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Positioning for Success: A Comparative Analysis of Supine and Semi-Fowler's Extubation in Laproscopic Abdominal Surgery

[1]Dr Burhan Ali, Postgraduate, Department of Anaesthesiology & Critical Care, Acharya Shri Chander College of Medical Sciences & Hospital, Jammu

[2]Dr Nandita Mehta, Professor & Head, Department of Anesthesiology& Critical Care, Acharya Shri Chander College of Medical Sciences & Hospital, Jammu

[3]Dr Shubham Mahajan, Postgraduate, Department of Anaesthesiology & Critical Care, Acharya Shri Chander College of Medical Sciences & Hospital, Jammu

Corresponding Author: Dr Burhan Ali, Postgraduate, Department of Anaesthesiology & Critical Care, Acharya Shri Chander College of Medical Sciences & Hospital, Jammu.

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Abstract

Introduction: Tracheal extubation following laproscopic abdominal surgery represents a critical phase, uniquely complicated by respiratory challenges arising from pneumoperitoneum-induced physiological alterations. While optimal patient positioning holds transformative potential for recovery, direct comparative evidence for supine versus semi-Fowler's positions is conspicuously sparse. This investigation meticulously examines these pivotal positions in the immediate post-extubation phase, precisely evaluating their impact on patient comfort, expiratory tidal volume, peak airway pressures and incidence of post-operative respiratory complications forging a path towards refined clinical protocols.

Methods: The study included ASA grade I to III patients aged between 18 and 65 years of either sex, with a BMI of 18-30 kg/m^2. Patients were computer-randomized into two groups undergoing laproscopic abdominal surgeries. Extubation was performed in supine and semifowler's positions as per position allocation of the patients. All the patients after meeting extubation criterias were evaluated for demography, extubation time**,** expiratory tidal volume**,** peak airway pressures, incidence of post-operative respiratory complications and Bruggeman comfort score (0,10, 20 & 30 mins intervals)**.**

Results: The two groups were demographically comparable in terms of age, sex, and BMI. Extubation time showed no significant difference between groups (P = 0.0756). However, the Semi-Fowler's group demonstrated significantly higher expiratory tidal volumes ($P = 6.22 \times 10^{-9}$) and peak airway pressures ($P = 1.57 \times 10^{-38}$). Respiratory complications were comparable (P = 0.8337), while patient comfort was significantly better in the Semi-Fowler group at 10 and 30 minutes (P = 0.0382, 0.0463).Overall, the distribution of results was statistically significant with a P-value <0.05.

Conclusions: We conclude that the semi-Fowler's position presents a favorable balance of benefits for post-abdominal surgery recovery. While extubation time and overall respiratory complications remained comparable, this position significantly improved both expiratory tidal volume and patient comfort. Although it led to higher peak airway pressures, the overall statistically significant findings (P <0.05) underscore its positive impact on patient outcomes.

Keywords: Semi-Fowler's position, Supine position, Extubation time**,** Expiratory tidal volume**,** Peak airway pressures**,** Bruggeman comfort score.

Introduction

Tracheal extubation, the final stage of transitioning a patient from mechanical ventilation to spontaneous respiration, is a critical event in perioperative management. Although routine in practice, it remains a high-risk phase that can precipitate respiratory complications such as hypoxemia, atelectasis, aspiration, and the need for re-intubation. These events are particularly relevant in specific surgical populations, such as those undergoing laparoscopic abdominal procedures**,** where altered respiratory mechanics pose unique challenges. Despite the availability of general extubation protocols, evidence-based strategies tailored to this group remain limited.

Patient positioning during extubation is a simple, modifiable variable that may influence postoperative respiratory outcomes. In neurosurgical practice, head elevation is employed to reduce intracranial pressure, while in obstructive sleep apnoea, upright positioning enhances airway patency. These examples illustrate how positioning can be used therapeutically across different surgical contexts.

Laparoscopic surgeries introduce physiological changes including pneumoperitoneum and increased intra-abdominal pressure, which impair diaphragmatic movement and reduce functional residual capacity. These alterations increase the risk of early postoperative pulmonary complications. Traditionally, extubation is performed in the supine position**;** however, the semi-Fowler's position—with 30–45° torso elevation—may alleviate diaphragmatic compression, improve lung volumes, and enhance gas exchange.

Although some literature supports the role of positioning in respiratory care, comparative data in laparoscopic surgery remains sparse. This study aims to evaluate the impact of supine versus semi-Fowler's positioning during extubation in patients undergoing laparoscopic abdominal surgery, focusing on respiratory parameters, complication rates, and patient comfort, thereby guiding more effective extubation strategies.

