

Effects of respiratory disease and age in quadriceps muscle mass: a pilot study with ultrasonography

Paula Martins^{1,2,3}, Laura Noronha^{2,4,5}, Alexandra André⁶, Cátia Paixão^{2,5}, Patrícia Rebelo^{2,5}, Ana Oliveira^{1,2,5}, Silvia De Francesco^{1,3}, Alda Marques^{1,2,5}

¹School of Health Sciences (ESSUA), University of Aveiro, Aveiro, Portugal; ²Institute of Biomedicine (iBiMED), University of Aveiro, Aveiro, Portugal; ³Institute of Electronics and Informatics Engineering of Aveiro (IEETA), University of Aveiro, Aveiro, Portugal; ⁴Universidade Luterana do Brasil, Canoas, Brasil; ⁵Respiratory Research and Rehabilitation Laboratory - Lab3R – School of Health Sciences, University of Aveiro, Aveiro, Portugal; ⁶Coimbra School of Health, Polytechnic Institute of Coimbra, Coimbra, Portugal

pmartins@ua.pt

Introduction: Patients with chronic obstructive pulmonary disease (COPD) have been shown to present muscle wasting when compared to healthy peers, which affect their quality of life (1). The mechanisms behind this process are still little understood and even less is known in other chronic respiratory diseases (e.g., interstitial lung diseases - ILD). Ultrasound (US) is a safe and inexpensive imaging modality providing reliable measurements of muscle size and quality. Thus, US may be a useful technique to assess and monitor muscle mass. This study explored differences in quadriceps muscle mass in patients with COPD, hypersensitivity pneumonitis (ILD-HP) and healthy people (elderly and young).

Materials and Methods: A cross-sectional pilot study was conducted with 10 patients with ILD-HP (68.4±9.8yrs), 10 patients with COPD (69.4±6.7yrs) and 10 healthy age-matched elderly volunteers (67.8±8.7yrs). A group of 10 young university students (21.9±3yrs) was also included. Groups were balanced for gender (5f/5m) and anthropometrics variables. An US equipment (GE LOGIQ P6) with multifrequency linear probe (10-13 MHz) was used to obtain B-mode US images. The following measures were taken: Rectus Femoris Thickness (RF_T), Quadriceps Thickness (Q_T), Rectus Femoris cross sectional area (RF_{CSA}). Data were analysed using SPSS version 24. Data normality and homogeneity were assessed. Between-group differences and correlations were performed with non-parametric tests (Kruskal-Wallis, Mann-Whitney U test and Spearman's correlation coefficient). Statistical significance was set at 0.05.

Results: RF_{CSA} (median and IQR) was 5.44 [3.56-6.57] cm²; 4.29 [3.58-4.50] cm²; 6.06 [4.61-9.41] cm² and 7.99 [5.92-9.41] cm² for ILD-HP, COPD, elderly and young people, respectively. RF_T results were 1.51 [1.08-1.78] cm; 1.16 [1.07-1.53] cm; 1.64 [1.36-1.76] cm and 2.06 [1.68-2.27] cm, respectively. There were significant differences in RF_{CSA} (p=0.027), RF_T (p=0.041) and Q_T (p=0.011) between COPD and elderly people. No significant differences were found between ILD-HP group and elderly. Significant differences in the same measurements occurred for elderly and young groups (RF_{CSA} p=0.034; RF_T p=0.016; Q_T p=0.034). Moderate and negative correlations were found between age and RF_{CSA} (r_s=-0.416), RF_T (r_s=-0.540) and Q_T (r_s=-0.450). A strong and positive correlation was found between RF_T and RF_{CSA} (r_s=0.891).

Discussion and Conclusions: Our results corroborate previous findings supporting the existence of quadriceps muscular wasting in patients with COPD when compared with age-matched healthy controls (1). In the group of patients with ILD-HP, muscular mass seems to be somewhat preserved. Future studies should include a larger sample with quantitative measures of muscular quality (e.g., echointensity) and relationship between muscle size/quality and muscle strength.

References:

1.Seymour JM, Ward K, Sidhu PS, Puthuchery Z, Steier J, Jolley CJ *et al.* Ultrasound measurement of rectus femoris cross-sectional area and the relationship with quadriceps strength in COPD. *Thorax* 2009;64(5):418-423.