

Depth of Neuromuscular Blockade (NMB) Affects Surgical Conditions in Obese Patients Undergoing Robotic Lower Abdominal Surgery



Allison Woosley MD, Rainer Lenhardt MD, Daniel Metzinger MD⁺, Maria Lenhardt MD*, Sarah Todd MD⁺
Department of Anesthesiology and Perioperative Medicine and Department of OB/GYN⁺
University of Louisville, Louisville KY and Landeskrankenhaus Feldkirch, Austria*



Background

- Robotically assisted surgeries have been shown to improve outcomes in obese patients.
- Pneumoperitoneum, used to provide optimal surgical views, is facilitated by neuromuscular blockade, of which there are two levels: moderate and deep neuromuscular block¹.
- Evidence suggests a deep NMB may improve surgical conditions² and reduce sudden abdominal contractions during surgery³, but it is unclear if the advantages are comparable in obese and non-obese patients.
- This study aimed to determine whether deep neuromuscular blockade improves surgical conditions in obese and non-obese patients compared to moderate NMB.

Methods

- 100 patients were randomized based on BMI (< or > 30) to either deep neuromuscular blockade (dNMB) or moderate NMB (mNMB).
- Rocuronium was used to keep NMB moderate or deep, which was monitored with an acceleromyometer.
- “Train of four” (TOF) was maintained at 1-3 twitches in the mNMB group and at 0 twitches with at least one post-tetanic count (PTC) in the dNMB group.
- During abdominal CO₂ insufflation, the intra-abdominal pressure was kept around 15 mmHg.
- Surgeon and surgical assistant assessed surgical conditions using the 5-point Leiden surgical rating scale every 15 minutes.

N=100	Body mass index, > 30 kg/m ² , moderate	Body mass index, > 30 kg/m ² , deep	Body mass index, < 30 kg/m ² , moderate	Body mass index, < 30 kg/m ² , deep	
Leiden Surgical Rating Scale	3.4 ± 0.7	4.0 ± 0.6	4.5 ± 0.5	4.5 ± 0.5	P < 0.05
Peak airway pressure, cm H ₂ O	31 ± 3	31 ± 4	22 ± 3	21 ± 3	P < 0.05
Patient compliance, ml/cm H ₂ O	20 ± 4	19 ± 4	25 ± 5	27 ± 5	P < 0.05
End-tidal CO ₂ , mmHg	43 ± 4	43 ± 4	40 ± 4	40 ± 3	P < 0.05
CO ₂ amount of insufflation, liters	211 ± 90	216 ± 117	198 ± 165	227 ± 109	
Insufflation pressure, mmHg	14.0 ± 1.7	13.9 ± 2.2	12.6 ± 1.4	12.9 ± 2.0	P < 0.05
CO ₂ insufflation time, min	81 ± 33	81 ± 30	70 ± 29	85 ± 30	P < 0.05
Surgery duration, min	109 ± 34	112 ± 47	94 ± 32	111 ± 33	

Table 1. Comparison of primary and secondary outcomes in obese and non-obese patients stratified to moderate versus deep paralysis during general anesthesia for robotic abdominal surgery, ANOVA and Student’s t-test of pooled data. P-values < 0.05 were considered significant.

Results

- Obese patients had significantly lower rating scores during the insufflation period compared to non-obese patients, 3.7 ± 0.7 versus 4.5 ± 0.5 (p < 0.001).
- Deep compared to moderate paralysis yielded better results in the obese group 4.0 ± 0.6 versus 3.4 ± 0.7 (p = 0.02), but not in the non-obese patient group (score of 4.5).



Picture 1. Acceleromyometer to measure depth of paralysis.

Conclusion

- Surgical conditions, assessed by the Leiden scale, during robotic abdominal surgery are significantly worse in obese patients compared to non-obese patients regardless of level of NMB.
- Surgical conditions amongst obese patients are significantly improved when under deep paralysis.

References

- 1) Bruintjes et al.; BJA, 118(6):834-42
- 2) Torensma et al.; PLOS one DOI:10.1371/journal.pone.0167907
- 3) Koo et al.; World J Urology, 37:359-365