Material and methods

This prospective, randomized study was conducted in the Department of Anaesthesiology and Intensive Care, ASCOMS Jammu, after obtaining approval from the Institutional Ethics Committee. A total of 120 patients ASA I–III, aged 18–65 years, BMI 18–30 kg/m²,

scheduled for elective laparoscopic abdominal surgery were included and randomized into two equal groups **(**Supine and Semi-Fowler's**,** n=60 each) using computer-generated random numbers and sealed envelope allocation.

Anaesthesia was induced with fentanyl 1 mcg/kg**,** propofol 2 mg/kg, and succinylcholine 1.5 mg/kg IV**,** and maintained with isoflurane (0.5–1%)**,** nitrous oxide and oxygen (66:33%)**,** and rocuronium 0.6 mg/kg**,** guided by Train-of-Four (TOF) monitoring**.** Paracetamol 15 mg/kg and ondansetron 0.1 mg/kg were administered intraoperatively.

At the end of surgery, anaesthetics were discontinued, and patients were positioned per group (supine or semi-Fowler's at 30–45°). Neuromuscular blockade was reversed using neostigmine 50 mcg/kg and glycopyrrolate 10 mcg/kg**.** Extubation was performed after confirming spontaneous ventilation, consciousness, head lift >5 seconds, and TOF ratio >0.9

Immediately following extubation, several key parameters were meticulously measured: extubation time**,** expiratory tidal volume and peak airway pressures**.** Postoperative respiratory complications were also recorded, including transient SpO2 >5% drop from baseline or <90% requiring additional oxygen, upper airway obstruction requiring suctioning or non-invasive intervention and severe obstruction necessitating reintubation. Patient comfort was assessed via the Bruggemann comfort score (where 0 indicated severe pain, 1 severe pain with deep breathing or coughing, 2 mild pain with deep breathing or coughing, 3 no pain with deep breathing, and 4 no pain with coughing) at 0, 10, 20, and 30 minutes post-extubation with pain relief provided as per the score.

The collected data were analyzed using standard statistical methods, with a p-value <0.05 considered statistically significant. All analyses were conducted using statistical software.

Results

This study assessed extubation outcomes in patients positioned either supine or in the Semi-Fowler's position. Baseline demographic variables, including age, BMI, and sex distribution, were comparable between the two groups (P > 0.05), indicating no significant differences (Table 1).

Extubation time showed no significant difference between groups (P = 0.0756). The Semi-Fowler position was associated with significantly higher expiratory tidal volumes (P = 0.000001) and peak airway pressures (P < 0.000001). Notably, these physiological changes did not lead to an increased incidence of postoperative respiratory complications, which remained comparable across both groups (P = 0.8337) (Table 2).

Patient-reported comfort scores were significantly better in the Semi-Fowler group, with improvements noted at both 10 minutes (P = 0.0382) and 30 minutes (P = 0.0463) post-extubation (Table 3).

Table and Graph 1: Comparison of Mean Age between Supine and Semi-Fowler Positions

Group	Mean Age ± SD	Mean BMI ± SD	Sex (M/F)
Supine	41.17 ± 13.47	24.1 ± 3.5	22 / 18
Semi-Fowler	45.05 ± 13.33	24.7 ± 3.2	24 / 16
P value	0.0609	0.457	0.799

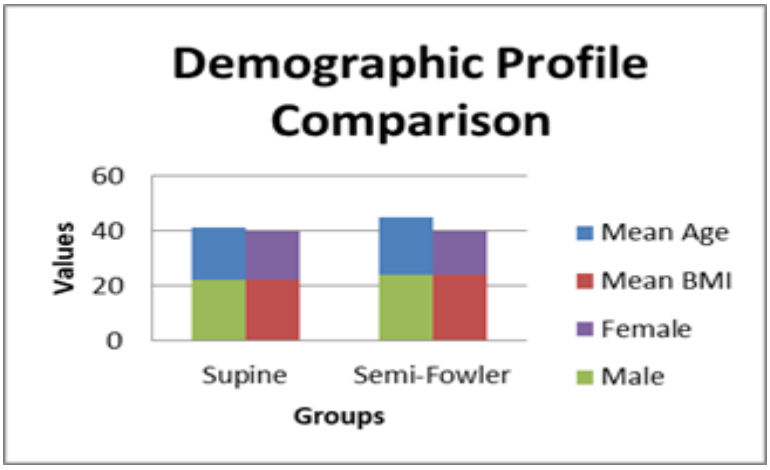


Table and Graph 2: Comparison of Mean Extubation Time, Expiratory Tidal Volume, Peak Pressure, post op. Respiratory complications Between Supine and Semi-Fowler Position.

