Impact of diaphragm atrophy in elderly patients with heart failure: a multicenter prospective cohort study

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Background: The diaphragm plays an important role in cardiac and respiratory functions. However, the importance of diaphragm atrophy in patients with heart failure (HF) has not been well described.

Purpose: To assess the feasibility of ultrasound-based assessment of the diaphragm and its prognostic impact in elderly patients with HF.

Methods: We conducted a multicenter prospective cohort study enrolling patients hospitalized with HF aged ≥65 years. Diaphragm thickness at rest and during inspiration was measured with ultrasound by certified observers, and interobserver variability was assessed using 90 images.

Results: Of the 599 enrolled patients (median 81 [74 - 86] years old, 55% female), mean diaphragm thickness at rest and during inspiration were 1.9 ± 0.6 and 3.1 ± 1.2 mm, respectively. Interobserver variability was small with an intraclass correlation coefficient of 0.84 (0.76 – 0.89). Patients with thin (<1.9 mm) diaphragm at rest (n=304) had smaller body mass index (20.9 ± 3.6 vs 22.2 ± 4.0 kg/m², p < 0.001), higher NYHA class (class II or higher 78% vs 61%, p < 0.001), lower % forced expiratory volume in 1 second (83.2 ± 22.3% vs 88.7 ± 23.7%, p = 0.013), and lower handgrip strength (18.1 ± 7.3 vs 19.8 ± 8.0 kg, p = 0.009). During the median follow-up of 663 [456 - 882] days, 160 patients died. Kaplan-Meier curve analysis showed significant stratification by quartile groups of diaphragm thickness at rest. After adjustment for the established MAGGIC risk score, diaphragm thickness was significantly associated with all-cause death (hazard ratio 0.56 [0.41 – 0.71] /mm, p < 0.001).

Conclusions: Diaphragm atrophy was prevalent in elderly patients with HF and had a strong association with all-cause death. Further studies are necessary to evaluate the efficacy of interventions.