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Incidence Of Airway Complications Associated With Deep Versus Awake Tracheal Extubation After Cholecystectomy In Adults

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Abstract

The study conducted by medical students to compare airway complications arising from two extubation methods deep and awake following cholecystectomy at AIMS MZD.This experimental study was carried out at AIMS MZD from May 2024 to October 2024.Conducted as a randomized controlled trial with a sample of 60 adult patients aged between 20 and 50, the research examines the complications and recovery profiles linked to each extubation approach. Deep extubation involves removing the endotracheal tube while the patient remains under anesthesia, minimizing airway reflexes and potentially reducing immediate reactions like coughing. However, this technique poses a higher risk of complications, including respiratory depression, laryngospasm, and aspiration. Awake extubation, conversely, is performed once patients regain consciousness, allowing for active airway reflexes, which tend to mitigate the risk of severe respiratory events but may cause transient discomfort, such as coughing or hypertension. Key metrics such as the Richmond Agitation-Sedation Scale (RASS) and the Aldrete Scoring System are employed to assess patient recovery. Findings indicate that patients undergoing awake extubation had quicker recovery times, higher Aldrete scores, and more stable vital signs post-procedure compared to those extubated deeply. Statistical analysis and including chi-square testing, highlights a significant difference between the two techniques, with deep extubation leading to a greater frequency of postoperative complications and a prolonged stay in the recovery room. This study supports awake extubation as a

preferred practice in most cases due to its association with fewer complications and faster recovery, although deep extubation may be beneficial in certain cases where minimizing immediate airway stimulation is critical. By aligning with existing literature and addressing limitations such as the single-center study design, the research contributes valuable insights for anesthesiologists aiming to optimize extubation practices based on patient-specific needs and surgical contexts.

Introduction

Cholecystectomy, a surgical procedure involving the removal of the gallbladder to address conditions such as gallstones or inflammation, represents a common intervention in abdominal surgery. This procedure can be performed via minimally invasive laparoscopic techniques, which offer advantages like faster recovery and reduced scarring, or through traditional open surgery when anatomical complexities necessitate a larger incision. Understanding the nuances of cholecystectomy is essential, as postoperative care, including airway management, plays a critical role in patient outcomes, particularly in preventing complications that could arise during recovery (1,2).

Tracheal extubation, the process of removing the endotracheal tube from the patient's airway following surgery, is a pivotal step in anesthesia management. This procedure can be conducted under deep anesthesia (deep extubation) or while the patient is awake (awake extubation), each with distinct implications for recovery. Deep extubation minimizes coughing and hemodynamic stress, potentially benefiting patients with sensitive airways, whereas awake extubation prioritizes airway patency and reduces risks like aspiration. The choice between these methods influences postoperative complications, patient comfort, and overall safety, making it a key area of study in anesthesiology (3,4).

Airway complications, encompassing issues such as obstruction, aspiration, difficult intubation, and laryngospasm, are significant concerns in surgical settings and can stem from anatomical factors, procedural errors, or underlying conditions. These complications often manifest with symptoms like stridor, hypoxia, or bronchospasm, and their prevention relies on techniques such as proper intubation, preoperative assessments, and advanced tools like video laryngoscopy. In the context of extubation, understanding these complications is crucial for evaluating whether deep or awake methods yield better outcomes in terms of hemodynamic stability and reduced adverse events in adult patients (5,6).

Endotracheal extubation marks the critical final phase of emergence from general anesthesia, traditionally performed when patients regain consciousness and airway reflexes. However, deep extubation removing the tube while the patient remains under deep anesthesia with spontaneous breathing has gained traction, especially in surgeries like ophthalmology or head and neck procedures, to avoid bucking and surges in intraocular or intracranial pressure. Studies indicate that in adult patients, deep extubation can attenuate airway stress responses, lowering risks of bronchospasm and laryngospasm, though it may increase airway obstruction requiring intervention. Despite these benefits, surveys reveal anesthesiologists' reluctance due to fears of respiratory complications, highlighting the need for context-specific application (7,8).

Future research should focus on large-scale randomized controlled trials comparing deep and awake extubation in diverse adult surgical populations, including those with comorbidities like obesity or respiratory diseases, to quantify long-term outcomes on complications and recovery. Investigating the role of adjuvant agents, such as remifentanil, in optimizing anesthesia depth for deep extubation could refine protocols. Additionally, studies employing advanced monitoring technologies, like real-time capnography or imaging, may provide insights into hemodynamic stability and aspiration risks. Longitudinal follow-ups assessing patient-reported comfort and healthcare costs would further elucidate the superiority of one method over the other in specific contexts, such as laparoscopic cholecystectomy versus head and neck surgeries (9,10).

