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Title: DO LUNG FUNCTION TESTS IMPROVE WITH MASSIVE WEIGHT LOSS?

Authors: Robert W. Vaughan, M.D., Randall C. Cork, M.D., Ph.D., Dorothy Hollander

Affiliations: Department of Anesthesiology, Arizona Health Sciences Center, Tucson, AZ 85724
Department of Anesthesiology, Washington University School of Medicine, St. Louis, MO 63131

Recent evidence has shown a significant correlation between massive weight loss and improvement in arterial oxygenation measured by either PaO₂ or P(A-a)DO₂.¹ The purpose of this study was 1) to examine the effects of massive weight loss on pulmonary function tests (PFT's) and 2) to examine the correlation of change in indices of oxygenation [PaO₂ and P(A-a)DO₂] with change in expiratory reserve volume (ERV).

Method: After approval of the study protocol by the Human Subjects Committee, informed consent was obtained from morbidly obese patients undergoing elective jejunoileal bypass. Patients were studied 24 hours preoperatively and again postoperatively at time intervals ranging from 5 to 17 months (mean, 9.5 months), corresponding to weight loss ranging from 41-86 kg (mean, 60 kg). All patients were free of cardiorespiratory disease and denied a smoking history. Data collection included age, weight, height, girth, length of time since surgery, forced expiratory volume in one second (FEV₁), forced vital capacity (FVC), maximum mid-expiratory flow (MMEF), and ERV. Pulmonary spirometric tests were obtained using standard techniques with the patient in the sitting position. FEV₁, FVC, MMEF, and ERV were expressed as percent of normal. Arterial blood gases were determined before and after weight loss from 10 of the patients studied. Girth measurements were obtained in the standing position at the level of the umbilicus at normal end-exhalation. Data were analyzed for paired observations (preop vs after weight loss) and by linear regression analysis. Significance was defined as $p < 0.05$.

Results: Thirty-seven subjects (34 women/3 men) were studied. Sample descriptors, mean \pm SE (range), were as follows: age, 32.6 \pm 1.2 years (21-51 yrs.); weight, 139.2 \pm 3.8 kg (104-200 kg); height, 168 \pm 1 cm (158-178 cm); girth, 147 \pm 2.5 cm (107-175 cm). Changes in FEV₁, FVC, MMEF, and ERV with weight loss are shown (Figure). Mean FEV₁ changed from 82.4 \pm 1.2% to 84.2 \pm 1.0% of normal, mean FVC from 87.5 \pm 2.3% to 90.0 \pm 2.9%, and mean MMEF from 84.7 \pm 3.4% to 88.4 \pm 2.6%. None of these changes were statistically significant. Mean ERV demonstrated a statistically significant change ($p < 0.05$) from 54.6 \pm 4.1% before weight loss to 93.2 \pm 5.7% of normal. However, there was no significant correlation between the change in ERV and change in girth ($r = 0.21$, $p = 0.18$); weight ($r = 0.09$, $p = 0.30$), body mass index ($r = 0.08$, $p = 0.33$), or body surface area ($r = 0.24$, $p = 0.09$) with weight loss. A significant correlation was found between the change in ERV and improvement in oxygenation. In 10 patients whose ABG's were monitored before and after weight loss, a significant correlation was demonstrated between change in ERV and change in both PaO₂ ($r = 0.59$, $p = 0.037$) or P(A-a)DO₂

($r = 0.76$, $p = 0.005$).

Discussion/Conclusions: This study demonstrates that, in the absence of intrinsic respiratory disease, morbidly obese subjects do not significantly improve PFT's (FEV₁, FVC, or MMEF) with massive weight loss. However, there is a significant increase in ERV with weight loss that directly correlates with improvement in both PaO₂ and P(A-a)DO₂. This improved ERV as an index of resting lung volume (FRC) could account for the salutary affect on oxygenation of massive weight loss. In addition, the amount of reduction in abdominal girth, weight, body mass index, or body surface area does not correlate with amount of improvement in ERV.

REFERENCE:

- Vaughan RW, Cork RC, Hollander D: Improvement in oxygenation with massive weight loss. *Anesthesiology* 51:S191, 1979.

PFT'S AS PERCENT OF NORMAL