Radiographic Sarcopenia as a Prognostic Marker of Early Clinical Outcomes in Intertrochanteric Hip Fractures

Rachit Saggar, Abdulganeey Olawin, Warren Austin, Matthew F Gong, Mike Zino Kuhn, Gele Moloney, George V Russell

INTRODUCTION:
Sarcopenia, characterized by progressive loss of skeletal muscle mass and strength, is increasingly being recognized as a potential prognostic marker across orthopedic surgery. Traditional assessment methods present significant implementation barriers: CT-based psoas muscle measurements require advanced imaging with associated radiation exposure and cost, while functional assessments (grip strength, gait speed, timed up-and-go tests) demand specialized equipment, trained personnel, and patient cooperation that may be impractical in acute fracture settings. Recent validation studies have demonstrated that simple radiographic thigh muscle measurements correlate well with gold-standard diagnostic techniques, offering a potentially accessible alternative. Using recently published radiographic thresholds derived from population-based studies, we aimed to assess whether these measurements could identify patients at higher risk for adverse outcomes. We hypothesized that patients meeting radiographic criteria for low muscle mass would experience increased early mortality and complications following intertrochanteric fracture fixation, though we recognized the preliminary nature of applying these thresholds to our specific population.
METHODS:
In this IRB-approved retrospective cohort study, we analyzed consecutive patients with intertrochanteric fractures treated with short cephalomedullary nails between January 2017–December 2019 at a tertiary academic medical center. Radiographic measurements were performed following validated techniques: anteroposterior (AP) thigh muscle thickness was measured 15 cm proximal to the adductor tubercle on AP radiographs, and lateral quadriceps thickness was measured 15 cm proximal to the distal terminus of the Blumensaat line on lateral radiographs. Sarcopenia was defined using validated cutoffs from published literature correlating to CT-based psoas measurements, requiring both measurements to be below established thresholds: thigh muscle thickness (<12.47 cm in men, <10.68 cm in women) on AP radiographs AND quadriceps thickness (<3.23 cm in men, <2.20 cm in women) on lateral radiographs. Patients were stratified into and non-sarcopenic groups. The primary endpoint included 30-day mortality. Secondary endpoints included length of stay (LOS), complications, discharge disposition, and readmissions. Statistical analysis used Mann–Whitney U and Fisher's exact tests with significance set at $p<0.05$.
RESULTS:
In our cohort of 126 patients, sarcopenia prevalence was notably high at 44% (56/126) , with a large gender disparity: 75% of males versus 32% of females were sarcopenic ($p<0.001$). All early mortality events occurred in the sarcopenic group, with no deaths observed in patients with normal muscle mass, though the total number of events was small. Key comparisons are summarized in Table 1. Sarcopenic patients had a lower BMI, while age, LOS, Charlson-Deyo Comorbidity Index, and disposition did not differ. Sarcopenia was associated with significantly increased 30-day mortality (10.7% vs 0%; $p = 0.0066$). Discharge disposition was similar: 74.3% of nonsarcopenic and 71.4% of sarcopenic patients went to skilled nursing facilities, 4.3% vs 12.5% to inpatient rehabilitation, and 21.4% vs 16.1% to a home health agency. Rates of perioperative blood transfusion, 30- and 90-day readmission, 30-day ED return, wound/surgical site infection, and sepsis also did not differ in our cohort (all $p>0.05$).
DISCUSSION AND CONCLUSION:
This study demonstrates a high prevalence of radiographic muscle mass deficiency in intertrochanteric fracture patients, with preliminary associations with early mortality. The 44% prevalence of patients meeting radiographic thresholds substantially exceeds sarcopenia rates reported in the general elderly population (10-24%), though the clinical significance of these measurements requires further validation. While all mortality events occurred in patients below the radiographic thresholds, the small number of events limits definitive conclusions about predictive accuracy.
Importantly, these radiographic measurements should not be considered a substitute for comprehensive sarcopenia assessment, which encompasses muscle quality, strength, and functional capacity beyond simple linear dimensions. The thresholds, while functionally useful for research purposes, may not fully capture the complex pathophysiology underlying poor outcomes in this population. Rather, this work represents an early step toward developing more accessible screening approaches, with the primary value lying not in diagnostic accuracy, but in demonstrating the feasibility of incorporating muscle mass and strength assessment into routine hip fracture evaluation.
The clinical contribution of this method is accessibility and implementation feasibility. These measurements can be obtained in under 2 minutes from standard radiographs without additional cost, equipment, radiation exposure, or specialized training, all factor that are a barrier to current sarcopenia assessment. This represents progress toward making muscle mass assessment more practical and accessible, though significant validation work is required before clinical implementation. This work demonstrates that muscle measurements can be standardized using routine imaging and establishes baseline prevalence data for this population.

Larger prospective studies across various orthopedic injuries are essential to establish true clinical utility.

Table 1. Baseline Characteristics & Early Mortality

Variable	No Sarcopenia (n=70)	Sarcopenia (n=56)	p-value
Age, mean ± SD (yr)	78.7 ± 9.8	77.7 ± 10.2	0.4433
Male sex, n (%)	9 (13%)	27 (48%)	< 0.001
BMI, mean ± SD (kg/m²)	27.0 ± 5.2	22.9 ± 6.5	0.000005
LOS, mean ± SD (days)	6.7 ± 3.4	6.5 ± 3.0	0.5208
In-hospital mortality, n (%)	0 (0%)	3 (5.4%)	0.0852
30-day mortality, n (%)	0 (0%)	6 (10.7%)	0.0066