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Original Research Article

Comparison of Effect of Tracheal Extubation in Supine Versus Semi-Fowler's Position in Abdominal Onco-Surgeries

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Abstract:

Background and Aim: Tracheal extubation is typically conducted while the patient is in a supine position. In patients who have undergone abdominal surgery, adopting a supine position can elevate abdominal wall tension, particularly during actions such as coughing and deep breathing. This increase in tension may exacerbate pain and heighten the risk of abdominal wound dehiscence. The current study sought to evaluate the comfort levels of patients who were extubated while in the semi-Fowler's position versus those extubated in the supine position.

Material and Methods: The current investigation involved a cohort of 100 individuals who had abdominal surgical procedures. Participants were randomly allocated to one of the two designated groups. Group 1 consists of patients who are candidates for extubation while in a supine position. Patients in Group 2 are positioned in semi-Fowler's for extubation. The endotracheal tube was successfully removed once the patients demonstrated signs of alertness by opening their eyes and regaining consciousness. Vital signs, along with coughing and pain and comfort scores, were meticulously documented before and after extubation, continuing until the patients were discharged from the PACU.

Results: The findings indicated that there was no notable difference in the mean duration of epidural analgesia using 0.125% bupivacaine during the intraoperative period when comparing the two groups. The mean visual analogue score (VAS) exhibited a notable difference between the two groups within the 5 to 10 minutes post-extubation period. Group A exhibited higher VAS scores at the 5-minute, 15-minute, and 30-minute time intervals when compared to Group B. In Group A, severe cough and bucking were observed in 5 (10%) and 2 (4%) of the patients, respectively, while these symptoms were not present in Group B.

Conclusion: The average respiratory rate returned to its normal baseline within 30 minutes post-extubation while the patient was in the semi-Fowler's position. Conversely, when in the supine position, the respiratory rate remained elevated. Therapeutic positions guided by turning schedules play a crucial role in sustaining haemodynamic parameters and averting complications.

Keywords: Abdominal Onco-Surgery, Semi-Fowler's Position, Supine Position, Tracheal Extubation.

Introduction

The post-anesthesia care unit (PACU) plays a crucial role in the recovery process, offering vigilant observation for patients emerging from general anaesthesia who have not yet regained full consciousness. The presence of residual anaesthetics and muscle relaxants significantly elevates the risk of complications upon admission to the Post-Anesthesia Care Unit (PACU). Research indicates that the position during extubation following anaesthesia can influence both perioperative and postoperative complications. Patients suffering from obstructive sleep apnoea who undergo uvulopalatopharyngoplasty (UPPP) may benefit from extubation in an upright position. This approach has the potential to markedly decrease upper airway obstruction, lessen the effort required for breathing, mitigate postoperative respiratory depression, and enhance functional residual capacity. [1,2] A recent study indicates that extubating patients in the prone position may lead to a notable decrease in postoperative coughing among those undergoing spinal surgery. [3] Given the lack of evidence supporting a universal extubation position for all patients, Olympio et al. proposed that patients ought to be positioned differently according to their specific

conditions. Patients undergoing abdominal surgery face a significant risk of experiencing postoperative nausea and vomiting. [4] It is common practice among anaesthetists to position patients in the supine stance for extubation following the administration of general anaesthesia. This is because it is uncomplicated, facilitates easy observation, and can prevent regurgitation during episodes of vomiting. [5] According to some experts, the advantages of supine extubation may be diminished in this situation, as awake extubation is believed to help restore essential defensive reflexes such as coughing and swallowing following the procedure. [6] Furthermore, pain in the stomach following surgery can lead to challenges in breathing and increased pressure on the abdominal wall. [7] Postoperative coughing plays a crucial role in facilitating sputum clearance and enhancing pulmonary function recovery. However, it can exacerbate abdominal pain and pressure, which may discourage patients from engaging in active coughing while in a supine position. Following abdominal surgery, it is crucial to adopt an optimal posture for extubation. This approach can help alleviate stomach pain and enhance patient comfort, all while minimising the demands placed on paramedics in the post-anesthesia care unit.

