

· 临床研究 ·

老年创伤患者营养状况及其影响因素

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【摘要】目的 分析围术期老年创伤患者营养状况及其影响因素,为早期营养干预和临床诊疗提供科学依据,改善其临床结局及预后,提高生活质量。**方法** 选择四川大学华西医院2021年1月至12月收治的103例老年创伤患者为研究对象,基于患者实验室检查、体成分数据等多维度描述老年创伤患者的营养状况。依据微型营养评定法(MNA-SF)的结果将患者进行营养风险分组,其中营养风险组46例,营养正常组57例,分析老年创伤患者营养状况及其影响因素。采用SPSS 19.0统计软件进行数据分析。根据数据类型,分别采用 t 检验、秩和检验或 χ^2 检验进行组间比较。采用二分类变量的多元逐步logistic回归分析老年创伤患者营养状况的影响因素。**结果** MNA-SF筛出营养状况良好者57例,潜在营养不良者39例,营养不良者7例,合计营养风险发生率为44.66%(46/103)。老年创伤患者还存在能量摄入不足、血糖较高、体脂偏高、骨骼肌质量减少、体蛋白质水平偏低等营养问题。logistic回归分析结果显示,高体脂($OR=0.126, 95\%CI 0.022\sim 0.707; P=0.019$)、低血清白蛋白($OR=3.579, 95\%CI 1.365\sim 9.388; P=0.010$)及低骨骼肌质量指数($OR=4.757, 95\%CI 1.854\sim 12.209; P=0.001$)与老年创伤患者的营养风险具有较高的相关性。存在营养风险($Z=-2.908, P=0.004$)和低血清白蛋白($Z=-3.511, P<0.001$)的老年创伤患者住院时间更长。**结论** 老年创伤患者存在诸多营养问题,营养风险发生率较高,且与患者住院时间相关,需及时监测营养状况,重点关注低体脂、低血清白蛋白、低骨骼肌质量指数的老年患者,及时给予营养支持,以改善其营养状况及预后。

【关键词】 老年人; 创伤; 营养状况; 影响因素**【中图分类号】** R592**【文献标志码】** A**【DOI】** 10.11915/j.issn.1671-5403.2022.10.158**Nutritional status in elderly trauma patients and its influencing factors**YU Feng-Mei¹, GONG Jie¹, CHEN Yan-Lin², ZUO Si-Lu¹, YIN Jie¹, HU Wen^{1*}⁽¹⁾Department of Clinical Nutrition, West China Hospital, Sichuan University, Chengdu 610041, China; ⁽²⁾School of Public Health, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China)

【Abstract】 Objective To analyze the nutritional status and its influencing factors of elderly trauma patients in perioperative period so as to provide scientific basis for early nutritional intervention and clinical diagnosis and treatment, promote clinical outcomes and prognosis, and improve their quality of life. **Methods** A total of 103 elderly trauma patients admitted in West China Hospital of Sichuan University from January 2021 to December 2021 were included in the study. The results of laboratory examinations and body composition data were recorded to describe the nutritional status of elderly trauma patients in multiple dimensions. According to the evaluation results of mini nutritional assessment-short form (MNA-SF), they were divided into nutritional risk group ($n=46$) and normal nutrition group ($n=57$). The nutritional status and the influencing factors were studied in the elderly trauma patients. SPSS statistics 19.0 was used to perform the statistical analysis. Student's t test, rank sum test or Chi -square test was employed for intergroup comparison. Multivariate stepwise logistic regression for binary variables was performed to analyze influencing factors of nutritional status in elderly trauma patients. **Results** The results of MNA-SF showed there were 57 patients with good nutritional status, 39 with potential malnutrition, and 7 with malnutrition, with an incidence of nutritional risk of 44.66% (46/103). Elderly trauma patients also had nutritional problems such as insufficient energy intake, high blood glucose, high body fat, reduced skeletal muscle mass and low body protein level. Logistic regression analysis indicated that high body fat ($OR=0.126, 95\%CI 0.022\sim 0.707; P=0.019$), low serum albumin level ($OR=3.579, 95\%CI 1.365\sim 9.388; P=0.010$) and low skeletal muscle mass index ($OR=4.757, 95\%CI 1.854\sim 12.209; P=0.001$) were significantly associated with nutritional risk in elderly trauma patients. The length of hospital stay was prolonged in the patients with nutritional risk ($Z=-2.908, P=0.004$) and those with low serum albumin level ($Z=-3.511, P<0.001$). **Conclusion** Elderly trauma patients had many nutritional problems and are at high nutritional risk, which is associated with the length of hospital stay. Monitoring of nutritional status should be carried out, especially in those with low body fat, serum albumin and skeletal muscle mass index. Timely nutritional support should be given to improve their nutritional status and prognosis.

