia. Using a standardized anaesthetic protocol and structured postoperative assessment, the study demonstrated that recall of extubation occurred in only 3.2% of patients, while actual discomfort was reported by an even smaller proportion (1.3%). These findings indicate that extubation-related recall and discomfort are uncommon events in routine anaesthetic practice. The uniformity of baseline characteristics, including age distribution, ASA status, and comorbidity profile, ensured minimal confounding and allowed a reliable assessment of true patient experience during emergence .

The observed incidence of recall in this study closely parallels findings from *Shinoura et al.*[10], who reported a recall rate of 3.1% and discomfort recall of 1.1% in a large cohort of 818 patients. This striking similarity reinforces the consistency of evidence across different populations and supports the conclusion that extubation is rarely remembered by patients. Importantly, it challenges the commonly held perception among anaesthetists that extubation is a highly distressing experience. In clinical practice, airway reflex responses such as coughing or bucking are often interpreted as indicators of significant discomfort; however, the present findings demonstrate that these physiological responses do not necessarily translate into conscious perception or recall. This distinction is crucial, as it highlights that observable patient reactions during emergence may not accurately reflect subjective experience.

Among the small subset of patients who reported discomfort, sore throat was the most common symptom, followed by coughing and a sensation of choking or breathlessness. These findings are consistent with the pathophysiological mechanisms described in previous studies. *Park et al.*[11], *Lee et al.*[12], and *Taşkın et al.*[13] have demonstrated that postoperative sore throat is primarily attributable to mucosal irritation, cuff-related pressure, and airway manipulation. Similarly, studies evaluating pharmacological interventions such as dexamethasone and lidocaine have shown reductions in these symptoms, further supporting their origin in airway trauma rather than conscious distress. However, the present study adds an important clinical perspective by demonstrating that, although such symptoms may occur physiologically, they are rarely perceived or remembered by patients unless a sufficiently light plane of anaesthesia is reached.

The low incidence of discomfort recall observed in this study also aligns with broader literature on anaesthesia awareness and emergence phenomena. *Errando et al.*[14] and *Inoue et al.*[15] have reported that recall of perioperative events is generally uncommon and strongly influenced by anaesthetic depth and timing. Despite the absence of targeted amnestic interventions in the present study, recall remained minimal, suggesting that routine anaesthetic practices are sufficient to prevent clinically significant awareness during extubation. Furthermore, major awareness audits such as the NAP5 project have emphasized that distressing recall is typically associated with intraoperative awareness or paralysis rather than emergence-related events. The absence of severe or persistent discomfort in this study further distinguishes extubation recall from clinically significant awareness phenomena.

An important observation in this study is that even among patients who recalled extubation, the discomfort was uniformly mild and short-lived, with no cases of moderate or severe distress and no requirement for intervention. Additionally, overall patient satisfaction remained high, indicating that extubation-related experiences had minimal impact on postoperative perception of care. This finding is consistent with the work of *Myles et al.*[16], who identified pain, nausea, and vomiting as the primary determinants of postoperative dissatisfaction rather than airway-related events. Thus, extubation discomfort, when present, appears to have limited clinical significance in terms of patient outcomes.

The broader implication of these findings lies in addressing a key concern in anaesthetic practice—the tendency to expedite extubation due to perceived patient discomfort. Anaesthetists often rely on visible signs such as coughing or agitation as indicators of distress, which may lead to premature extubation and an increased risk of complications such as aspiration, airway obstruction, or laryngospasm. However, the present study provides objective evidence that such assumptions may be overstated. These results support the recommendations of *Benham-Hermetz and Mitchell*[1], who advocate for a structured and risk-assessed approach to extubation rather than hurried removal based on perceived discomfort.

Overall, the findings of this study reinforce the concept that physiological responses during extubation occur largely outside the domain of conscious perception. While airway stimulation may trigger reflex responses and hemodynamic changes, these do not necessarily result in subjective discomfort or memory formation. This distinction is clinically important, as it provides reassurance to anaesthetists and supports safer, more deliberate extubation practices. The study thus contributes meaningful evidence to the limited literature on extubation recall and highlights that discomfort,

when present, is rare, mild, and transient, with minimal impact on patient satisfaction or recovery.

CONCLUSION

In this prospective observational study involving 308 patients undergoing elective surgery under general anaesthesia, recall of the extubation process was observed in only 3.2% of patients, while recall of actual discomfort was even lower at 1.3%. Among those who experienced discomfort, symptoms were predominantly sore throat (50%), followed by coughing (25%) and choking or breathlessness (25%). Importantly, the intensity of discomfort was mild (100%), and the duration was short-lived (<5 minutes in all cases), with no requirement for additional intervention.

These findings demonstrate that recall of discomfort during tracheal extubation is rare, mild, and transient under standard anaesthetic practice. Despite observable airway reflexes such as coughing or bucking during emergence, these physiological responses do not necessarily correspond to conscious perception or distress. The results provide important clinical reassurance that routine extubation techniques are generally well tolerated and do not significantly impact patient satisfaction or postoperative recovery.

Overall, the study supports the concept that anaesthetists may overestimate patient discomfort during extubation based on visible responses. A more deliberate and well-planned extubation strategy, rather than hurried removal driven by perceived discomfort, may enhance patient safety without compromising comfort. These findings contribute valuable evidence to the limited literature on extubation recall and reinforce the goal of achieving a smooth, safe, and patient-centered emergence from anaesthesia.

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