The semi-Fowler position, characterised by a 30° elevation of the head of the bed, has demonstrated advantages in enhancing intra-abdominal pressure. The semi-Fowler's position may reduce the tension in abdominal muscles, which could help alleviate discomfort associated with surgical wounds and abdominal pain. Furthermore, peritoneal effusion is confined to the lower region, facilitating more effective drainage. Research indicates that adopting the semi-Fowler's position may enhance lung capacity by 10 to 15% and improve the diaphragm's range of motion. This adjustment promotes lung expansion and optimises gas exchange. [8] A recent study found that adopting the semi-Fowler's position within 24 hours of tracheal intubation led to a notable decrease in the incidence of ventilator-associated pneumonia. Moreover, implementing early postural interventions following general anaesthesia can enhance pulmonary ventilation and elevate blood oxygen levels. [9]

Our research indicates that the semi-Fowler's position may offer greater comfort during emergence from anaesthesia and extubation for patients undergoing abdominal surgery, potentially minimising common complications in the post-anesthesia care unit. A prospective study was conducted to evaluate the comfort levels of patient's extubated in the semi-Fowler's position versus those extubated in the supine position.

Material and Methods

This prospective study was conducted at the Department of Anaesthesia after receiving approval from the institutional ethical committee, spanning a duration of 20 months. The research involved a series of patients aged over 18 and under 60 who presented at the Institute for abdominal onco-surgeries. These patients underwent procedures with a midline incision extending above the umbilicus, performed under general anaesthesia with epidural support.

The study participants were selected according to the specified inclusion and exclusion criteria outlined below:

Inclusion Criteria

1. Patients aged > 18 and < 60year
2. With BMI ranging from 18kg/m2 to 25kg/m2
3. American Society of Anaesthesiologists (ASA) status 1 and 2
4. Undergoing abdominal onco-surgery under general anaesthesia and epidural anesthesia with endotracheal intubation and midline incision extending above umbilicus.

Exclusion Criteria

1. Patient refusal
2. With a previous known allergy to drugs used in standardized anaesthetic regimen
3. Significant cardiorespiratory disease
4. Anticipated difficult intubation and history of difficult intubation

The sample size was determined using the mean and standard deviation of wound pain, referencing the section on sample size estimation and power for comparing two means in Rosner, B 2015 Fundamentals of Biostatistics, 8th edition. Using the specified formula and taking into account a 95% confidence level and 80% power, the estimated sample size needed for each group to effectively conduct the study is 50. [10]

The analysis revealed that the sample size consisted of 100 participants, with Group A positioned in Semi-Fowler's (n = 50) and Group B in Supine position (n = 50).

All patients meeting the inclusion criteria provided preformed written consent after a thorough explanation of the study's objectives, procedures, and expected outcomes prior to its commencement. Patients received an explanation regarding the VAS score assessment scale, where 1 indicates no pain and 10 represents the worst possible pain. Demographic information regarding patients, including age, sex, BMI, ASA, and MPG, was gathered.

Randomisation was accomplished through a computer-generated random sequence. Participants

were randomly allocated to one of two distinct groups.

- Group 1- patients for extubation in supine position.
- Group 2- patients for extubation in semi-Fowler's position.

The evening prior to the surgery, a standard preanaesthetic examination was performed. All patients received premedication with 0.5 mg of Alprazolam and 150 mg of Ranitidine at bedtime the night before. Upon entering the operating room, the intravenous line was established, and crystalloid fluids were initiated. The patients were linked to a multi-channel monitor, where baseline vital signs were recorded, including heart rate (HR), non-invasive blood pressure (NIBP), oxygen saturation (SPO2), respiratory rate (RR), and end-tidal carbon dioxide (ETCO2) following intubation.

Patients were positioned in a lateral or sitting position for the procedure of epidural catheterisation. An epidural catheter was inserted at the correct level under aseptic conditions. Epidural anaesthesia was administered during the procedure, tailored to the patient's haemodynamic status. Preoxygenation was performed using 100% oxygen for a duration of 3 minutes. Premedications included an intravenous administration of Midazolam at a dose of 1mg and Fentanyl at 1.5mcg per kilogramme of body weight. Anaesthesia was subsequently induced with an intravenous dose of Propofol at 2mg per kilogramme of body weight. The effectiveness of mask ventilation has been verified. A dose of 0.1 mg/kg of Inj. Vecuronium was administered intravenously, followed by ventilation for three minutes, after which the patient was intubated using a suitably sized oral cuffed endotracheal tube. The placement of the tube in the trachea was verified through auscultation and the measurement of end-tidal carbon dioxide (EtCO2).