Group	Extubation Time (min)	Expiratory Tidal Volume (ml)	Peak Pressure (cmH_2O)	Post op. respiratory complication		
				Mild airway obstruction	Transient SpO2 drop	None
Supine	15.02 ± 3.74	435.82 ± 38.99	10.60 ± 1.62	11(18. 33)	10 (16.67)	39 (65.0)
Semi-Fowler	17.27 ± 4.40	391.00 ± 41.17	16.55 ± 1.76	9 (15.0)	9 (15.0)	42 (70.0)
P-value	0. 0756	6. 22E-09	1. 57E-38	0.8337		

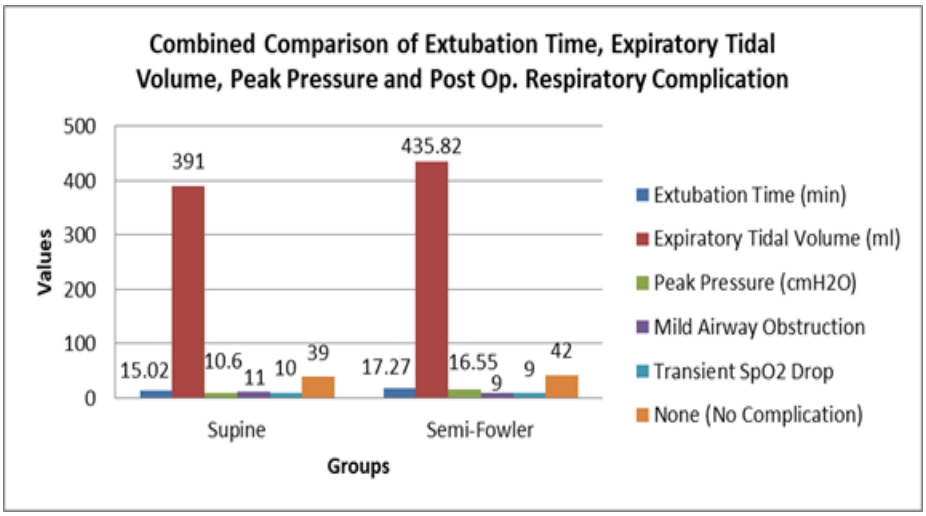
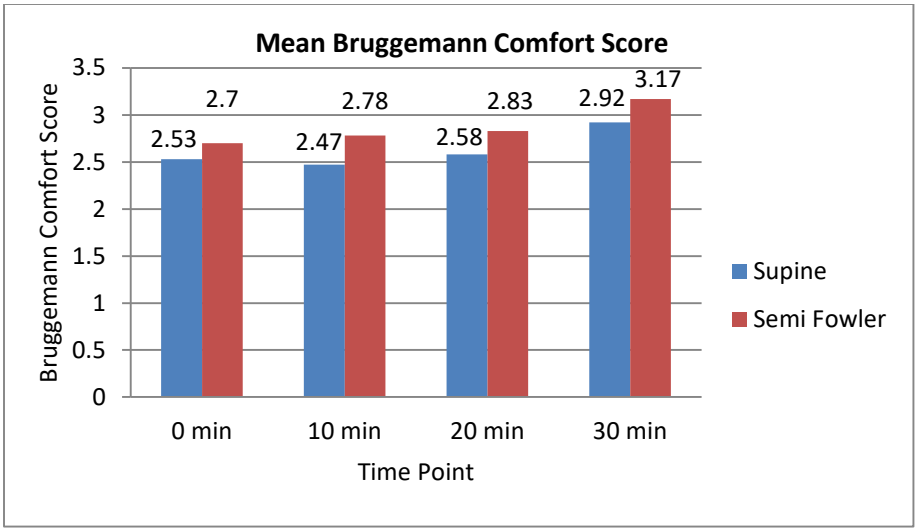


Table and Graph 3: Comparison of Bruggemann Comfort Scores between Supine and Semi-Fowler Positions at Different Time Points.

Time Point	Group	Bruggemann Comfort Score		P-value
		Mean	S. D.	
0 min	Supine	2. 53	0. 98	0. 1682

	Semi Fowler	2. 70	0. 91	
10 min	Supine	2. 47	0. 98	0. 0382
	Semi Fowler	2. 78	0. 96	
20 min	Supine	2. 58	0. 85	0. 0667
	Semi Fowler	2. 83	0. 96	
30 min	Supine	2. 92	0. 81	0. 0463
	Semi Fowler	3. 17	0. 81	



Discussion

This randomized prospective study compared supine and semi-Fowler's positions during the immediate post-extubation period in patients undergoing laparoscopic abdominal surgery, a setting with limited existing research on optimal positioning. The findings highlight semi-Fowler's as a simple, cost-effective strategy to enhance respiratory mechanics, patient comfort, and recovery without added risk. Given the respiratory challenges posed by pneumoperitoneum and diaphragmatic splinting, our study adds valuable insight to the limited literature, reinforcing the role of evidence-based positioning in improving perioperative outcomes. In our study, the Supine and Semi-Fowler groups were demographically well-matched, with no statistically significant differences in age, sex, or BMI ($P > 0.05$). This baseline comparability strengthens the validity of our findings and aligns with observations by Aluş et al., (2007), who found minimal demographic influence on positional outcomes.