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创伤是指机械性致伤因素作用于人体所造成的组织结构完整性的破坏或功能障碍^[1],位列2017年中国居民死因别累积死亡率第四(占比36.34%)^[2],造成较重的疾病负担。应激状态下较高的代谢水平、能量和蛋白质消耗增加、精神焦虑、免疫功能低下等因素致其易出现营养不良。老年人群因其生理特点及合并一种或多种基础疾病,创伤时更易发生营养风险。研究显示,外科老年患者营养不良发病率高达41.6%,存在营养风险者占20.8%,均显著高于中青年患者^[3]。且营养不良与老年创伤患者预后高度相关^[4],可导致不良的临床结局,增加病死率及并发症发生率、降低生活质量、延长住院时间、增加住院费用等^[5,6]。

研究发现,老年创伤患者例数及其在总体创伤患者中占比逐年上升,其年龄、Charlson合并症指数也逐年增长^[7]。随着我国老龄化进程加剧,此趋势必将日益突出。老年创伤患者的营养问题值得高度关注,但目前关注老年创伤患者营养状况的研究较少,未见多维度全面描述其营养状况的研究。明确老年创伤患者营养状况及其影响因素对于识别高危人群,实施精准营养干预,提高患者治疗效果,促进术后恢复,提高生活质量均具有重要意义。

1 对象与方法

1.1 研究对象

选择2021年1月至12月四川大学华西医院创伤医学中心收治的103例老年患者为研究对象。纳入标准:(1)年龄 ≥ 60 岁;(2)主要诊断符合创伤定义或诱因为创伤;(3)知情且同意参与本研究。排除标准:(1)体内植入心脏起搏器;(2)严重听力受损或认知障碍等交流障碍;(3)因石膏固定未完全暴露四肢。本研究已通过四川大学华西医院伦理委员会审批。

1.2 方法

采用问卷调查收集患者入院时一般资料(包括性别、年龄、身高、体质量、家庭情况、精神状况、Charlson合并症指数等),并使用微型营养评定法(mini nutritional assessment-short form, MNA-SF)行营养风险评估;从电子病历系统获取患者血红蛋白(hemoglobin, HB)、血清白蛋白(albumin, ALB)、血糖、胆固醇(total cholesterol, TC)、甘油三酯

(triglyceride, TG)、低密度脂蛋白胆固醇(low-density lipoprotein cholesterol, LDL-C)、高密度脂蛋白胆固醇(high-density lipoprotein cholesterol, HDL-C)、血钙(calcium, Ca)等营养相关实验室检查数据和住院时间;通过Inbody S10 Biospace多频生物电阻抗人体成分分析仪行人体成分测定,收集患者入院时体蛋白质、骨骼肌质量指数(skeletal muscle mass index, SMI)、体脂、体脂百分比、相位角(phase angle, PA)、无机质含量等体成分指标。记录各指标的测定值及正常范围。

SMI计算公式^[8]为骨骼肌质量/身高²(kg/m²)。根据亚洲肌少症工作组(Asian Working Group for Sarcopenia, AWGS)关于肌少症的诊断及治疗共识2019版推荐的SMI切值,男性 ≤ 7.00 kg/m²,女性 ≤ 5.7 kg/m²为低肌肉质量^[9]。结合以上多项指标对患者营养状况进行多维度描述。

将蛋白质、体脂、体脂百分比、无机质根据测定值和个人正常值范围转换为低于正常值、正常值及高于正常值的分级指标。根据MNA-SF评分结果将患者分为营养状况良好、营养不良风险和营养不良。其中营养不良风险和营养不良归于存在营养风险组。

1.3 统计学处理

采用SPSS 19.0统计软件进行数据分析。正态分布的计量资料以均数 \pm 标准差($\bar{x} \pm s$)表示,组间比较采用 t 检验;非正态分布的计量资料使用中位数(四分位数间距)[$M(Q_1, Q_3)$]表示,组间比较使用秩和检验。计数资料以例数(百分率)表示,组间比较采用 χ^2 检验。采用二分类变量的多元逐步logistic回归分析老年创伤患者营养状况的影响因素。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 老年创伤患者的一般资料

103例老年创伤患者,年龄(71.83 \pm 7.57)岁。其中,男性37例,年龄(71.19 \pm 6.84)岁;女性66例,年龄(72.18 \pm 7.98)岁;空巢老年人(包括相对空巢和绝对空巢)60例,存在高血压、糖尿病、冠心病、肿瘤等慢性疾病家族史23例,存在吸烟史16例,存在饮酒史16例;创伤诱因中,摔倒/跌倒/扭伤49例,手术创伤31例。老年创伤患者一般资料详见表1。

