Left Humerus Fracture on Dialysis Access Arm

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Introduction: End-stage renal disease (ESRD) affects millions of patients worldwide, many of whom require chronic hemodialysis for survival. Vascular access in the form of an arteriovenous (AV) fistula or graft is the standard of care, with the non-dominant upper extremity being the preferred site for access creation. Dialysis access is essential for treatment; however, the presence of AV fistulas and grafts can alter local hemodynamics, limb biomechanics, and possibly bone health. Fracture risk is already elevated in ESRD patients due to renal osteodystrophy, secondary hyperparathyroidism, and frailty. Yet, limited data exist on the risk of ipsilateral humerus fractures in patients with AV access, where fracture prevention and management may be complicated by concerns about vascular integrity, surgical exposure, and rehabilitation. The objective of this study is to determine the incidence of left humerus fractures among ESRD patients with left-arm dialysis access (fistula or graft) and to describe demographic trends.

Methods: A retrospective cohort study was conducted using the TriNetX research network, encompassing data from 2005 to 2025. Adult patients with a diagnosis of ESRD (ICD-10 N18.6) and documented dialysis dependence (Z99.2) were included. The exposure of interest was creation of a left-arm AV fistula or graft, identified using ICD-10-PCS procedure codes 031J0Z1 and 031J0DZ. The primary outcome was incidence of left humerus fractures, determined using laterality-specific ICD-10 codes for humeral fractures (S42.x). Patients were followed from the time of vascular access creation until fracture occurrence or end of the study period. Demographic variables of race, sex and ethnicity and clinical correlates were examined.

Results: A total of 11,876 patients met inclusion criteria. During follow-up, 10.2% of patients sustained a new left humerus fracture, with an overall prevalence of 12.4%. The incidence rate was 2.66 per 100,000 person-days. Fracture risk demonstrated strong age dependence: while younger patients had relatively low risk, the proportion with fractures rose sharply with advancing age, exceeding 55% in patients aged 85 years or older. Women experienced a significantly higher incidence compared to men (16.7% vs. 5.8%). Racial disparities were also evident. Black/African American patients had the highest fracture incidence (23.3%), compared to other racial groups.

Discussion: Our findings demonstrate that ipsilateral humerus fractures are relatively common among ESRD patients with left-arm vascular access. This risk is heightened in elderly, female, and Black populations. These results align with known biological vulnerabilities in ESRD, including mineral bone disease, as well as broader disparities in musculoskeletal health outcomes. The high incidence in women and older adults may reflect cumulative effects of osteoporosis and frailty, whereas the elevated risk among Black patients warrants further investigation into potential socioeconomic, comorbidity, and care-access factors. Standard orthopedic fracture repair often employs a pneumatic tourniquet to minimize intraoperative bleeding and improve visualization. In patients with an ipsilateral dialysis access, this practice carries a significant risk. Tourniquet inflation can acutely thrombose the AV fistula or graft, induce endothelial injury, and precipitate stenosis, jeopardizing the patient's primary or secondary vascular access. Loss of a functional dialysis access site directly impacts dialysis adequacy, increases the need for central venous catheter placement, and has been associated with higher morbidity and mortality in the ESRD population. These findings suggest that vascular access in the left arm, combined with age, sex, and race-related factors, may contribute to a higher burden of fracture risk in this patient population.

Clinical Significance: Clinically, these fractures pose unique challenges due to proximity to vascular access sites, with implications for fixation choice, surgical approach, and risk of access compromise. This underscores the importance of multidisciplinary planning between nephrology, vascular surgery, and orthopedic surgery.