

European Respiratory Society Annual Congress 2012

Abstract Number: 2475

Publication Number: P272

Abstract Group: 1.3. Imaging

Keyword 1: Respiratory muscle **Keyword 2:** Imaging **Keyword 3:** COPD - management

Title: Ultrasonographic assessment of the diaphragm in patients with chronic obstructive pulmonary disease (COPD): Relationships with pulmonary function and the influence of body composition

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Body: Background: Skeletal muscle weakness and loss of fat-free-mass (FFM) is one of the main systemic effects of COPD. Also diaphragm is involved leading to disadvantageous conditions and poor contractile capacities. We measured the thickness (TD) of diaphragm by ultrasonography to evaluate the relationships between echographic measurements, parameters of respiratory function and body composition data. Material and methods: 24 patients (17 males) underwent: a) pulmonary function tests; b) echographic assessment of TD in the zone of apposition at various lung volumes (TDRV, TDFRC, TDTLC); c) bioelectrical body impedance analysis. BMI was calculated. Results: Mean FEV1 as percentage of the predicted value was 49,6% (min 22%, max 86%). Mean BMI was $27 \pm 5,3$ Kg/m² (min 17,2 max 38,8). TDRV, TDFRC and TDTLC measured 3.28, 3.58, 5.92 mm respectively. Reproducibility of measures was good (Ri=0.93, 0.93, 0.77 for TDRV, TDFRC, TDTLC respectively). All the TD were found correlated to FFM being the relationship greater for TDFRC ($R^2=0.51$, $p=0.0002$). As regards lung volume IC, was found related to TDRV ($R^2=0.21$, $p=0.025$), TDFRC ($R^2=0.16$, $p=0.05$), TDTLC ($R^2=0.36$ $p=.002$). No significant association was found between TD and TLC, FRC, RV. Using a multiple regression model TDTLC was found related to RV/TLC, FEV1/FVC and FFM ($R^2: 0,55$ $p: 0,004$). Lastly, the difference between TDTLC and TDRV was closely related to FVC ($R^2=0.33$, $p=0.0036$). Conclusion: Ultrasonographic assessment of the diaphragm could be a useful tool to study the progression of the disease in COPD patients in terms of static hyperinflation and loss of FFM.