Are Thigh Muscle Diameter Measurements on Radiographs Independently Associated with One-Year Mortality Following Hip Fracture Surgery?

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INTRODUCTION:

The objective of this study was to determine whether thigh muscle diameter measurements on radiographs are independently associated with one-year mortality following hip fracture surgery.

METHODS:

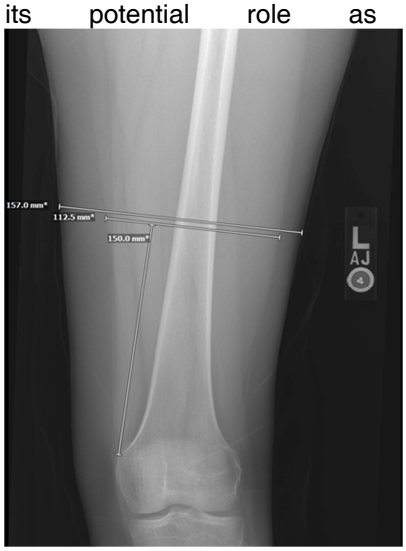
A retrospective cohort study was conducted at two Level 1 trauma centers in Boston, including patients aged 70 years or older who underwent surgical treatment for an isolated hip fracture after January 1st 2018. Eligible patients had standard radiographs of the pelvis and femur taken during diagnostic work-up prior to surgery. Thigh muscle diameter was measured on anteroposterior and lateral radiographs at standardized anatomical landmarks. Radiographic assessments were performed in duplicate by radiology fellows under musculoskeletal radiologist supervision. Mortality data were sourced from publicly available obituaries, while clinical variables were obtained through a chart review of patients' electronic medical records.

RESULTS:

A total of 199 patients were included, with a median age of 85 (IQR 78-90), a CCI 4 (IQR 4-7) a CGA-FI of 0.32 (SD 0.14), and a BMI of 23.3 (IQR 20.8-26.9). Patients were predominantly female (n = 136, 68.3%), white (n = 177, 88.9%), non-Hispanic and non-Latino (n = 182, 95.5%), and lived at home (n = 164, 82.4%). The in-hospital, 30-day and one-year mortality were 2%, 5%, and 22%, respectively. The ICC showed excellent reliability for all radiographic measurements. After adjusting for age, smoking status, residence, dementia, CCI, CGA-FI, and BMI, a greater diameter of thigh muscle on the AP projection was associated with lower odds of 1-year mortality (adjusted OR 0.74, 95% CI 0.56-0.97, p=0.032). The other radiographic measurements were not significantly associated with one-year mortality.

DISCUSSION AND CONCLUSION:

Diameter of thigh muscle on anteroposterior radiograph of the femur is independently associated with one-year mortality following hip fracture surgery. Specifically, lower muscle mass is significantly linked to increased mortality risk, highlighting its potential role as a valuable prognostic indicator in this patient population.



	Total n = 199	Survived n = 155	Deceased n = 44	p-value
Age in years, median (IQR)	85 (78-90)	84 (78-89)	87 (81-94)	**0.032**
Sex, n (%)				0.337
Female	136 (68)	110 (71)	26 (61)	
Race, n (%)				0.417
Asian	6 (3)	5 (3)	1 (2)	
Black	6 (3)	3 (2)	3 (7)	
Native Hawaiian or Other Pacific Islander	1 (1)	1 (1)	-	
White	177 (89)	138 (89)	39 (91)	
Unknown	9 (5)	8 (5)	1 (2)	
Ethnicity, n (%)				0.687
Hispanic or Latino	9 (5)	8 (5)	1 (2)	
Non-Hispanic / Non-Latino	182 (95)	142 (95)	40 (98)	
Unknown	8 (4)	5 (3)	3 (7)	
Residence, n (%)				**0.038**
Home	164 (82)	133 (86)	31 (70)	
Short-term facility	6 (3)	3 (2)	3 (7)	
Long-term facility	29 (15)	19 (12)	10 (23)	
Body Mass Index in kg/m², n (%)	23.3 (20.8-26.9)	23.7 (21.2-27.1)	22.7 (21.2-24.8)	0.355
Unknown, n (%)	13 (8)	13 (13)	2 (5)	
Mobility, n (%)				0.147
Independent	72 (36)	62 (40)	13 (30)	
With cane	40 (20)	34 (22)	6 (14)	
With walker	72 (36)	50 (32)	22 (50)	
Wheelchair	11 (6)	8 (5)	3 (7)	
Unknown	1 (1)	1 (1)	-	
Smoking status, n (%)				**0.042**
Current	9 (5)	6 (4)	3 (7)	
Former	86 (43)	61 (40)	25 (57)	
Never	103 (52)	87 (58)	16 (38)	
Unknown	1 (1)	1 (1)	-	
Dementia, n (%)				**<0.001**
Yes	31 (11)	9 (6)	12 (27)	
Unknown	6 (2)	6 (4)	-	
CCI, n (%)	4 (4-7)	4 (4-6)	7 (5-8)	**<0.001**
Unknown, n (%)	6 (2)	6 (4)	-	
CGA-FI, mean (SD)	0.32 (0.14)	0.30 (0.13)	0.41 (0.14)	**<0.001**
Pre-frail, n (%)	42 (21)	41 (26)	1 (2)	
Mild frailty, n (%)	45 (23)	34 (22)	11 (25)	
Moderate frailty, n (%)	48 (24)	41 (26)	7 (16)	
Severe frailty, n (%)	64 (32)	39 (25)	25 (57)	
Injury mechanism, n (%)				0.124
Same level falls	177 (89)	140 (93)	37 (84)	
Multi-level falls	11 (6)	11 (7)	-	
Unknown	11 (6)	4 (3)	7 (16)	
ASA, n (%)				**<0.001**
<II	30 (10)	18 (12)	2 (5)	
III	147 (73)	123 (80)	24 (55)	
≥ IV	20 (13)	13 (8)	18 (41)	
Unknown	2 (1)	2 (1)	-	
Method of anesthesia, n (%)				0.589
General	173 (88)	137 (90)	38 (88)	
Spinal	22 (11)	16 (10)	6 (14)	
Unknown	2 (1)	2 (1)	-	
Fracture, n (%)				0.473
Femoral neck	80 (40)	60 (39)	20 (45)	
Intertrochanteric	109 (55)	88 (57)	21 (48)	
Subtrochanteric	10 (5)	7 (5)	3 (7)	
Surgical construct, n (%)				0.068
Total Hip Arthroplasty	7 (4)	7 (5)	-	
Hemiarthroplasty	56 (28)	40 (26)	16 (36)	
Sliding Hip Screw / Dynamic Hip Screw	23 (12)	22 (14)	1 (2)	
Intramedullary Nail	103 (52)	79 (51)	24 (55)	
Closed Reduction Percutaneous Pinning	10 (5)	7 (5)	3 (7)	

	n	Adjusted OR	95% CI	p-value
AP projection: Diameter of thigh muscle	162	0.74	**0.56-0.97**	**0.032**
AP projection: Diameter of whole soft tissue envelope	142	0.81	0.64-1.04	0.093
Lateral projection: Diameter of thigh muscle	165	1.05	0.82-1.33	0.701
Lateral projection: Diameter of whole soft tissue envelope	159	0.95	0.78-1.16	0.634