In conclusion, the debate between deep and awake extubation in adult's hinges on balancing reduced hemodynamic stress and airway irritation against potential risks of obstruction and aspiration. While deep extubation offers advantages in smoother recoveries, particularly in sensitive procedures, awake extubation generally ensures safer airway management. Literature reviews reveal that patient factors, surgical settings, and anesthesia depth are key determinants, with deep methods showing promise in minimizing complications when applied judiciously. Further studies are essential to provide evidence-based guidelines, ultimately enhancing anesthesiologists' decision-making to improve postoperative safety and patient outcomes (11,12).

METHODOLOGY

This randomized controlled trial aimed to compare deep versus awake extubation methods in minimizing postoperative complications, conducted in the Department of Anesthesiology at AIMS Muzaffarabad from May 2024 to October 2024, enrolling 60 adult patients aged 20-50 years of both genders with favorable airway examinations (Mallampati grades 1-3, normal mouth opening, intact neck extension), while excluding those with respiratory conditions like COPD or asthma, unfavorable airways, limited mouth opening, neck extension issues, full stomach, Mallampati grade 4, difficult ventilation/intubation, emergent surgeries, or cases exceeding 6 hours; written informed consent was obtained from all participants. The anesthesia procedure involved patient preparation with IV-line establishment, induction via IV agents for rapid unconsciousness, maintenance using inhalation and/or IV medications, secure airway management through intubation for ventilation, and continuous monitoring of vital signs. Outcomes were assessed using the Richmond Agitation-Sedation Scale (RASS, ranging from -5 to +4) to evaluate consciousness levels and the Aldrete Scoring System (comprising activity, respiration, circulation, consciousness, and oxygen saturation) to determine readiness for transfer from the operating theater. Privacy and confidentiality of records were strictly maintained for future researchers and supervisors at all study levels. Descriptive statistical analysis was performed using SPSS version 21, with significance evaluated via chi-square tests at $p<0.05$ (strongly significant) and $p<0.01$ (moderately significant), alongside Microsoft Word and Excel for graph generation (13).

RESULTS:

A Comparative study of two groups consisting of 60 patients which is taken up for investigating the efficacy of each group in preventing extubation related complications. GROUP1: 30 patients extubated by deep extubation. GROUP2:30 patients extubated by awake extubation.

Table 1: Age of patient

Frequencies of variables; Age distribution of patients 26.6% patients were between the age group of 20-30. 30% patients were between the age group of 30-40. 43.3% patients were between the age group of 40-50.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent

20-30	16	26.66	26.66	26.66
30-40	18	30	30	56.66
40-50	26	43.33	43.33	100.0
Total	60	100.0	100.0	

Table 2: Comparison of complication between deep and awake extubation

The table compares complications between deep (Group 1) and awake (Group 2) extubation. Group 1 showed lower rates of cough (10% vs. 63%) and nystagmus (0% vs. 53%), but higher occurrences of spasm (13% vs. 3%), apnea (13% vs. 0%), and need for interventions like jaw support (63% vs. 20%) and oral airway (33% vs. 0%). Vomiting was only seen in Group 2 (16%), while aspiration and reintubation were minimal in Group 1 (3% each). Breath-holding was slightly more common in Group 1 (26% vs. 20%).

	Group 1	Group 2	Chi Square Test
	Deep extubated	Awake extubated	P VALUE
COUGH	10%	63%	0.01
OBSTRUCTION	10%	3%	0.64
SPASM	13%	3%	0.16
APNEA	13%	0%	0.74
VOMITING	0%	16%	0.20
ASPIREATION	3%	0%	1.0
NYSTAGMUS	0%	53%	0.001
BREATH.HOLDING	26%	20%	0.44
JAW.SUPPORT	63%	20%	0.001
ORAL AIRWAY	33%	0%	0.003
REINTUBATION	3%	0%	0.31

