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Title of Presentation   Neutrophil-lymphocyte ratio is associated with mortality in rib fracture patients

Background

Neutrophil-lymphocyte ratio (NLR) has been described as a hematologic marker of systemic inflammatory response. NLR has been previously shown in trauma to be associated with poor outcomes. However, the impact of NLR on outcomes in rib fracture is not described. We hypothesized that NLR would be associated with adverse outcomes after rib fractures.

Methods

We performed a retrospective study (7/13/2011-6/24/2022) of the TriNetX database, a database consisting of EMR records of ~89 million patients from 58 HCOs in the United States. Adult patients were included if they had $\geq$ 1 rib fracture after blunt trauma with documented neutrophil and lymphocyte counts within one week of fracture. Rib fractures were categorized as single rib, multiple-rib non-flail, or flail chest injuries using ICD-10 coding. The primary outcome was mortality at 1-, 3- and 5-years post-injury. NLR was calculated as the ratio of neutrophils over lymphocytes within one week following the rib fracture. The relationship between clinical factors, such as NLR, and mortality was analyzed using T-test and ANOVA testing. Receiver operator characteristic (ROC) analysis was performed for each model to assess the performance of NLR in predicting mortality and reported as the Area Under the Curve (AUC) and 95% confidence interval. To reduce confounding a multivariable regression was performed to assess for an independent relationship of NLR and mortality adjusting for clinically

salient factors.

Results

We identified 29,755 adult patients with rib fractures, of which the majority of patients had multiple rib fractures (17,729; 59.5%). 256 (0.9%) patients were identified as having flail chest (table 1). Patients with flail chest had a greater NLR (10.9 ± 14.0) compared to multiple (9.9 ± 22.7) and single rib fractures (8.6 ± 14.3, $p < 0.001$).

Lower NLR ratio was associated with survival at 1 year. The mean NLR (within 1 week of injury) was 8.9 ± 15.8 for survivors at 1 year versus 12.6 ± 35.2 for patients who had died by 1 year ($p<0.001$).

We performed multivariable regression analyses for one-, three- and five-year mortality post-injury; each showed that increased NLR was associated with increased odds of death (table 2). Other factors associated with death included increasing age, male gender, and fracture pattern. ROC analysis showed that the AUC for NLR was 56.6%, 55.8%, and 55.4% at 1, 3, and 5 years, respectively.

Conclusion

Among patients with rib fractures, lower NLR ratios were associated with lower mortality at 1-year, 3-years, and 5-years in multivariable analysis. NLR may assist in prognostication of long-term prognosis in patients with rib fractures. This is the first study to document an association of systemic inflammation and long-term outcomes in patients with rib fractures.