Biologic Age and Age Acceleration as Predictors of One-Year Mortality After Geriatric Hip Fracture

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Purpose: Geriatric hip fractures are a significant cause of morbidity and mortality, with 1-year mortality rates as high as 30%. Incorporating biologic age and age acceleration into traditional assessments may improve outcome predictions and guide interventions.

Methods: This prospective cohort study included patients aged ≥50 years with low-energy hip fractures. Demographic data, chronologic age, and nine laboratory values—albumin, creatinine, glucose, C-reactive protein, lymphocyte percentage, mean corpuscular volume, red cell distribution width, alkaline phosphatase, and white blood cell count—were collected within 24 hours preoperatively. Biologic age was calculated using Levine et al's method (2018), and age acceleration (biologic age minus chronologic age) was derived. Patients were dichotomized into two age acceleration groups (–15 to 20 years, 20+ years) for survival analysis and stratified into four subgroups (–15 to 5, 5–20, 20–30, 30+ years) to compare mortality rates.

Results: Among 81 patients (35.1% male, 64.9% female; mean age 77.0 ± 8.7 years), the 1-year mortality rate was 23.5%, with a mean time to death of 3.3 ± 2.6 months. Chronologic age did not differ significantly between survivors (76.7 ± 7.9 years) and non-survivors (77.9 ± 11.0 years, P = 0.49). However, biologic age (100.9 ± 12.5 vs 87.9 ± 14.3 years, P = 0.001) and age acceleration (23.0 ± 13.8 vs 11.2 ± 12.0 years, P = 0.001) were significantly higher in non-survivors. Mortality rates increased with age acceleration: 8% (–15 to 5 years), 16.7% (5–20 years), 43.8% (20–30 years), and 50% (30+ years; P = 0.008). Patients with age acceleration >20 years had lower survival probabilities (log-rank P = 0.0007) and a 4.41-fold higher mortality risk (95% CI: 1.73–11.21, P = 0.002) compared to those with –15 to 20 years of age acceleration.

Conclusion: Biologic age and age acceleration were strongly associated with 1-year mortality, outperforming chronologic age. These findings support the use of biologic aging measures in risk stratification and personalized care for geriatric patients with hip fracture.