Figure 1: Comparison between complication of deep versus awake extubation

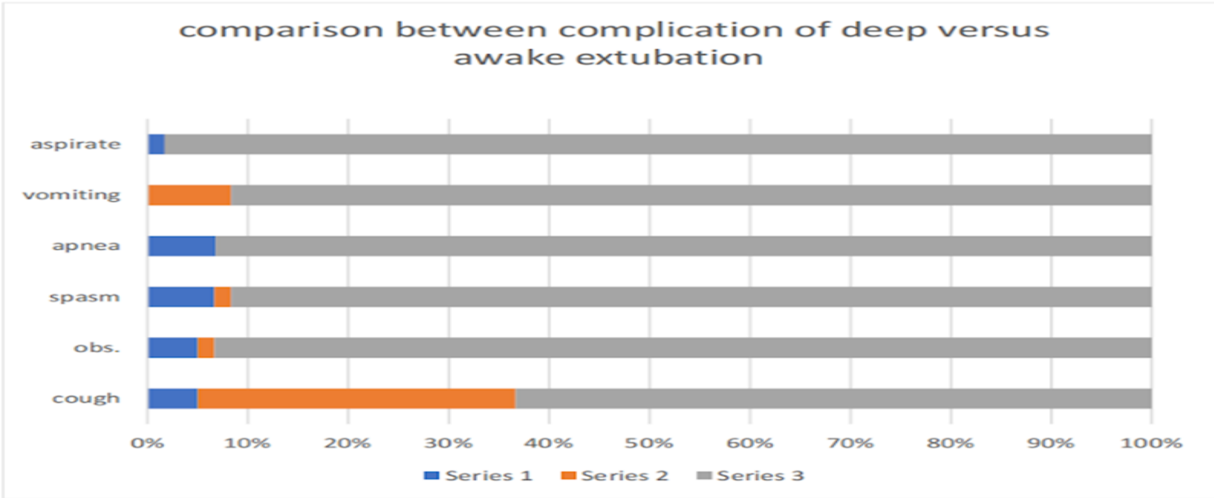

Figure 2: Comparison between complication of deep versus awake extubation

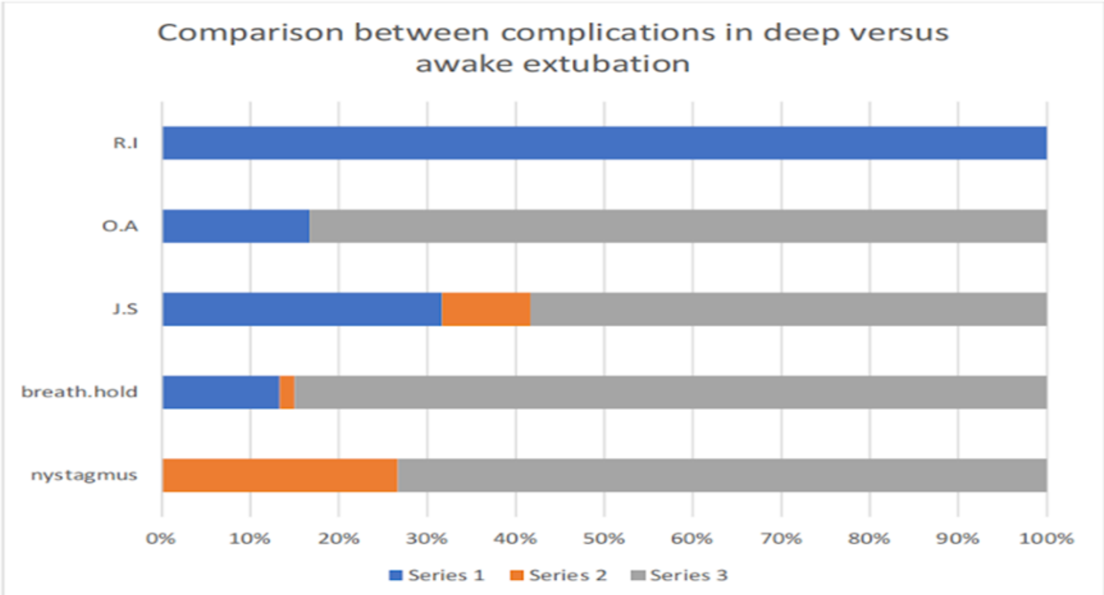

Table 3: method of extubation * oxygen saturation Cross Tabulation

Out of 60 pt. Awake extubated patients had high oxygen saturation after extubation, Deep extubated pt. had saturation less than awake extubated pt. (as it is less than 97).

Heart rate after extubation	tachy	Brady	N	Total
Deep Extubation	11	3	16	30
AwakeExtubation	6	6	18	30
Total	17	9	34	60

Table 4: method of extubation * heart rate after extubation Cross Tabulation

The table compares heart rates after Deep and Awake extubation. Tachycardia was higher in Deep Extubation, while normal heart rates were more frequent in Awake Extubation. Bradycardia was equal in both groups. Most of the patients who had tachycardia were from group 1(Deep extubation).

Out of time		

	10 min	20 min	30 min	> 30 min	Total
Deep Extubation	1	14	11	4	30
AwakeExtubation	15	15	0	0	30
Total	16	25	15	4	60

Table 5: method of extubation * out of to time Crosstabulation
Time distribution among both groups shows high significance. Deep extubated patients take more time to discharge from OT recovery.