表1 老年创伤患者的一般资料

Table 1 General data of elderly trauma patients (n=103)

Item	n(%)
Gender	
Male	37(35.92)
Female	66(64.08)
Age(years)	
60≤age<70	49(47.57)
70≤age<80	35(33.98)
Age≥80	19(18.45)
Family structure	
Childless	1(0.97)
Relatively empty nest	50(48.54)
Absolutely empty nest	9(8.74)
Living with children	43(41.75)
Cause	
Traffic accident	12(11.65)
Falling/sprain	45(43.69)
Dropping	1(0.97)
Re-operation	31(30.10)
Others	14(13.59)
Family history	
No	80(77.67)
Yes	23(22.33)
Smoking history	
No	87(84.47)
Yes	16(15.53)
Drinking history	
No	87(84.47)
Yes	16(15.53)
Operation history	
No	37(35.92)
Yes	66(64.08)
Mental status	
None	98(95.15)
Mild dementia	4(3.88)
Severe dementia or depression	1(0.97)

2.2 老年创伤患者的营养状况

基于MNA-SF筛查结果,共46例患者存在营养风险,营养风险发生率为44.66%(46/103);根据体质质量指数(body mass index, BMI)判定标准,消瘦患者23例;全天能量摄入小于需要量80%患者41例,其中有11例小于需要量的50%;51例患者ALB含量偏低,34例患者HB含量偏低,43例血糖偏高,20例血钙偏低;低肌肉质量的患者共47例;体脂超出正常范围者61例,体脂百分比超标者76例;45例患者体蛋白质含量偏低,24例患者无机质含量偏低;PA中位数为4.9°(4.1°,5.4°)。患者营养状况分布情况详见表2。

2.3 单因素分析老年创伤患者营养状况的影响因素

使用MNA-SF评分将老年创伤患者划分为存在营养风险组和营养正常组。2组患者年龄、ALB、HB、蛋白质、体脂、体脂百分比、SMI构成比比较,差异有统计学意义($P<0.05$);营养正常组PA[5.20°(4.60°,5.50°)]高于营养风险组[4.30°(3.58°,4.92°)],差异有统计学意义($P<0.05$);2组患者性别、全天能量摄入量、TG、无机质等构成比及Charlson合并症指数比较,差异无统计学意义($P>0.05$;表3)。

表2 老年创伤患者营养状况分布情况

Table 2 Distribution of nutritional status in elderly trauma patients (n=103)

Item	n(%)
BMI(kg/m ²)	
BMI<20	23(22.33)
20≤BMI<24	42(40.78)
24≤BMI<28	27(26.21)
BMI≥28	11(10.68)
MNA-SF score(points)	
≥12	57(55.34)
8-11	39(37.86)
≤7	7(6.80)
All-day energy intake	
>80% energy requirement	62(60.19)
50%-80% energy requirement	30(29.13)
<50% energy requirement	11(10.68)
ALB(g/L)	
≥40	52(50.49)
<40	51(49.51)
HB(g/L)	
Male:<120; Female:<110	34(33.01)
Male:≥120; Female:≥110	69(66.99)
Blood glucose(mmol/L)	
<3.9	3(2.91)
3.9-5.9	57(55.34)
>5.9	43(41.75)
TG(mmol/L)	
0.29-1.83	79(76.70)
>1.83	24(23.30)
LDL-C(mmol/L)	
≥4.00	10(9.71)
<4.00	93(90.29)
HDL-C(mmol/L)	
≤0.9	15(14.56)
>0.9	88(85.44)
Calcium(mmol/L)	
<2.11	20(19.42)
2.11-2.52	82(79.61)
>2.52	1(0.97)
Skeletal muscle mass(kg)	
Below normal range	48(46.60)
Normal range	51(49.51)
Above normal range	4(3.88)
SMI(kg/m ²)	
Normal range	56(54.37)
Below normal range	47(45.63)
Body fat(kg)	
Below normal range	12(11.65)
Normal range	30(29.13)
Above normal range	61(59.22)
Percentage of body fat(%)	
Below normal range	5(4.85)
Normal range	22(21.36)
Above normal range	76(73.79)
Protein(kg)	
Below normal range	45(43.69)
Normal range	54(52.43)
Above normal range	4(3.88)
Inorganic matter(kg)	
Below normal range	24(23.30)
Normal range	73(70.87)
Above normal range	6(5.83)

BMI: body mass index; MNA-SF: mini nutritional assessment-short form; ALB: albumin; HB: hemoglobin; TG: triglyceride; LDL-C: low-density lipoprotein cholesterol; HDL-C: high-density lipoprotein cholesterol; SMI: skeletal muscle mass index.

