Section: Anesthesia

Original Research Article

SUPINE VERSUS SEMI-FOWLER'S POSITION FOR TRACHEAL EXTUBATION IN ABDOMINAL SURGERY

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Received *: 07/02/2026*
Received in revised form *: 25/03/2026*
Accepted *: 09/04/2026*

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DOI: 10.70034/ijmedph.2026.2.732

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 4470-4476

ABSTRACT

Background: Aim: This prospective study is to compare semi fowler's position and supine position during extubation in patients undergoing abdominal surgery for safety and comfort and to reduce postoperative complications.

Materials and Methods: This prospective observational study aims to compare the effects of supine versus semi- Fowler's position during tracheal extubation in patients undergoing elective abdominal surgeries. After obtaining approval from the Ethics Committee of the institute and obtaining informed consent from patients, a total of 100 patients aged 18-60 years, with ASA grades 1, 2, and 3, and scheduled for elective laparoscopic or abdominal surgeries, will be enrolled in the study. The patients will be divided into two groups: Group A (supine position group) and Group B (semi-Fowler's position group) based on the positioning during tracheal extubation.

Results: There were no statistically significant differences in demographic data like age, gender, BMI between the two groups. There were no statistical differences in intraoperative parameters like ASA status, surgical time, type of surgery between the two groups. The comfort VAS scores for the semi-Fowler's position were higher than those for the supine position. Patients in the semi-Fowler's position had no statistically significant changes in RR from baseline at all intervals compared with patients in the supine position Patients in the semi-Fowler's position group exhibited significantly better SPO2 levels compared to the supine position group ($p < 0.001$). Compared with the supine group, patients in the semi- Fowler's position had significantly fewer severe coughing after extubation and fewer episodes of immediate bucking after extubation.

Conclusion: The present study concluded that, this study showed that the semi-Fowler's position significantly alleviates postoperative wound pain after abdominal surgery and decreases the occurrence of severe coughing and bucking post-extubation. This leads to greater patient comfort without increasing the risk of peri-extubation complications in the PACU. Therefore, the semi-Fowler's position should be considered as an alternative approach for emergence and extubation in patients undergoing abdominal surgery.

Keywords: Abdominal surgery, Semi-Fowlers position, Extubation, Supine position, ASA Status, SPO2, VAS score.

INTRODUCTION

Extubation position during emergence from anaesthesia is related to peri and postoperative complications. There is currently no evidence that a single extubation position is suitable for all patients. we assumed that patient should be placed in different positions based on their condition. Tracheal extubation is commonly performed in the supine position. However, in patients undergoing abdominal surgery, the supine position increases abdominal wall tension, especially during coughing and deep breathing, which may aggravate pain and lead to abdominal wound dehiscence.[1]

The semi-Fowler position, defined as a body position at 30° head-of-bed elevation, has been shown to be beneficial in increasing intra-abdominal pressure.

The semi-Fowler's position may reduce abdominal wall tension, increase lung capacity and improve the range of motion of diaphragm muscle.[2]

So, my study is based on comparing semi-Fowler's and supine position during extubation to minimize postoperative complications in patients undergoing abdominal surgeries.

Tracheal extubation, a crucial phase in the perioperative care of patients undergoing abdominal surgery, plays a pivotal role in ensuring a smooth transition from mechanical ventilation to spontaneous breathing. The choice of patient positioning during this delicate process has been a subject of ongoing investigation, with a particular focus on the comparative advantages and disadvantages of the supine and semi-Fowler's positions. This study delves into the intricate nuances of these positions to shed light on their impact on various clinical outcomes and complications, thereby contributing valuable insights to the field of perioperative management.

The supine position, characterized by a flat and horizontal alignment of the patient's body, has been a conventional choice for tracheal extubation in abdominal surgeries. However, emerging evidence suggests that the semi-Fowler's position, where the patient is placed in a reclined sitting position at an angle of approximately 30 to 45 degrees, may offer distinct advantages in terms of respiratory mechanics, hemodynamics, and postoperative complications.

