

Δ Injury Severity in Orthopaedic Trauma Patients Is Associated with Body Iron Store Derangements

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Purpose: The systemic inflammatory response to trauma impairs mobilization of body iron stores despite the increased demand from acute blood loss anemia. This leaves patients who require operative surgical stabilization at risk of impaired anemia resolution. We hypothesize that patients with higher injury severity scores will exhibit larger body iron store derangements.

Methods: We prospectively identified adult patients admitted to a Level I academic trauma center following operative fracture management with ISS scores (April-December 2022). Serum iron, total iron binding capacity (TIBC), transferrin saturation (%Sat), transferrin, and ferritin levels were collected on postoperative day one. Reference ranges were used to interpret laboratory values as low, normal, or high with anemia defined as hemoglobin below 13.5 g/dL in males and 12 g/dL in females per standard. ISS scores were collected from the institutional trauma database. We used linear and logistic regression models controlling for relevant confounders of anemia to estimate the mean change in laboratory values and determine odds of lab abnormalities, respectively. Analysis of variance was used to compare the mean ISS score of each ferritin reference range category.

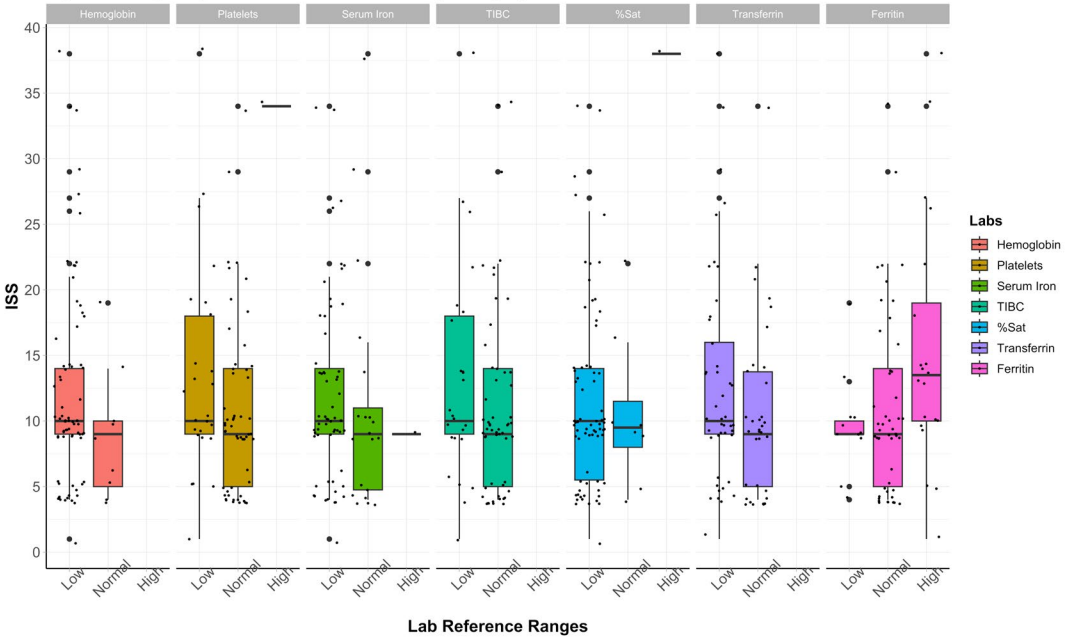
Results: During the enrollment period, 80 patients who received operative fracture treatment and obtained iron store labs were scored for ISS by our trauma system (mean ISS: 12 [standard deviation: 8]). Body iron store derangements were present in 96% (77/80) of patients and 94% (49/52) of patients with laboratory evidence of anemia above the transfusion threshold. Ferritin levels increased by 15 points on average for every increasing ISS point (95% confidence interval [CI]: 7.7-22.0; $P < 0.001$). With ferritin categorized by low, normal, and high, the average associated ISS score increased from 9.7, to 10.9, to 15.4, respectively ($P = 0.051$). There was no evidence of a relationship between ISS and iron, TIBC, or transferrin levels ($P > 0.2$). Iron, TIBC, %Sat, and transferrin were all low in 25% (20/80) of patients, although ISS was not a predictor (odds ratio [OR] = 1.07, 95% CI: 0.89-1.49, $P = 0.6$).

Conclusion: Degree of functional iron deficiency increases as injury severity does. In our population, ferritin levels increase while other body iron stores remained low, supporting the theory that iron may become sequestered and unavailable for repleting red blood cell volume.

Δ OTA Grant

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.

Figure 1. ISS by Body Iron Store Lab Reference Range Category



Box plot indicating median ISS and IQR. Reference ranges were used to categorize laboratory values as low, normal, or high.