表3 基于MNA-SF评分的单因素分析

Table 3 Univariate analysis based on outcomes of MNA-SF score

Item	Nutritional risk group(<i>n</i> =46)	Normal nutrition group(<i>n</i> =57)	χ^2/Z	<i>P</i> value
Age (years)			8.029	0.018
60≤age<70	18	31		
70≤age<80	14	21		
Age≥80	14	5		
Gender			3.493	0.062
Male	12	25		
Female	34	32		
All-day energy intake/energy requirement			3.951	0.139
>80%	23	39		
50%–80%	16	14		
<50%	7	4		
ALB (g/L)			13.368	<0.001
≥40	14	38		
<40	32	19		
HB (g/L)			10.861	0.001
Male; <120; Female; <110	23	11		
Male; ≥120; Female; ≥110	23	46		
TG (mmol/L)			1.624	0.202
<0.29	0	0		
0.29–1.83	38	41		
>1.83	8	16		
Protein (kg)			14.150	0.001
Below normal range	29	16		
Normal range	17	37		
Above normal range	0	4		
Body fat (kg)			15.785	<0.001
Below normal range	10	2		
Normal range	18	12		
Above normal range	18	43		
Percentage of body fat (%)			7.612	0.022
Below normal range	4	1		
Normal range	14	8		
Above normal range	28	48		
SMI (kg/m ²)			15.865	<0.001
Below normal range	31	16		
Normal range	15	41		
Inorganic matter (kg)			2.500	0.287
Below normal range	14	10		
Normal range	30	43		
Above normal range	2	4		
Charlson comorbidity index			1.794	0.408
0–1	35	47		
2	8	5		
>3	3	5		

ALB: albumin; HB: hemoglobin; TG: triglyceride; SMI: skeletal muscle mass index.

2.4 多因素分析老年创伤患者营养状况的影响因素

以MNA-SF营养风险筛查评估结果作为因变量,赋值存在营养风险=1、无营养风险=0。将单因素分析中 $P<0.05$ 的变量(年龄、ALB、HB、蛋白质、体脂、体脂百分比、SMI、PA)纳入二元逐步logistic回归分析(向后似然比检验),其中PA以连续型变量纳入,其余自变量赋值见表4。结果显示,高体脂是老年创伤患者营养风

险的保护因素($P<0.05$),体脂高于正常值的老年创伤患者出现营养风险的概率是低体脂老年人的0.126倍;低SMI和低ALB是老年创伤患者出现营养风险的危险因素($P<0.05$),低肌肉质量患者出现营养风险的概率是正常肌肉质量患者的4.757倍,低ALB患者出现营养风险的概率是正常ALB患者的3.579倍(表5)。Hosmer-Lemeshow拟合优度检验 $P=0.989$,拟合极好。

表4 自变量赋值表

Table 4 Assignment of independent variables

Factor	Assignment
Age	60 years ≤ age < 70 years = 1 70 years ≤ age < 80 years = 2 Age ≥ 80 years = 3
ALB	< 40 g/L = 1, ≥ 40 g/L = 0
HB	Below normal range = 1 Normal range = 0
Protein, body fat, percentage of body fat	Below normal range = 1 Normal range = 2 Above normal range = 3
SMI	Below normal range = 1 Normal range = 0

ALB; albumin; HB; hemoglobin; SMI; skeletal muscle mass index.

表5 基于MNA-SF的回归分析

Table 5 Regression analysis based on MNA-SF

Factor	P value	OR	95%CI
Body fat			
Below normal range (reference level)			
Normal range	0.191	0.299	0.049-1.829
Above normal range	0.019	0.126	0.022-0.707
ALB			
Normal range (reference level)			
Below normal range	0.010	3.579	1.365-9.388
SMI			
Normal range (reference level)			
Below normal range	0.001	4.757	1.854-12.209
Constant	0.972	0.969	

ALB; albumin; SMI; skeletal muscle mass index.