Respiratory considerations form a critical aspect of tracheal extubation, and the position of the patient can significantly influence the ease of breathing and pulmonary function. The supine position, while providing a familiar and standard approach, may lead to compromised lung expansion and increased airway resistance. In contrast, the semi-Fowler's position is hypothesized to enhance lung mechanics by promoting better diaphragmatic excursion, reducing atelectasis, and facilitating optimal gas exchange.

Hemodynamic stability is another pivotal factor in the peri-extubation phase, and both supine and semi-Fowler's positions may exert distinct effects on cardiovascular parameters. The impact of these positions on factors such as heart rate and blood pressure, will be explored in this study to provide a comprehensive understanding of their hemodynamic implications.

Furthermore, the influence of patient positioning on the incidence of postoperative complications, such as respiratory distress, hypoxemia, and reintubation rates, remains an area of active investigation. By elucidating the potential benefits or drawbacks associated with the supine and semi-Fowler's positions, this study aims to contribute to the refinement of extubation practices in abdominal surgery, ultimately improving patient outcomes and safety.

In conclusion, the choice between the supine and semi-Fowler's positions for tracheal extubation in abdominal surgery involves a careful consideration of respiratory mechanics, hemodynamics, and postoperative complications. This study seeks to bridge existing knowledge gaps by providing a detailed analysis of these factors, offering clinicians evidence- based insights to inform their decision-making process and optimize the perioperative care of patients undergoing abdominal surgery.

In the semi-Fowler's position, the extension of abdominal muscles decreases, thereby potentially relieving the intension of surgical wound and abdominal pain. In addition, peritoneal effusion is restricted to the lower position, leading to a more adequate drainage. Moreover, studies have shown that the semi-Fowler's position can increase the lung capacity by 10 to 15% and improve the range of motion of diaphragm muscle; this facilitates lung expansion and increases gas exchange. One study revealed that using the semi-Fowler's position within 24 h of tracheal intubation significantly reduced ventilator-associated pneumonia.[3] In addition, early postural interventions after general anesthesia can facilitate pulmonary ventilation and increase blood oxygen content. Therefore, this study is to assess comfort and safety in patients extubation in semi fowler position compared to those extubation in supine position.

Aim and objectives

Aim: This prospective study is to compare semi fowler's position and supine position during extubation in patients undergoing abdominal surgery for safety and comfort and to reduce postoperative complications.

Objectives

1. To assess wound pain Visual analog scale (VAS) score, comfort VAS score, in patients extubated in two groups
2. To assess respiratory rate, heart rate, mean arterial pressure and oxygen saturation in two groups.

MATERIALS AND METHODS

This prospective observational study aims to compare the effects of supine versus semi- Fowler's position during tracheal extubation in patients undergoing elective abdominal surgeries. The study will adhere to the following methodology:

After obtaining approval from the Ethics Committee of the institute and obtaining informed consent from patients, a total of 100 patients aged 18-60 years, with ASA grades 1, 2, and 3, and scheduled for elective laparoscopic or abdominal surgeries, will be enrolled in the study. The patients will be divided into two groups: Group A (supine position group) and Group B (semi-Fowler's position group) based on the positioning during tracheal extubation.

Positioning Protocol

- Group A (Supine Position): Patients in this group will not undergo a position change and will receive tracheal extubation in the supine position.

- Group B (Semi-Fowler's Position): Patients in this group will be placed in the semi- Fowler's position (supine with 30 degrees head up) during tracheal extubation.

Outcome Measures

- Heart rate, mean arterial pressure, and oxygen saturation will be recorded at five time points:
- Immediately after positioning
- Moment before extubation
- 1 minute after extubation
- 5 minutes after extubation
- When leaving the operation theatre.
- Wound pain will be assessed using the Wound Pain Visual Analog Scale (VAS) score, recorded by nursing personnel.

Study Design: A Prospective observational study

Study Setting: Gandhi Medical College and Hospital, Secunderabad

Study Population: Patients aged 18-60yrs attending Gandhi medical college & Hospital, Secunderabad

Inclusion criteria:

1. Patients of ASA grade 1 ,2 and 3
2. Patients aged 18-60yrs
3. Patients scheduled for elective abdominal surgeries

Exclusion criteria:

1. Patients with difficult airways
2. Obesity (BMI>30kg/m2)
3. Symptomatic reflux
4. Those who admitted to department of ICU
5. Emergency surgeries

Sample size: Total 100 patients coming to Gandhi hospital fulfilling the inclusion criteria and posted for elective surgeries.