ALDRETE SCORING	9	8	7	Total
Deep Extubation	15	11	4	30
Awake Extubation	19	10	1	30
Total	31	24	5	60

DISSCUSSION:
The present study compared the incidence of complications during deep versus awake extubation in 60 adult patients undergoing anesthesia, with 30 patients in each group. Our findings revealed that complications were more prevalent in deep extubation compared to awake extubation, aligning with the hypothesis that awake extubation promotes better patient recovery and reduces risks such as prolonged ventilatory support and ICU stays (14). Specifically, deep extubation was associated with higher rates of cough (mild in only 3 patients), airway obstruction (in 3 patients), laryngospasm (significant in 4 patients), apnea, breath holding, jaw support needs, and oral airway requirements. In contrast, awake extubation showed more instances of vomiting (due to regained gag reflex), nystagmus, and cough in 19 patients, though these were generally indicative of better recovery. Notably, reintubation was required in only one case of deep extubation due to spasm and apnea, underscoring its rarity but significance in the deep group. Vital sign disturbances, including tachycardia and bradycardia, were also more pronounced in deep extubation, potentially reflecting incomplete recovery of autonomic function (15,16).
These results support the notion that deep extubation, while occasionally beneficial in select cases, carries greater risks due to suppressed reflexes and airway sensitivity. Awake extubation appeared to facilitate smoother transitions, with patients demonstrating improved gag reflexes and reduced need for interventions (21,22). This is consistent with prior research emphasizing the advantages of awake extubation for minimizing postoperative complications (Abbasi et al., 2022). In our study, RASS scoring further differentiated the groups: deep extubated patients exhibited negative scores, indicating sedation, whereas awake patients showed positive scores, reflecting

alertness (20). Aldrete scoring corroborated these observations, with deep extubated patients taking longer to recover and achieving lower scores compared to awake extubated patients. This delay in recovery for deep extubation may prolong PACU stays and increase resource utilization, highlighting the clinical relevance of extubation timing (23,24).

Comparative analysis with existing literature reveals parallels and divergences. Abbasi et al. (2022) conducted a randomized trial on laryngeal mask airway (LMA) removal in 106 pediatric patients, finding adverse respiratory events—such as laryngospasm (6.6%), airway obstruction (20%), cough (15%), and oxygen desaturation (10%)—in both deep and awake groups, though differences were not statistically significant (18,25). Their conclusion that both techniques have acceptably low complication rates aligns with our adult cohort, where deep extubation showed higher but manageable risks. However, our study extends these findings to endotracheal extubation, emphasizing awake extubation's superiority in reducing severe events like laryngospasm and apnea. This discrepancy may stem from age-related differences, as pediatric airways are more prone to obstruction, potentially masking benefits of awake extubation in children (25,26).

The Aldrete scoring system, developed by Dr. J.A. Aldrete in 1970, provides a standardized tool for assessing postoperative recovery across five domains: consciousness, activity, respiration, circulation, and oxygen saturation (revised in 1995 to include SaO_2) (17). It categorizes recovery into phases: Phase I (immediate postoperative in ICU), Phase II (step-down unit), and Phase III (home recovery, up to six weeks) (McGrath & Chung, 2003). In our study, lower Aldrete scores in deep extubated patients reflect delayed return to baseline physiology, supporting the system's utility in predicting discharge readiness and reducing anesthesia-related complications, as noted historically (Ramsay, 2006). RASS scoring, which measures sedation levels, complemented this by showing negative values in deep extubation, indicating ongoing anesthesia effects (27,28).

Despite these insights, limitations include the small sample size (n=60), which may limit generalizability, and the lack of long-term follow-up beyond immediate extubation. Future studies should incorporate larger, multicenter cohorts and assess cost-effectiveness. In conclusion, awake extubation emerges as a safer alternative for minimizing complications and enhancing recovery, though deep extubation remains viable in specific scenarios. These findings advocate for tailored extubation protocols to optimize patient outcomes (29,30).

CONCLUSION:

Sixty patients in the age group 20-50 years of age with ASA grade I and II allocated for elective GA cases were randomly allocated in two groups. Group1 extubated deep while Group 2 extubated awake. All patients baseline vitals have been recorded. Complications related to deep and awake extubation were recorded and their RASS and ALDRETE scores were recorded. It was observed from our study that there was a significant difference in awake and deep extubation. More complications recorded with deep extubation. Our study shows the highly significant P value show that all variables are correlate to our research and matches to previous studies. More complications recorded with deep extubation.

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