Prognostic significance of Controlling Nutritional Status score in predicting short-term functional prognosis in patients with acute osteoporotic vertebral fractures

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INTRODUCTION:

Acute osteoporotic vertebral fracture (AOVF) causes pain, disability, decline of activities of daily living (ADL), reduced Quality of Life (QoL) and increase in the rate of mortality. Thus, the management to treat and prevent AOVFs are of increasing interest. Severe osteoporosis, sarcopenia and loss of muscle are recognized as risk factor for poor prognosis of the clinical outcome of patients with AOVF, and nutritional status has been reported to be associated with osteoporosis, sarcopenia, loss of muscle and ADL in elderly people. However, few reports are available on investigating nutritional status of patients with AOVF and the impact of malnutrition on the functional prognosis. Controlling Nutritional Status (CONUT) score is a convenient screening tool for nutritional status and calculated based on serum albumin, total cholesterol concentration, and total lymphocyte counts (TLC). The score is one of the objective data assessment tools that allow examiner-independent evaluation for nutritional status and is reported to be a reliable nutritional screening tool. The score is well considered in association with prognosis in cancer patients. Nevertheless, little has been reported on the CONUT score in patients with AOVF. This study aimed to evaluate nutritional status of patients with AOVF using the CONUT score and the relationship between the CONUT score and short-term functional prognosis.

METHODS:

This was a retrospective, single-center, cohort study. We reviewed clinical data of 192 patients who had been hospitalized for conservative treatment of AOVF between January 2017 and March 2020. The inclusion criteria were as follows: 1) patients aged 65 years or older; 2) fragility fracture without trauma or resulting from low-energy trauma, such as a fall from standing or sitting; 3) admission for severe low back pain. The exclusion criteria were as follows: 1) required surgery due to neurological deficit or nonunion following conservative treatment for OVF; 2) pathological vertebral fracture; 3) previous spine surgery; 4) concomitant non-spinal-associated injury; 5) lack of radiographic and blood sampling data; 6) dead during hospitalization. AOVF was diagnosed by radiographs and magnetic resonance imaging (MRI). The indication for hospitalization is notably disability due to severe low back pain. The conservative treatment of AOVF involved bed rest, physical therapy, soft or hard brace, and evaluation and appropriate treatment of osteoporosis. We collected all clinical data such as demographic, laboratory and radiographic data through the electronic medical record system. The CONUT score was a sum based on serum albumin (0, 2, 4 ,6), total cholesterol concentration and TLC (0, 1, 2, 3, each) and classified as normal, light, moderate, and severe for scores of 0-1, 2-4, 5-8 and 9-12, respectively (Table 1). The primary outcome measures were the level of the gait ability. Gait ability was categorized into the following 5 levels: level 1, bedridden; level 2, wheelchair use; level 3, wheelbarrow use; level 4, use a cane; and level 5, independent gait. A decline in the gait ability was defined as a reduction in level by one or more. The secondary outcome measures were complications during hospitalization and the length of hospital stay and rate of discharge to their home. The patients were divided into two groups: CONUT-low (≤3) and CONUT-high (≥4), according to receiver operating characteristics (ROC) analysis to predict the decline in the gait ability. Logistics regression analyses were performed to estimate the association between CONUT score and the decline in the gait ability.

RESULTS:

Of the 192 patients, 58 were excluded and the total of 134 patients enrolled. The mean age was 83±7.6 years, and 89 patients were woman. 112 (84%) patients had medical comorbidities. The median of the CONUT score was 4 (2–6). 25 (15%), 56 (42%), 46 (34%) and 7 patients (5%) were classified as normal, light, moderate, and severe, respectively. 109 patients (81%) were malnourished. The optimal cut-off value of the CONUT score by ROC analysis was 4 (sensitivity=72.9% and specificity=61.0%; p<0.0001). 58 and 76 patients were categorized into CONUT-low (≤3) group and CONUT-high group (≥4) respectively. The CONUT-high group had a significantly older age (82.4±6.6 vs 84.6±7.7, p=0.042), lower body mass index (22.7±5.0 vs 19.3±3.7; p<0.0001), lower rate of discharge to their home (41% vs 14%; p=0.0005), higher rate of complication (21% vs 39%; p=0.019), and higher rate of decline in gait ability (33% vs 67%; P<0.0001) compared with the CONUT-low group. Osteoporotic treatment, complication during hospitalization, serum albumin level and multiple AOVF were identified as the associated cofactors with decline in the gait ability by univariate analysis. The multiple logistic regression analysis revealed that the CONUT score (≥4) was the independent risk factor associated with decline in the gait ability (odds ratio 3.44; 95% CI 1.61–7.37; p=0.0014) (Table 2).

DISCUSSION AND CONCLUSION:

The current study demonstrated that 81% hospitalized patients with AOVFs was malnourished based on the CONUT score. The CONUT score was the independent risk factor associated with the decline in the gait ability at discharge. Our findings suggested that nutritional assessment using the CONUT score may be important for improving short-term prognosis after AOVFs. Further research into the impact of nutritional support interventions against elderly patients with AOVFs is warranted.

Table1, Controlling Nutritional Status Score

	Undernutrition Degree			
Parameter	Normal	Light	Moderate	Severe
Serum albumin (g/dl)	3.5 - 4.5	3.0 - 3.49	2.5 - 2.9	< 2.5
Score	0	2	4	6
Total lymphocytes (/mm³)	> 1600	1200 - 1599	800 - 1199	< 800
Score	0	1	2	3
Cholesterol (mg/dl)	> 180	140 - 180	100 - 139	< 100
Score	0	1	2	3
Screening total score	0 - 1	2 - 4	5 - 8	9 - 12

Table2, Univariate and multivariate analysis of factors associated between CONUT score and decline of the gait ability

	Univariate analysis			Multivariate analysis		
	OR	95% CI	P-value	OR	95%CI	P-value
Age, years	2.49	0.38 – 16.3	0.345			
Sex						
Sex, Women	1.60	0.77 – 3.32	0.20			
BMI	0.37	0.05 – 2.52	0.30			
Comorbidities	1.11	0.45 – 2.78	0.82			
Osteoporotic treatment	0.33	0.12 – 0.93	0.030*	0.42	0.14 – 1.25	0.68
Complication	2.38	1.11 – 5.10	0.023*	1.86	0.82 – 4.22	0.12
Hb (g/dl)	0.28	0.03 – 2.31	0.23			
Multiple acute OVFs	3.50	1.20 – 10.2	0.014*	2.61	0.85 – 8.02	0.14
Prevalent OVFs	1.09	0.55 – 2.16	0.81			
Lumber lordosis	2.13	0.31 – 14.5	0.44			
BMD	1.32	0.41 – 3.46	0.92			
CONUT score ≧4	4.18	2.02 – 8.67	<.0001*	3.44	1.61 – 7.37	0.0014*

CONUT, Controlling Nutritional Status; BMI, body mass index; Hb, hemoglobin; OVF, osteoporotic vertebral fracture
BMD, bone mineral density; OR, odds ratio; CI, confidence interval
* p value<0.05 statistically significant difference