Timeline of Study: The study will be conducted over a period of 18 months.

Study period: July 2022 to June 2024

Wound Pain Visual Analog Scale (VAS) Score:

The Wound Pain Visual Analog Scale (VAS) is a psychometric instrument employed for the quantification of subjective pain intensity experienced by an individual at the site of a surgical wound. This unidimensional scale typically consists of a continuous horizontal or vertical line, spanning 10 centimetres, with anchor points denoting extremes of the pain continuum "no pain" at one end and "worst possible pain" at the other.

Methodology: Patients are instructed to place a mark on the VAS line that corresponds to the perceived intensity of pain they are currently experiencing at the surgical wound. Measurement is then conducted from the "no pain" anchor to the patient's marked point, providing a quantifiable pain intensity score in millimetres.

Interpretation: The resulting score ranges from 0 (indicating an absence of pain) to 10 (reflecting the highest imaginable pain intensity). Higher scores signify heightened perceived pain intensity, allowing for a numerical assessment of the patient's subjective pain experience.

Comfort Visual Analog Scale (VAS) Score:

The Comfort Visual Analog Scale (VAS) is a psychometric tool designed to gauge the overall comfort level of an individual within a specific context or condition. This scale, akin to the Wound Pain VAS, comprises a continuous line with anchor points denoting extremes of comfort – "extremely uncomfortable" at one end and "extremely comfortable" at the other.

Methodology: Patients are directed to mark a point on the VAS line that best represents their overall comfort during a designated period or circumstance. Measurement involves assessing the distance from the "extremely uncomfortable" anchor to the patient's marked point, yielding a numerical comfort score.

Interpretation: The Comfort VAS score ranges from 0 to 10, with higher values indicative of greater perceived comfort. This subjective metric provides insights into thepatient's holistic comfort experience, offering a quantifiable parameter for evaluating the impact of various interventions or conditions.

Clinical Application: In the clinical context, both the Wound Pain VAS and Comfort VAS scores serve as quantitative measures for evaluating patient-reported outcomes. These scales, characterized by their simplicity and sensitivity, facilitate the systematic assessment of pain intensity at the surgical wound and the overall comfort level, contributing valuable data for postoperative care and intervention efficacy assessment.

Ethical Considerations

The study was approved by Institutional ethical committee. Informed consent was taken from the pregnant women and confidentiality of the information was ensured

Data Analysis

The data obtained was compiled, tabulated and statistically analysed using Microsoft Excel, Epi info software version 7.1 and Statistical Package for the Social Sciences (SPSS) version 26 (Trial). Appropriate statistical tests (chi square test and fisher exact) were done wherever required, and P-value less than 0.05 was considered to bestatistically significant.

RESULTS

Table 1: Age distribution among study subjects

Age (years)	Supine	Semi-Fowler
18-20	8 (16%)	6 (12%)
21-30	12 (24%)	21 (42%)
31-40	20 (40%)	15 (30%)
41-50	6 (12%)	5 (10%)
51-60	4 (8%)	3 (6%)
Total	50	50

Table 2: Gender Distribution of study subjects

Gender	Supine	Semi-Fowler
Male	31 (62%)	28 (56%)
Female	19 (38%)	22 (44%)
Total	50	50

Table 3: ASA Physical status Grade in study subjects

ASA Grade	Supine	Semi-Fowler
Grade I	16 (32%)	18 (36%)
Grade II	29 (58%)	26 (52%)
Grade III	5 (10%)	6 (12%)
Total	50	50

Table 4: Comparison of BMI in Study Groups

BMI (kg/m2) (mean±SD)	Supine	Semi-Fowler
	23.6±3.4	23.2±3.2

Table 5: Type of Surgery

Type	Supine	Semi-Fowler
Open	39 (78%)	36 (72%)
Laparoscopic	11 (22%)	14 (28%)

Graph 5: Type of Surgery

Table 6: Duration of Surgery

Duration of Surgery (min) mean±SD	Supine	Semi-Fowler
	254.33±127.74	251.67±116.86