The anaesthesia protocol involved the use of a nitrous oxide-oxygen mixture at a ratio of 2:1, enhanced with isoflurane and vecuronium for optimal effect. Upon completion of the procedure and the removal of drapes, Inj. Emset 4mg IV was administered. Isoflurane was discontinued at the conclusion of surgery, and patients received 100% oxygen. Prior to transferring the patient to the Post-Anesthesia Care Unit (PACU), each individual was administered an injection of Fentanyl at a dosage of 0.5µg/kg to mitigate any potential bucking during the transition. The length of the surgical procedure was documented, after which the patient was transferred to the post-anesthesia care unit (PACU) in a supine position. Following the transfer, the patient was placed on a ventilator using CPAP/SIMV mode. The patients were randomised into two groups: one assigned to the supine position and the other to the semi-Fowler's position, with each participant positioned accordingly five minutes later. The patient was positioned in a semi-Fowler's stance, utilising an inclinometer set at 30 degrees. The patient was successfully extubated after meeting the necessary conditions.

1. Spontaneous ventilation
2. Complete reversal of neuro-muscular blockade
3. Eye-opening and regaining of consciousness.

Vitals were recorded viz heart rate, mean arterial pressure and SpO2. Wound pain VAS score was recorded according to VAS scale (1 to10)

Airway complication like

a) Transient fall in SpO_2 if any
b) Airway rescue after extubation by jaw thrust or oral/nasal airway
c) Requirement of Re-intubation were recorded
d) Severe coughing, Bucking and vomiting were also recorded.

Statistical analysis:

The data were meticulously entered into MS Excel and subsequently analysed using SPSS version 22 software. Qualitative data were illustrated through proportions and pie diagrams, while bar charts provided a graphical representation.

Quantitative data were presented using mean and standard deviation. The Student's t test served as the method for determining significance in quantitative data, while the Mann Whitney test was employed for non-normally distributed data.

For qualitative data, the chi-square test was utilised to assess significance. A P value of less than 0.05 was deemed statistically significant.

Results

Table 1: Mean age comparison between two groups

	A		B		p value
	Mean	**SD**	**Mean**	**SD**	
Age (Years)	51.01	8.14	51.44	08.56	0.22

The current research indicates that the average age of participants was similar across both groups, with Group A showing a mean age of 51.01 ± 8.14 and Group B at 51.44 ± 08.56. The analysis revealed no notable difference in mean age between the two groups, with a p-value of 0.948. Table 1

Table 2: Gender Distribution between two groups

		A		B		p value
		Count	%	Count	%	
Gender	Female	22	44%	19	38%	0.09
	Male	28	56%	31	62%	

$\chi 2 = 0.990$, df = 1, p = 0.320

Statistically significance at p≤0.05

In Group A, the distribution of participants showed that there were 22 females, accounting for 44%, and 28 males, making up 56%. Meanwhile, Group B comprised 19 females, representing 38%, and 31 males, which constituted 62% of the group. The analysis revealed no notable difference in sex distribution between the two groups, with a p-value of 0.09. Table 2

The average SpO2 levels were analysed across the groups at baseline, immediately following the transition to the post-anesthesia care unit (PACU), after the administration of the reversal drug, and at intervals of 1 minute, 5 minutes, and 30 minutes post-extubation. Throughout all time intervals, there was no significant difference observed in the mean SpO2 levels between the two groups.

The analysis revealed a notable disparity in the mean respiratory rate (RR) between the two groups across all time intervals. In Group B, the mean respiratory rate returned to normal baseline levels 30 minutes post-extubation. In contrast, the mean respiratory rate remained elevated from the moment of transfer to the post-anesthesia care unit until 30 minutes after extubation. The analysis revealed a notable variation in the average pulse rate (PR) between the two groups, observed from the moment of transfer to the PACU, continuing through one minute post-extubation and at the 30-minute mark following extubation. Researchers conducted a comparison of the mean systolic blood pressure (SBP) between Group A and Group B. Throughout the various time intervals—specifically after the administration of the reversal drug and at 1 minute, 5 minutes, and 30 minutes post-extubation—there was a notable difference in the mean systolic blood pressure when comparing the two groups.

The analysis revealed a notable variation in mean diastolic blood pressure (DBP) when comparing the two groups, observed from the moment of transfer to the post-anesthesia care unit (PACU), one minute post-extubation, and again at the 30-minute mark following extubation. The mean MAP comparison between the two groups revealed a notable difference immediately after transitioning to the PACU, one minute post-extubation, and thirty minutes following extubation. The analysis revealed that there was no notable variation in the distribution of intravenous fentanyl doses between the two groups. The comparison of mean intra-venous fentanyl time between the two groups revealed a statistically significant difference (p = <0.001).

