The Impact of Biological Age and Age Acceleration on One-Year Mortality Rates in Elderly Hip Fracture Patients: A Prospective Cohort Study

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INTRODUCTION: Geriatric hip fractures cause high morbidity and up to 30% one-year mortality. Incorporating biological age and age acceleration into traditional assessments may improve predictions of outcomes and guide clinical interventions and perioperative counseling.

METHODS: In this prospective study, patients aged ≥50 with low-energy hip fractures had demographic data, chronological age, comorbidities, and nine laboratory parameters collected preoperatively. Biological age was computed per Levine et al. (2018) and age acceleration defined as the difference between biological and chronological age. Patients were categorized by age acceleration (<20 vs. ≥20 years) and into four subgroups (–15 to 5, 5–20, 20–30, and ≥30 years) for survival analysis.

RESULTS: Ninety-one patients were included. Mean chronological age was 76.6 (SD 9.2) years, biological age 90.5 (SD 15.0) years, and age acceleration 13.9 (SD 13.1) years; the mean Charlson Comorbidity Index was 4.1 (SD 3.1). One-year mortality was 25.3%. Those who died had higher CCI (6.0 vs. 3.5; p = 0.001), biological age (102.6 vs. 86.4; p < 0.001), and age acceleration (23.8 vs. 10.7; p < 0.001). Mortality increased from 7.7% in the lowest (–15 to 5 years) to 63.6% in the highest (≥30 years) age acceleration bracket. Cox regression—adjusted for ambulation, race, sex, CCI, and smoking—confirmed age acceleration ≥20 years as an independent predictor (HR 3.27; 95% CI 1.28–8.38; p = 0.014).

DISCUSSION AND CONCLUSION: Biological age and age acceleration outperform chronological age in predicting one-year mortality, supporting their role in risk stratification for geriatric hip fracture patients.

Figure 3. 1-year Mortality Stratified by Age Acceleration Group

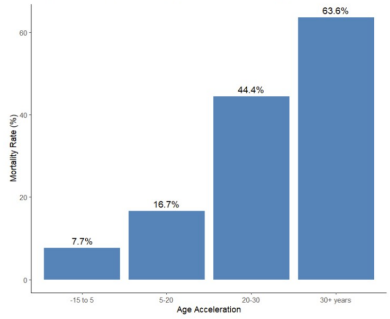

Figure 4. Kaplan-Meier Survival Analysis Based on Age Acceleration Over or Under 20 Years of Excess

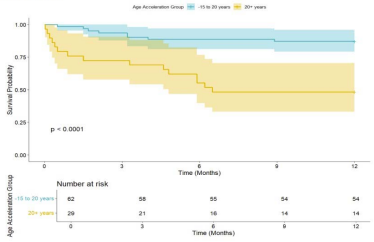

Table 1. Baseline Characteristics Stratified by 1-Year Mortality Status

Variable	Overall (N = 91)	Alive (N = 68)	Deceased (N = 23)	P-value
Age, years (mean ± SD)	76.6 (9.2)	75.85 (8.28)	78.74 (11.30)	0.27
Race, n (%)				0.48
– American Indian	1 (1.1)	1 (1.5)	0 (0.0)	
– Black	12 (13.2)	9 (13.2)	3 (13.0)	
– Latino	1 (1.1)	0 (0.0)	1 (4.3)	
– White	77 (84.6)	58 (85.3)	19 (82.6)	
Sex, n (%)				1
– Female	57 (62.6)	43 (63.2)	14 (60.9)	
– Male	34 (37.4)	25 (36.8)	9 (39.1)	
Smoking, n (%)				0.87
– Current smoker	8 (8.8)	6 (8.8)	2 (8.7)	
– Former smoker	33 (36.3)	26 (38.2)	7 (30.4)	
– Never smoked	50 (54.9)	36 (52.9)	14 (60.9)	
Ambulation, n (%)				0.12
– Cane	42 (46.7)	30 (44.1)	12 (54.5)	
– Non ambulatory	1 (1.1)	0 (0.0)	1 (4.5)	
– Unassisted	47 (52.2)	38 (55.9)	9 (40.9)	
Charlson Comorbidity Index (mean ± SD)	4.13 (3.06)	3.5 (2.8)	6.0 (2.9)	**0.001**
Biological Age, years (mean ± SD)	90.5 (15.0)	86.4 (13.8)	102.6 (11.9)	**<0.001**
Age Acceleration, years (mean ± SD)	13.9 (13.1)	10.7 (11.2)	23.8 (13.4)	**<0.001**