Does residual neuromuscular weakness lead to an increase in respiratory events in bariatric patients? A prospective randomized trial

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Introduction

- Most clinicians do believe residual postoperative neuromuscular blockade is a rare phenomenon, despite more than 30 years of reports on its high incidence (25-84%) (1,2).
- Residual blockade is associated with impaired pharyngeal function, increased risk of aspiration and upper airway obstruction. (3)
- Morbidly obese patients are at high-risk for postoperative adverse respiratory events. (4)
- In this poster we present preliminary data on CRE of the first 200 patients.

Purpose of the Study

The purpose of the study is to determine if residual neuromuscular weakness leads to respiratory events in morbidly obese patients after bariatric operations.

Hypothesis

The hypothesis is that quantitative assessment of residual neuromuscular blockade reduces critical respiratory events (CRE) and/or postoperative pulmonary complications (POPC) in morbidly obese patients after bariatric surgery.

Participants

- Morbidly obese patients undergoing bariatric operations: BMI>35kg/m^2; sleeve gastrectomy, LRYGB, revision LRYGB and conversion sleeve to LRYGB
- Protocol registered at clinicaltrials.gov #NTC02037516; IRB approved – Flagler Hospital
- Intraoperative narcotic-free TIVA (5) and post-operative multimodal analgesia (6)
- 207 patients had bariatric procedures, 5 patients declined, 9 patients did not qualify (7 BMI<35kg/m^2 [Revision], 1 s/p kidney tx, 1 long-QT with AICD), 198 patients participated
- Ongoing trial until n=362

Methods

- **Control Group:** Reversal administration and extubation are based on qualitative assessment of residual neuromuscular blockade according to the discretion of the anesthesia provider
- **Study Group:** Reversal (at least 4 twitches) and extubation (TOF>0.9) based on quantitative assessment (AMG via TOF-Watch®)
- The patients were computer-randomized at end of surgery when neuromuscular blockade was no longer necessary according to the surgeon.
- **Randomized assessor blinded trial**: PACU nurses, respiratory therapists
- **Definition CRE:** desaturation <90%, airway manipulation, CPAP application, reintubation, prolonged ventilation, unplanned ICU admission, subjective/objective muscle weakness, tactile/verbal stimulation, signs of respiratory distress, O_2 Flow>3l/min

Data Analysis

The categorical data was analyzed with the chi square test for independence. The quantitative data was analyzed using the unpaired student t-Test. Ordinal data was analyzed using the Wilcoxon-rank-sum test.

Results

- **Comparable:**
  - Baseline characteristics: age, gender, height, weight, BMI
  - Risk factors: Surgical procedure / times, morbidity (7) and mortality (8) scores
  - Dose and time of intraoperative administration of muscle relaxants and neostigmine
  - Postoperative narcotic / antiemetics administration, pain scores (PACU)
  - Time from end of surgery to extubation or to PACU
- **Significant lower** TOF in the control group versus the study group at time of reversal (7.7% vs 14.3%) and extubation (see table 1)
- **Comparable** in PACU on arrival and discharge:
  - Oxygen flow / saturation
  - Airway management
  - Total CREs (number / patient)
  - Number of patients with a CRE
  - Readiness for discharge time (≈1h)
- Frequent technical problems with AMG (≈10%)

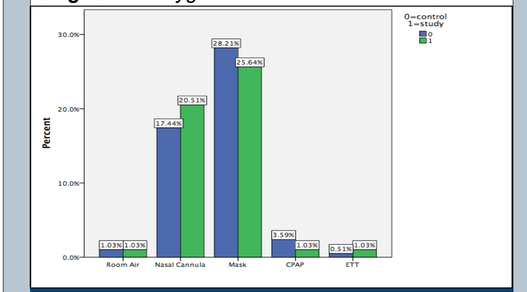
Table 1: *Critical respiratory events*

	Control (n=102)	Study (n=96)	p
O_2 Flow on PACU arrival (l/min)	6.6 (+/-3.1)	6.0 (+/-3.2)	0.154
Airway management on PACU arrival[1]	2 [1;2]	2 [1;2]	0.220
Number of CRE per patient (%)	63 (61.8%)	54 (56.3%)	0.732
Number of patients with CRE (%)[2]	31 (30.4%)	27 (28.1%)	0.757
TOF (%)[3]	83.3% (21.5%)	93.3% (11.5%)	0.000

[ ]: Interquartile Range for not normally distributed data
(): Standard deviation
CRE: critical respiratory event
1: 1=room air, 2=nasal cannula, 3=mask, 4=CPAP, 5=ETT
2: all CREs counted, multiple for one single patient allowed
3: Train-of-Four at time of extubation

Results cont.

Diagram 1: *Oxygen device on PACU arrival*



Discussion

- Qualitative management of neuromuscular blockade (control group) compared to quantitative (study group) in morbidly obese patients leads to a higher degree of residual weakness.
- The preliminary data from this study did not find an increase in CREs in PACU. In a case-control study by Murphy et. al. (9) there was a significant increase in CRE in patients with residual neuromuscular weakness. This case-control study included mild oxygen desaturation to 92% as CREs and excluded morbidly obese patients. The patients in the current study receive routinely oxygen per nasal cannula and mild oxygen desaturation was not included in the definition of CRE.
- Despite a significantly higher incidence of TOF<0.90 in the control group this was not related to an increased risk of CRE/POPC. This might be explained by a relatively mild degree of residual block compared to the study group (TOF 83% vs TOF 93%). (10)
- Using AMG and a TOF>90% did not increase the time from end of surgery to PACU.

Conclusion

- Qualitative management leaves morbidly obese patients with a mild degree of residual neuromuscular weakness.
- There was no difference in extubation times
- A mild degree of weakness seems not to increase the risk of a CRE in morbidly obese patients following bariatric operations.

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