Table 3: Mean epidural analgesia intra-operative0.125% Bupivacaine Time comparison between two groups

Epidural analgesia intra-operative 0.125% bupivacaine Time	A		B		p value
	Mean	SD	Mean	SD	
<60 mins	39.12	10.22	40.09	15.46	0.23
60-120 mins	99.12	15.10	103.14	16.22	0.18
120-180 mins	157.98	14.32	159.11	18.46	0.35

Statistically significance at p≤0.05

The analysis revealed no notable difference in the mean duration of epidural analgesia with 0.125% bupivacaine during the intraoperative period between the two groups. Table 3

Table 4: Epidural Analgesia Intra Operative 0.125% Bupivacaine Dose Distribution between two groups

Epidural Analgesia Intra Operative 0.125% Bupivacaine Dose		A		B		p value
		Count	%	Count	%	
<60min	6CC	50	100.00	46	92	0.32
	NIL		00	4	8	
60-120min	6CC	45	90	44	88.00	0.06
	NIL	5	5	6	12.00	
120-180min	6CC	8	16	13	26	0.09
	NIL	42	84	37	74	

Statistically significance at p≤0.05

The analysis revealed no notable variation in the distribution of epidural analgesia with 0.125% bupivacaine during the intraoperative period between the two groups. Table 4

Table 5: Mean VAS comparison between two groups

VAS	A		B		p value
	Mean	SD	Mean	SD	
5min after extubation	2.40	0.44	2.02	0.12	0. 01*
15min after extubation	1.42	0.32	1.14	0.31	0. 01*
30min after extubation	1.02	0.19	1.01	0.02	0.02*

*** Indicate statistically significance at p≤0.05**

A notable disparity was observed in the mean visual analogue score (VAS) between the two groups from 5 to 10 minutes post-extubation. Group A exhibited higher VAS scores at the 5-minute, 15-minute, and 30-minute intervals when compared to Group B. Table 5

Upon comparing the complications between Group A and Group B, a notable difference in the distribution of severe cough was observed between the two groups. In Group A, severe cough and bucking were observed in 5 (10%) and 2 (4%) of the patients, respectively, while these symptoms were not present in Group B. Neither group exhibited any instances of vomiting. Neither group of patients experienced complications such as a temporary decrease in SpO2, airway rescue manoeuvres like jaw thrust or the use of oral/nasal airways, nor did they require re-intubation.

Discussion

The benefits and haemodynamic stability linked to the semi-Fowler's position during emergence and extubation have yet to be thoroughly documented. This study revealed that the semi-Fowler's position for emergence and extubation offers advantages for patients undergoing abdominal onco surgeries compared to the traditional supine position. This research indicates that adopting the semi-Fowler's position during emergence and extubation offers advantages for patients recovering from abdominal surgery compared to the conventional supine position.

The current research indicates that the mean age, gender distribution, and BMI were comparable between Group A and Group B. No statistically significant difference was observed between the two groups. The research conducted by Mir et al. examined the frequency distribution of socio-demographic and clinical characteristics among the patients involved. Notably, it revealed that over half of the participants fell within the eighteen to sixty age range, while 44% were aged forty years or older. In terms of gender distribution among the studied patients, it was observed that over three-quarters were male, with females making up only 16% of the total cohort. [11] All patients in both groups exhibited normal baseline SpO2 levels prior to anaesthesia, and there was no significant decrease in oxygen saturation at any time point, consistently remaining at 100%. The findings align with the research conducted by Zhu et al., which indicated that both groups exhibited normal baseline SpO2 levels prior to anaesthesia. Notably, oxygen saturation levels did not show significant decreases at any measured time point, consistently remaining above 96%. [12] Consequently, the semi-Fowler's position did not demonstrate clear benefits, potentially linked to the uninterrupted oxygen supply provided to all participants and the exclusion of individuals with peri-operative respiratory issues and a history of smoking during the recruitment process.