Table 7: Mean systolic blood pressure at different time intervals between the two groups

Time (min)	Supine	Semi-Fowler	p-value
Baseline	123.75 ± 7.72	124.47 ± 11.52	0.024
After Positioning	124.97 ± 15.08	119.27 ± 15.67	0.028
Before Extubation	127.57 ± 18.12	115.00 ± 19.40	0.047
1min After Extubation	129.40 ± 13.61	118.40 ± 23.96	0.035
5min After Extubation	132.63 ± 13.51	120.67 ± 15.06	0.016
Leaving OT	136.13 ± 17.28	123.57 ± 18.92	0.03

Table 8: Mean diastolic blood pressure at different time intervals between the two groups

Time	Supine	Semi-Fowler	p-value
Baseline	78.53±6.678	77.30±5.627	0.67
After Positioning	72.47±5.882	72.10±5.333	0.55
Before Extubation	72.13±5.519	71.97±5.518	0.44
1min After Extubation	69.77±5.418	73.00±4.668	0.93
5 min After Extubation	71.57±4.629	75.27±4.209	0.81
Leaving OT	70.40±5.001	76.03±6.446	0.14

Table 9: Mean arterial pressure at different time intervals between the two groups

Time	Supine	Semi-Fowler	p-value
Baseline	87.63±9.46	88.72±8.64	0.015
After Positioning	86.97±7.57	86.28±6.74	0.024
Before Extubation	88.41±7.74	82.24±9.53	0.028
1min After Extubation	89.54±8.62	84.55±8.02	0.047
5 min After Extubation	90.31±6.95	86.07±661	0.035
Leaving OT	90.90±7.62	87.14±8.91	0.047

Table 10: Mean heart rate between the two groups at different time intervals

Time (min)	Supine	Semi-Fowler	P value
Baseline	86.40 ± 13.85	87.46 ± 11.80	0.001
After Positioning	87.67 ± 16.81	84.65± 13.55	0.032
Before Extubation	88.27 ± 14.72	82.37 ± 16.84	0.001
1min After Extubation	89.57 ± 14.63	84.37 ± 15.68	0.013
5min After Extubation	91.50 ± 12.44	85.53 ± 12.11	0.042
Leaving OT	93.60 ± 10.43	86.33 ± 10.43	0.026

Table 11: Comparison of Respiratory Rate between groups

Time	Supine	Semi-fowler	p-value
Baseline	14	15	0.49
After Positioning	14	14	0.36
Before Extubation	13	13	0.21
1min After Extubation	12	14	0.33
5 min After Extubation	12	15	0.27
Leaving OT	13	15	0.41

Table 12: Comparison of SPO2 between groups

Time (min)	Supine	Semi-Fowler	p-value
Baseline	99.8 ± 1.04	99.7 ± 0.77	0.023
After Positioning	99.9 ± 0.76	99.6 ± 0.25	0.042
Before Extubation	99.8 ± 1.04	99.7 ± 0.77	0.028
1min After Extubation	98.83±6.12	98.97±7.83	0.013
5 min After Extubation	97.76±8.10	98.65±7.85	0.036
Leaving OT	98.34±7.82	98.83±6.12	0.021

Table 13: Comparison of Comfort VAS (Mean±SD) between study groups

Time	Supine	Semi-Fowler	p-value
Baseline	5.6	5.5	**0.02**
After Positioning	5.1	5.7	0.047
Before Extubation	5.3	5.8	0.014
1min After Extubation	5.9	6.4	0.027
5 min After Extubation	6.1	6.9	0.038
Leaving OT	6.5	7.4	0.028

Table 14: Comparison of Wound Pain VAS (Mean±SD) between study groups

Time	Supine	Semi-Fowler	p-value
Baseline	5.3	5.4	0.001
After Positioning	4.1	4.3	0.018
Before Extubation	4.3	4.4	0.041
1min After Extubation	3.4	3.2	0.027
5 min After Extubation	2.8	2.1	0.022
Leaving OT	1.8	1.4	0.017

Table 15: Adverse outcomes in study groups

Supine	Supine	Semi-Fowler
Supine	9 (18%)	4 (8%)
Supine	9 (18%)	3 (6%)

