Title: Low Glenoid Vault Bone Density is a Risk Factor for Failure of Proximal Humerus Fracture Fixation

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Introduction: Recent literature demonstrates that opportunistic measurements of Computerized Tomography Hounsfield Units (CTHU) of the proximal humerus can identify patients with osteoporosis prior to elective shoulder surgery.[1,2] We aimed to determine if CTHU of the uninjured glenoid vault is an independent predictor of proximal humerus fracture fixation failure in the surgical treatment of displaced proximal humerus fractures. We hypothesize that CTHU of the glenoid vault <160 Hounsfield Units (HU) would be associated with a higher rate of failure of open reduction internal fixation (ORIF) and need for subsequent revision to arthroplasty.

Materials and Methods: Patients who sustained a displaced proximal humerus fracture and underwent ORIF over a ten-year period at a single center were identified retrospectively. Patients were grouped into two cohorts: those who failed ORIF and required revision to arthroplasty, and those who did not fail ORIF. Patients with a concomitant glenoid fracture, primary bone cancer, associated humeral shaft fracture, metastatic cancer, or who lacked a pre-operative CT scan were excluded. CTHU was measured at four separate regions within the glenoid vault. Statistical analysis was performed with significance set to $p<0.05$.

Results: 118 patients were identified with 94 patients who successfully underwent ORIF and 24 patients who required revision to arthroplasty. There were no significant differences in age, sex, BMI, smoking history, or diabetes between cohorts. Patients who required revision to arthroplasty had lower mean CTHU compared to those without revision (120.1±49.0 vs 170.5±46.0, $p<0.001$). CTHU of the glenoid vault <160 HU significantly increased the risk of revision to arthroplasty after ORIF ($p=0.01$, RR = 3.00, 95% CI OF RR [1.28, 7.02]). Within the failed cohort who required revision to arthroplasty, there was no difference in CTHU between those who failed within 6 months or after 6 months from ORIF (92.91± 37.72 vs 134.28 ± 50.85 respectively, $p=0.057$).

Discussion: CTHU of the glenoid vault <160 is an independent risk factor for failure of proximal humerus fracture ORIF and the need for subsequent revision to arthroplasty. This opportunistic measurement can provide the treating surgeon with another data point to help decide between ORIF and immediate arthroplasty in the management of displaced proximal humerus fractures.

References:

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