Extubation time, often viewed as a marker of recovery efficiency, showed no significant difference between the two positions ($P = 0.0756$). This reinforces the notion that while posture may tweak respiratory mechanics, it doesn't noticeably fast-track or delay the extubation process, a trend echoed by Zhu et al., (2020) in surgical patients positioned semi-upright versus supine.

One standout advantage of the Semi-Fowler position was its association with significantly higher expiratory tidal volumes ($P < 0.000001$), suggesting more effective lung ventilation and gas exchange. This finding mirrors the conclusions of Liu et al., (2011), who credited semi-upright positioning with facilitating diaphragmatic

movement and reducing basal lung compression. This enhancement is particularly relevant in abdominal surgeries, where diaphragmatic splinting often hampers adequate ventilation.

Interestingly, our findings diverged from conventional expectations which typically peg the supine position as the culprit for higher peak airway pressures, our results revealed significantly elevated pressures in the Semi-Fowler group ($P < 0.000001$). While initially counterintuitive, this may reflect increased thoracoabdominal pressure gradients in upright postures, as described by Benedik et al., (2009). Crucially, these elevations came without any clinical fallout. When viewed alongside the improvement in tidal volume, the "pressure price" seems a fair trade for the ventilatory gains, so long as careful monitoring is maintained.

Postoperative respiratory complications, such as mild airway obstruction and transient desaturation, occurred at comparable rates between groups ($P = 0.8337$), reaffirming that neither position increased the risk of respiratory compromise. These results align with findings by Jung et al., (2019), who also vouched for the safety of semi-upright extubation positioning (see Table and Graph 2).

The Semi-Fowler position, long recognized for its comfort enhancing reputation, lived up to expectations in our trial. Patient comfort scores were consistently and significantly higher at both 10 and 30 minutes post-extubation ($P = 0.0382$ and $P = 0.0463$), as shown in Table and Graph 3. These findings are in line with Gupta and Rusin (2012), who highlighted how reduced abdominal tension and improved breathing mechanics contribute to greater postoperative ease.

Conclusion

We conclude that Semi-Fowler's position emerges as a clinically advantageous strategy during the immediate post-extubation period, offering superior respiratory mechanics and enhanced patient comfort without a corresponding increase in postoperative complications. Despite the associated rise in airway pressures, its overall benefits underscore its role as a safe, effective, and easily implementable intervention in perioperative care. These findings advocate for its preferential use in laproscopic abdominal surgeries, with vigilant airway monitoring ensuring optimal patient outcomes.

Limitations

While this study offers valuable clinical insights, it is limited by the exclusion of higher-risk ASA >III patients and its focus solely on laparoscopic abdominal surgeries. Being a single-center study further restricts its generalizability to wider clinical settings. Additionally, long-term postoperative outcomes were not assessed. Future multicenter trials with broader patient populations and extended follow-up are recommended to strengthen the evidence.

References

1. Aluş M, Okumuş H, Mete S, Güçlü S. The effects of different maternal positions on non-stress test: an experimental study. J Clin Nurs. 2007;16(3):562–8.
2. Benedik PS, Baun M, Keus L, Jimenez C, Morice R, Bidani A, Meininger J. Effects of body position on resting lung volume in overweight and mildly to moderately obese subjects. Respir Care. 2009; 54(3):334–9.
3. Gupta D, Rusin K. Video laryngoscopic endotracheal intubation (Glide Scope) of morbidly obese patients in semi-erect position: a comparison

with rapid sequence induction in supine position. Middle East J Anaesthesiol. 2012;21(6):843–50.

4. Jung H, Kim H, Lee Y, Kim H. Comparison of lateral and supine positions for tracheal extubation in children. Anaesthesist. 2019;68(4):303–8.
5. Liu HP, Xue F, Liao X, Liu JH, Guo X. Use of a Boussignac TM continuous positive airway pressure mask to improve postoperative pulmonary function in morbidly obese patients. Can J Anaesth. 2011;58:969–70.
6. Zhu Q, Huang Z, Ma Q, Wu Z, Kang Y et al., Supine versus semi-Fowler's positions for tracheal extubation in abdominal surgery a randomized clinical trial. BMC Anesthesiol. 2020 Dec;20:1–9.