Title: Lasting effects of short term non-invasive ventilation in the PACU on postoperative lung function in obese adults

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Reviewer: Gerald Zavorsky

Summary: This study followed 60 obese patients with varying BMI’s who were randomly assigned to either routine care (n = 30) or non-invasive ventilation (NIV) (n = 30) in the post-anesthesia care unit after they had minor surgery. Various pulmonary function parameters were evaluated (i.e. for example pulse oxyhemoglobin saturation, arterial oxygen and carbon dioxide partial pressure, forced expiratory volume in one second (FEV1), Peak expiratory flow rate (PEF), and maximum expiratory flow rate at 25% of vital capacity). Measurements were obtained at 5 time points: Right after surgery, and then 1, 2, 6, 24 hours post surgery. In the group that had NIV, arterial oxygen partial pressure increased by about 7 mmHg, arterial carbon dioxide pressure decreased from an already normal 40 mmHg to about 34 mmHg, and pulse oximetry oxyhemoglobin saturation increased by about 2.7% (from 96.8% to 99.5% on average) in the NIV group compared to control. Post operative FEV1 was about 93% of that compared to pre-surgery in the NIV group compared to 83% in the routine group 1 – 12 hrs post surgery. Other dynamic lung volume parameters slightly improved 1 to 12 hrs post-surgery in the NIV group compared to the routine care group. While there are minor statistically significant improvements in the NIV group, the clinical importance of this small change in lung function is questionable.

• Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)

1) The clinical significance needs to be established. I’m not sure that small changes in dynamic lung volume/flows are meaningful especially when blood gases are only slightly improved in the NIV group. Arterial carbon dioxide pressure differs by only about 2 to 3 mmHg, but both groups are in the normal range anyway. Arterial oxygen pressure is only 8 mmHg different between the two groups. Which may be important if arterial oxygen pressure is around 45-50 mmHg, but not so important when arterial oxygen pressure is 65 to 75 mmHg due to the shape of the oxyhemoglobin dissociation curve. At an arterial oxygen pressure of about 65 mmHg and an arterial carbon dioxide pressure of 42 mmHg, the estimated arterial oxyhemoglobin saturation is about 92.7%. This is slightly hypoxemic, but it is not bad. With NIV, the arterial oxygen pressure increased to a maximum of 75 mmHg, which would raise the arterial oxyhemoglobin saturation to 95.2%, which is only a 2.5% absolute increase. I’m not sure that is clinically important. However, if the values were around 45 to 55
mm Hg, the small change in arterial oxygen partial pressure would significantly increase the saturation from 81 to 89%, which is would think to be meaningful. As such, I do not think the slight increase in arterial oxygen pressure is meaningful.

2) Why was blood-gases not measured pre-surgery? This is a significant limitation

3) SpO2 has a precision of ± 2.5% (forehead) of ± 3.0% to 7.3% from the finger (1, 2). As such the small changes in SpO2 found in this study are within the error and thus should not be used. Only arterial oxyhemoglobin saturation measured from an arterial-blood-gas sample with co-oximetry can be used when the differences between the two groups is small. I would remove SpO2 readings from Table 3 and in the figures as it was not measured with Co-oximetry. They could leave it in Table 2, unless arterial oxygen pressure was measured pre-operatively. If blood-gases were measured pre-operatively then remove the SpO2 from Table 2, if not, then keep SpO2 in Table 2.

4) A better discussion of what the “routine care” control group means should be mentioned. Is the routine care group the intubation group? I’m confused.

5) It is confusing to determine which parameters actually have a pre-surgical value and which parameters only have post surgical values. The authors need to make this clear. Table 3 and the figures show the same data. Delete Table 3.

6) The true measurement of an impairment of gas exchange is the alveolar-to-arterial oxygen partial pressure difference (AaDO2). I don’t see this reported anywhere. They can calculate the inspired PO2 from their data, and they have the carbon dioxide arterial partial pressure, and all they need now is the respiratory exchange ratio (RER). Did they measure RER? If not, then it could be assumed to be 0.8...perhaps...As such, they should report the AaDO2 in the figures section.

7) In the methods section the authors mention MEF25-75. Is this the same as FEV25-75? Forced expiratory flow over the middle half of expiration? The MEF25-75 is not mention in the Tables. The authors divide MEF25-75 into MEF25, MEF50, MEF75, FIVC, PIF, which makes no clinical sense. At most only report MEF25-75 (FEF25-75), PEF and the FEV1, and FVC for the spirometry values. Delete MEF25, MEF50, MEF75, FIVC, PIF, Table 2. Delete Table 3, report other spirometry values in the figures section. Report the ABSOLUTE value and not the percent compared to pre-surgery

8) Table 3, delete table completely as it is redundant with the figures.

9) Figure 1, Should be blood gases only all on one page. It should follow like: Figure 1, Panel A: arterial oxygen pressure (mmHg), Panel B, alveolar to arterial oxygen partial pressure difference (mmHg), Panel C, arterial carbon dioxide pressure (mmHg).

10) The next Figure should be Figure 2 and all on one page, and reported as spirometry values, Panel A = FEV1 (L); Panel B = FVC (L); Panel C = FEF25-75
(L/S); Panel D = PEF (L/s). Again, these should be reported as an absolute value not as a percentage of the pre-operative value.

• Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Method section: Spell out TOF and give the definition

Statistical analyses, please explain how a clinical meaningful improvement of 2 ± 2% was chosen for SpO2? This is not meaningful as I mentioned that the precision is # 2.5% for SpO2. Therefore delete SpO2 and perhaps use arterial oxygen pressure instead as that was your biggest change.

Results, eliminate SpO2 data for the post-operative values. It is not precise.

Table 1, please report numbers as, for example, age, 52 ± 11. Do this everywhere. Then footnote the table “reported as means ± SD”

Table 2, footnote “reported as mean ± SD”. Is the SpO2 reported under room air or with an FIO2 of 0.5? Please footnote this. The SpO2 could be kept in table 2 unless blood gases were performed pre-operatively. Blood gases were not reported for pre-surgery?

Table 2, for spirometry, only report FVC, FEV1, PEF, and FEF25-75. That is all they need and that is what is most reported in the literature.

References


Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I declare that I have no competing interests