2.5 不同营养状况患者住院时间比较

存在营养风险和白蛋白水平 < 40 g/L 的患者住院时间更长, 差异均有统计学意义 ($P < 0.05$); 而不同范围的四肢骨骼肌质量和体脂肪组间的住院时间比较, 差异无统计学意义 ($P > 0.05$; 表6)。

表6 不同营养状况患者住院时间比较

Table 6 Comparison of length of hospital stay among patients with different nutritional status

Factor	n	Length of stay [M(Q ₁ , Q ₃)]	Z	P value
Nutritional status			-2.908	0.004
Nutritional risk	46	10.0(7.0, 13.3)		
Normal nutrition	57	7.0(6.0, 10.0)		
Body fat			0.336	0.845
Below normal range	12	8.5(7.0, 12.5)		
Normal range	30	9.0(6.0, 12.0)		
Above normal range	61	8.0(6.0, 11.5)		
ALB			-3.511	<0.001
Normal range	51	7.0(6.0, 9.0)		
Below normal range	52	10.0(7.0, 13.0)		
SMI			-1.498	0.134
Normal range	56	8.0(6.0, 11.0)		
Below normal range	47	9.0(7.0, 13.0)		

ALB; albumin; SMI; skeletal muscle mass index.

3 讨论

本研究聚焦老年创伤患者, 基于营养评估、实验室检查、体成分测量等方式从多维度评价其营养状况。结果显示, 营养风险发生率为 44.66%, 49.51% 的患者白蛋白偏低, 仅 60.19% 患者能量摄入超过能量需要量 80%, 且体脂偏高、骨骼肌质量指数减少、体蛋白质水平偏低。可见老年创伤患者营养状况堪忧, 值得高度关注。

本研究基于 MNA-SF 的营养风险发生率稍低于周雪等^[10]报道的 54.7%, 高于内科患者和老年住院患者平均营养风险发生率^[11]。创伤老年人超重、肥胖者较多, 多数患者体脂百分比高于标准值, 与 BMI 表现一致, 存在营养过剩现状。但 logistic 回归分析结果显示, 较高的体脂对老年创伤患者的营养状况存在保护作用, 可减少 87% 的营养风险发生。系统评价结果同样显示, 体脂较高的老年人生存时间更长, 最佳 BMI 范围是超重 ($25 \text{ kg/m}^2 \leq \text{BMI} < 30 \text{ kg/m}^2$) 或轻度肥胖 ($30 \text{ kg/m}^2 \leq \text{BMI} < 35 \text{ kg/m}^2$)^[12]。老年创伤患者处于应激下高代谢状态, 一定量的脂肪储存不至于让患者长时间负能量平衡, 过度消耗机体营养物质, 延缓其营养风险发生。但过高的体脂不利于疾病康复还可能加重病情, 因此可进一步探索体脂及脂肪的分布情况与老年创伤患者预后的关联, 明确安全有利的最适宜体脂范围。

低肌肉质量的患者出现营养风险的概率是正常肌肉质量患者的 4.757 倍。低肌肉质量是诊断肌肉衰减综合征的必要条件, 老年创伤患者中近 50% 存在低肌肉质量, 未来可进一步关注该人群肌肉衰减综合征的患病率。肌肉衰减综合征与术后并发症具有相关性, 也是髋关节置换和股骨颈骨折等创伤患者术后预后不良的重要预测因素^[13,14]。可见, 围术期通过生物电阻抗分析法监测老年创伤患者的肌肉质量水平具有重要的参考意义。肌肉质量降低影响老年人的行动能力, 再次发生摔倒等意外的可能性随之增加。行动能力受限加上术后卧床的影响使肌肉功能进一步恶化, 如未进行及时干预, 临床不良结局的风险将增加。

作为传统的营养学指标, 白蛋白与营养状况密切相关, 广泛应用于临床营养评估。老年创伤患者中 49.51% 白蛋白低于 40 g/L, 且本研究结果显示, 低 ALB 的患者出现营养风险的概率是正常 ALB 患者的 3.579 倍, 研究结果同时显示, 低白蛋白与患者住院时间相关。作为常规检测的实验室指标, 当患者白蛋白较低时, 应密切监测患者营养状况, 及时予

以营养支持。本研究的局限性:(1)样本量较少,营养风险发生率可能低估,或存在检验效能不足问题;(2)未能从上臂围、腰围、小腿围、握力等维度进行营养状况评估。

综上,老年创伤患者营养风险发生率高,营养状况堪忧,以 BMI 作为标准判定为营养不良的患者超过 50%,血清白蛋白显示 49.51% 的患者白蛋白偏低,还伴随着能量摄入不足、血糖较高、体脂偏高、骨骼肌质量减少及体蛋白质水平偏低等问题。高体脂是老年创伤患者营养风险的保护因素,低 SMI 和低 ALB 是老年创伤患者出现营养风险的危险因素。存在营养风险和低 ALB 与患者更长的住院时间相关。在老年创伤患者营养诊疗过程中,应重视患者营养问题,及时行营养状况评估和营养干预。

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