

Effects of fat mass loss after metabolic bariatric surgery on diaphragmatic muscle function and configuration in patients with severe obesity

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Introduction: Metabolic bariatric surgery (MBS) induces a loss of muscle mass concomitant with the loss of fat mass, which may have consequences on the aerobic capacity and exercise dyspnea of the patient^{1,2}. However, little is known about function of the major muscle of respiration, the diaphragm, after MBS.

The aim of the present study was to evaluate the effects of fat mass loss induced by MBS in patient with severe obesity, on diaphragmatic muscle function and configuration.

Method: Nine patients (4 women/5 men, 30-51 years old) with obesity III (body mass index >40kg/m²) at the time of inclusion were tested before and 6 months after MBS. Body composition, including visceral fat mass, was measured by two-photon X-ray absorption. Respiratory function was evaluated by plethysmography. Diaphragm strength was assessed by the nonvolitional technique of bilateral anterolateral magnetic stimulation of the phrenic nerves, producing twitch transdiaphragmatic pressure (Pdi). Diaphragm conformation, in particular muscle fibre length, radii of curvature and total area (sum of dome area and apposition zone area) was measured on thoracic CT scan³.

Results: Significant loss of total weight -23% [19 - 24] and visceral fat mass -44% [38 - 56] (p<0.001) induced by MBS were associated with increased lung function and volumes: forced expiratory volume in the first second: +13% [0-15] (p=0.02), total lung capacity: + 6% [5-6] (p=0.009) and residual volume: +22% [2-28] (p=0.006).

The diaphragm strength was reduced after MBS: -2% [1-5] (p= 0.03). In terms of diaphragm conformation, MBS reduced the frontal diaphragmatic length: -0.5% [0.3-2] (p=0.03), the sagittal length on the right and left side: respectively -6% [4-7], -4% [3-7] (p<0.001), and the total area: -13% [8-15] (p=0.008).

Conclusion: The MBS-induced loss of thoracic and visceral fat leads to an increase in lung volumes and a slight decrease in diaphragmatic force linked to a reduction in the length of its muscle fibres and total area. However, these changes, although statistically significant, are of low amplitude and with probable little clinical impact at rest.

References:

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