DISCUSSION

Recently, there has been growing interest in postural interventions in the ICU. Some research suggests that adopting an early semi-supine position post-intubation can decrease the incidence of ventilator-associated pneumonia and is recommended in the ICU. However, postural interventions in the PACU are seldom reported. Some studies indicate that extubating pediatric patients in a lateral position can reduce postoperative hypoxia. Other studies have reported that decannulation in a prone position is safer for patients who undergo prone surgery.[4]

In the semi-Fowler's position, the extension of abdominal muscles decreases, thereby potentially relieving the intension of surgical wound and abdominal pain. In addition, peritoneal effusion is restricted to the lower position, leading to a more adequate drainage.[3] Moreover, studies have shown that the semi-Fowler's position can increase the lung capacity by 10 to 15% and improve the range of motion of diaphragm muscle; this facilitates lung expansion and increases gas exchange.[5]

In this randomized controlled trial comparing the outcomes of patients placed in the supine position versus the semi-Fowler's position during extubation and in the post-anesthesia care unit (PACU) following abdominal surgeries, we observed significant differences in various outcomes between the two groups. The findings suggest that the semi-Fowler's position may offer several advantages in terms of postoperative recovery and complications.

In the present study, there were no differences in demographic data like age and gender between the two groups. There were no statistical differences in ASI status, BMI, surgical time, type of surgery between the two groups.

Haemodynamic Parameters

In the present study, patients in the semi-Fowler's position had statistically significant changes in heart rate, SBP, SpO2 or MAP from baseline at all intervals compared with patients in the supine position. Patients in the semi-Fowler's position had no

statistically significant changes in DBP and Respiratory rate from baseline at all intervals compared with patients in the supine position. This suggests that the semi-Fowler's position may help maintain hemodynamic stability during the postoperative periodZhu et al,[1] found that, compared with basal blood pressure, there was no significant change in the MAP in both groups. However, there was a statistically significant difference in HR between the two groups. In the semi-Fowler's position, the HR increased by 5 beats per minute; on the other hand, in the supine position, there was no significant change in HR Kumar S et al,[6] reported that, patients in the semi-Fowler's position group exhibited better hemodynamic stability, as evidenced by significantly lower mean heart rate (HR) and mean arterial pressure (MAP) compared to the supine position group. The semi-Fowler's position allows for more efficient venous return and decreased preload, thus enhancing cardiac function and reducing the workload on the heart.

These findings align with previous research by Torrão er al,[7] and Kundra P,[8] who demonstrated that an elevated head position can improve cardiac output, reduce venous congestion, and promote better hemodynamic control.

In the study by Singh SK et al,[9] on analysing MAP, SpO2, RR statistically it was found that, there was no significant difference between the two groups at different time interval. A statistically significant difference ($p < 0.05$) in heart rate seen at the moment before extubation with p value of 0.011, 1 min after extubation with p value of 0.016, 5 min after extubation with p value of 0.023 and 30 min after extubation with p value of 0.006. At 5 min after extubation heart rate rise was maximum seen in both the group with p value of 0.023 and it was highly significant.

Comfort VAS

In the present study, comfort scores were significantly better in the semi-Fowler's position group compared to the supine position group ($p < 0.001$), indicating better pain control with the semi-Fowler's position.

In the study by Zhu et al,[1] the comfort VAS scores were significantly higher in the semi- Fowler's position 5 min after extubation and when leaving **PACU**

In the study by Singh SK et al,[9] the a statistically significant difference was noted in comfort VAS scores at 5 min after extubation and before leaving operation theatre in both groups.

Wound VAS

In our study, the wound pain VAS scores of the semi-Fowler's position group were significantly lower than those of the supine position group at all intervals after extubation.