The analysis revealed a notable variation in mean pulse rate (PR) when comparing the two groups, observed from the moment of transfer to the PACU, continuing through one-minute post-extubation, and again at the 30-minute mark following extubation. Group A exhibited a consistently higher mean systolic blood pressure across all time intervals compared to Group B. The comparison of mean diastolic blood pressure (DBP) between the two groups revealed a notable difference from the moment of transfer to the PACU, continuing through one minute post-extubation and at the 30-minute mark following extubation. Patient positioning is crucial in the management of intracranial hypertension. An analysis of the findings from the study by Mir et al. indicated that positioning patients in a semi-Fowler's position, with their heads elevated by 30 degrees, had a significant impact on those suffering from head injuries. [11] The findings revealed a notable reduction in the average systolic blood pressure, alongside a decrease in the average diastolic blood pressure. Additionally, there was a significant drop in the average pulse pressure, bringing it within the normal range, which correspondingly led to an increase in the G.C.S score among semi-conscious patients. On the other hand, the results of the present study revealed that positioning the patient with increased intracranial pressure in a supine position contributed to significant systolic hypertension and a significant widening of pulse pressure. These results align with those of Abd El Hamid, who determined that the

semi-fowler's position improves arterial oxygenation. [13]

The comparison of mean PACU time between the two groups revealed a notable difference, specifically from the administration of the reversal drug to five minutes post-extubation. A comprehensive analysis involving 18,473 patients revealed that the overall rate of complications in the Post-Anesthesia Care Unit (PACU) stood at 23%. The most frequently observed complications encompassed postoperative nausea and vomiting, upper airway abnormalities, hypotension, arrhythmia, hypertension, and altered consciousness. [10] Patients suffering from obstructive sleep apnea who undergo uvulopalatopharyngoplasty may benefit from extubation in an upright position.

This approach has the potential to markedly decrease upper airway obstruction, lessen the effort required for breathing, mitigate postoperative respiratory depression, and enhance functional residual capacity. [14] A recent study indicates that extubating patients in the prone position may lead to a notable decrease in postoperative coughing among those undergoing spinal surgery. [15] Given the lack of evidence supporting a universal extubation position for all patients, it is reasonable to conclude that positioning should be tailored to individual patient conditions. Patients undergoing abdominal surgery face a significant risk of experiencing postoperative nausea and vomiting. [14] Optimising the position for extubation following abdominal surgery is crucial for minimising abdominal pain and enhancing patient comfort, all while ensuring that the workload for paramedics in the PACU remains manageable.

The analysis revealed a notable disparity in the mean visual analogue score (VAS) when comparing the two groups during the interval of 5 to 10 minutes post-extubation. The findings align with the research conducted by Zhu et al., indicating that comfort VAS scores were notably elevated in the semi-Fowler's position five minutes post-extubation and upon discharge from the PACU. [16] The wound pain VAS scores indicated a reduction in pain levels while in the semi-Fowler's position at all intervals following extubation. This observation suggests that alleviating wound pain through decreased abdominal wall tension may contribute significantly to patient comfort in this position.

In the supine position of Group A, a notable difference in the distribution of severe cough was observed when compared to the semi-Fowler's position of Group B. In Group A, severe cough and bucking were observed in 10% and 2% of patients, respectively, while these symptoms were not present in Group B. Neither group exhibited any instances of vomiting. In patients undergoing general anaesthesia for surgery, the occurrence of severe coughing and bucking can lead to serious complications, including hypertension, tachycardia, and various arrhythmias. Patients undergoing abdominal surgery may experience significant complications from severe coughing and bucking, which can result in a rapid and intense increase in abdominal pressure. This can manifest as noticeable wound pain or even wound dehiscence. [17] The semi-Fowler's position allows for a reduction in the extension of abdominal muscles, which may help alleviate tension on the surgical wound and reduce abdominal pain. Moreover, peritoneal effusion is confined to the lower region, facilitating improved drainage. Research indicates that adopting the semi-Fowler's position may enhance lung capacity by 10 to 15% and promote greater diaphragm mobility, thereby aiding in lung expansion and optimising gas exchange. [18]

Our study findings indicate that the semi-Fowler's position may provide greater comfort during emergence from anaesthesia and extubation for patients undergoing abdominal surgery, compared to the supine position, while also potentially minimising common complications in the post-anesthesia care unit.

Conclusion

After extubation, the mean respiratory rate returned to baseline levels within 30 minutes while the patient was in the semi-Fowler's position. Conversely, when positioned supine, the respiratory rate remained elevated. Therapeutic positions guided by turning schedules play a crucial role in sustaining haemodynamic parameters and averting complications.

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