



CWIS Chest Wall Injury Summit 2023

Oral Presentation Abstract Submission

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Title of Presentation Novel Application of Pectoralis Muscle Index as Predictor of Outcomes in Patients with Blunt Chest Wall Injury

Background

The association between thoracic muscle wasting and poor outcomes in patients requiring mechanical ventilation (MV) is being increasingly recognized. Sarcopenia has been shown to portend worse outcomes in injured patients; however, little is known about the impact of thoracic muscle wasting on outcomes of patients with chest wall injury (CWI). We hypothesized that both sarcopenia and thoracic muscle wasting is also associated with poor outcomes in patients with severe blunt CWI requiring mechanical ventilation

Methods

After obtaining institutional review board approval, all patients admitted to the surgical intensive care unit (ICU) between 2014 and 2019, with blunt CWI requiring mechanical ventilation were retrospectively identified. Exclusion criteria included lack of admission computed tomography imaging, penetrating trauma, death within 72 hours of admission, and < 18 years of age. Thoracic musculature was assessed by measuring pectoralis major and minor muscle cross-sectional area (cm²) that was obtained at the 4th thoracic vertebral level using Slice-O-Matic® software (Figure 1). The area was then divided by the patients height in meters² (m²) to calculate pectoralis muscle index (PMI) (cm²/m²). Patients were divided into two groups, 1) the lowest gender-specific quartile of PMI and 2) second-fourth gender-specific PMI quartiles for comparative analysis. Sarcopenia was assessed via skeletal

muscle cross-sectional area (cm²) that was obtained at the 3rd lumbar vertebral level. Previously reported skeletal muscle index (SMI) cut-off values for sarcopenia of <41 cm²/m² for females, <43 cm²/m² for males with a BMI <25, and <53 cm²/m² for males with a BMI ≥25 were used.

Results

Overall, 153 patients met inclusion criteria with a median BMI of 30.5 kg/m² (IQR 25.4-34.7), age of 48 (IQR 34-60), Rib score of 3 (IQR 2-4), and 76% (116/153) were male. Only 14 patients (8%) had prior history of chronic lung disease. Median ICU length-of-stay (LOS) and duration of mechanical ventilation (MV) was 17 days (IQR 12-23) and 14 days (IQR 7-21), respectively. 73 patients (48%) underwent tracheostomy and 10 patients (6%) expired during hospitalization. On univariate analysis, presence of pectoralis muscle wasting on admission was associated with increased ICU LOS (p=0.001) increased duration of MV (p=0.002) and need for tracheostomy (p<0.001). On univariate analysis, presence of sarcopenia on admission was associated with increased ICU LOS (p=0.035), increased duration of MV (p=0.005), and need for tracheostomy (p=0.006). Presence of chronic respiratory disorder, age, gender, or injury severity score was not significantly associated with duration of MV. On multivariate linear regression, patients with pectoralis muscle wasting were associated with increased MV duration when adjusting for rib score (β 4.5, 95% CI 0.03-9.02, p=0.048).

Conclusion

Presence of pectoralis muscle wasting and generalized sarcopenia is associated with increased ICU LOS and duration of MV in patients with severe CWI. Knowledge of this can help guide future research and risk stratification of critically ill blunt CWI patients.