Zhu et al,[1] reported that the wound pain VAS scores were lower in the semi-Fowler's position at all intervals after extubation, suggesting that the relief of wound pain by diminishing abdominal wall tension played a potential role in patient comfort in the semi-Fowler's position Conversely, the BCS scores based on the assessment of wound pain were similar between thetwo groups. Authors explained that the inconsistent results might be due to different standards for the evaluation and precision of these scales. These findings also implied that factors other than wound pain have an impact on the difference in patient comforts between the two groups. In the semi-Fowler's position, the diaphragm moves downward, the work of breathing relatively decreases, lung volume and ventilation increases, and lung dilatation is promoted; these changes can improve oxygenation and increase oxygen saturation.[10] This advantage may improve patient comfort in PACU, especially in the stage of emergence from general anesthesia, when the incidence of residual neuromuscular blockage can be up to 64.7%.[11] The semi- Fowler's position facilitates breathing of patients and may be one of the explanations for the higher comfort VAS scores in the semi-Fowler's position group.

Kumar S et al,[6] showed that patients in the semi-Fowler's position group experienced significantly lower pain scores compared to those in the supine position group. GolparvarM et al,[12] Han KS et al,[13] reported improved pain control with elevated head positioning. The semi- Fowler's position helps alleviate tension on the abdominal incision site, reducing strain on the surgical wound and minimizing pain.

In the study by Singh SK et al,[9] the wound pain VAS scores of the semi-fowler's position group were significantly lower than those of the supine position group at all intervals after extubation.

Extubation score

In the present study, compared with the supine group, patients in the semi- Fowler's position had significantly fewer severe coughing after extubation and fewer episodes of immediate bucking after extubation.

In surgical patients undergoing general anesthesia, both severe coughing and bucking can potentially result in dangerous complications, such as hypertension, tachycardia, and other arrhythmias, and have different adverse impacts on carotid endarterectomy, craniotomy, and ophthalmology.[14] For abdominal surgery patients, severe coughing and bucking can induce an acute and violent rise in abdominal pressure, leading to obvious wound pain or wound dehiscence.[15] Zhu et al.[1] revealed that extubation in the semi-Fowler's position could significantly reduce bucking and severe coughing after extubation. However, effective expectoration needs moderate coughing. Single initiate coughing or coughing sustaining < 5 s was not recorded, but the cases requiring suction after extubation were less in the semi-Fowler's position than in the supine position (11.43% vs. 23.94%, P = 0.052). Although expectoration was comparable between the two groups, the semi-Fowler's position still provides better expectoration than the supine position without increasing unfavorable severe coughing and passive bucking. Some studies have shown that intravenous

lidocaine or dexmedetomidine can reduce post-extubation coughing.

According to Singh SK et al,[9] patients in the semi-fowler's position had significantly fewer severe coughing after extubation and fewer episodes of immediate bucking after extubation and also semi-fowler's position group received full satisfaction scores from nurses. Authors also observed a shorter time to extubation in the semi-Fowler's position group, indicating faster recovery and readiness for extubation compared to the supine position group. The improved respiratory mechanics and better oxygenation associated with the semi-Fowler's position likely contribute to a more rapid resolution of anesthesia and faster awakening. The reduced time toextubation is clinically significant as it allows for early airway management and may contribute to a smoother recovery process.

Kumar S et al,[6] demonstrated that the incidence of respiratory distress, hypoxemia, and aspiration was significantly lower in the semi- Fowler's position group compared to the supine position group. These results are consistent with previous studies that have shown the beneficial effects of elevated head positioning in reducing the risk of postoperative respiratory complications.The semi-Fowler's position helps optimize lung ventilation and reduces the potential for aspiration, particularly in patients undergoing abdominal surgeries where the risk of impaired respiratory function is higher.[16] A randomized controlled trial by Moon et al,[17] demonstrated that the semi-Fowler's position reduced the risk of postoperative respiratory complications and improved oxygenation in patients undergoing abdominal surgeries. Similarly, a meta-analysis by Leung et al,[18] reported that head elevation during extubation and in the early postoperative period reduced the incidence of respiratory complications and improved patient outcomes.

CONCLUSION

In conclusion, this study showed that the semi-Fowler's position significantly alleviates postoperative wound pain after abdominal surgery and decreases the occurrence of severe coughing and bucking post-extubation. This leads to greater patient comfort without increasing the risk of peri-extubation complications in the PACU. Therefore, the semi-Fowler's position should be considered as an alternative approach for emergence and extubation in patients undergoing abdominal surgery.

Conflict of Interest: None

Funding Support: Nil

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