老年人少肌性肥胖与代谢综合症的研究进展

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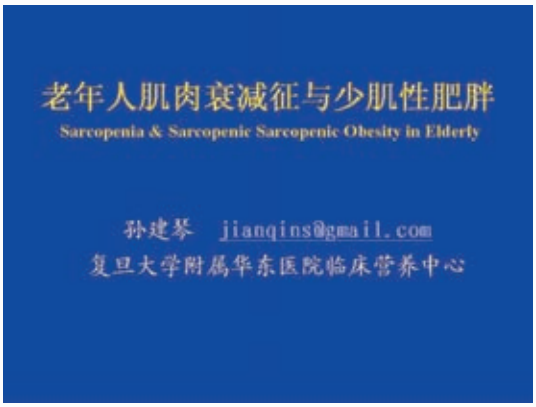
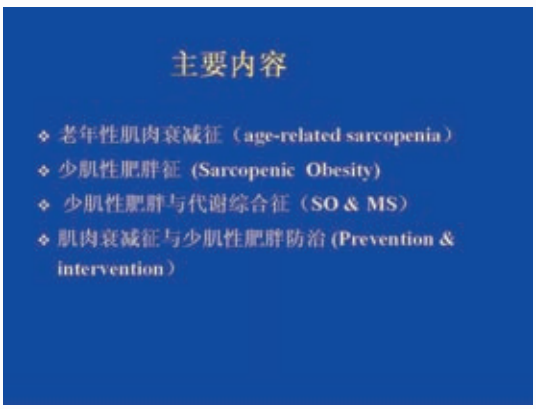
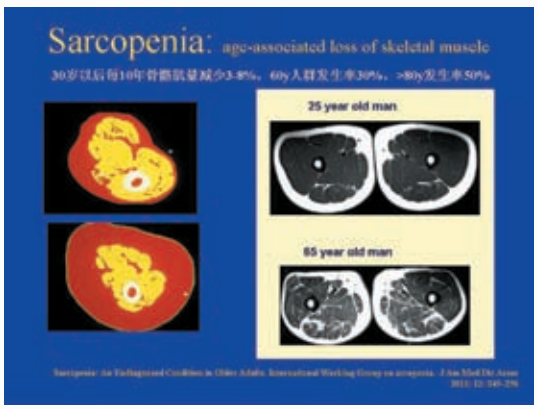
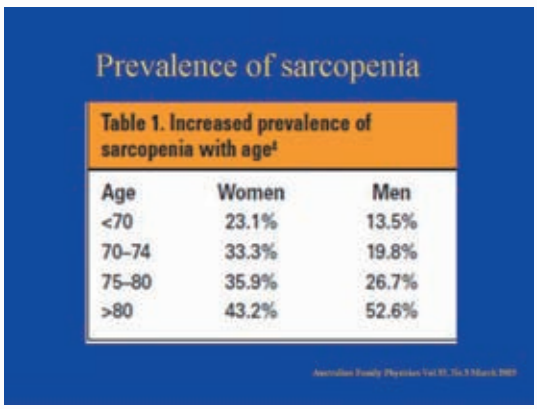








欧洲老年人少肌症工作组 (EWGSOP)
The European Working Group on Sarcopenia in Older People

- 4个组织构成：
  - 欧洲老年医学学会、
  - 欧洲临床营养与代谢学会、
  - 国际老年学和老年医学协会(欧洲)、
  - 国际营养与衰老协会
- 提出老年相关少肌症的临床定义以及诊断标准
- EWGSOP基于临床数据给出了循证意见：
  1. 什么是少肌症、病因
  2. 少肌症的指标有哪些
  3. 这些指标的影响因素、检查工具和临床检查指标的切点
  4. 少肌症对患液质、虚弱、少肌性肥胖的影响

How to diagnose sarcopenia?
肌肉衰减症诊断

检测方法：
双能X线 DEXA 、核磁共振 MRI 、
CT 、生物电阻抗、BIA、人体测量

工作诊断指标：
1, low muscle mass 肌量减低
<2SD (同性别同种族青年人)
2, Low gait speed 步速减缓
4米长的步行测试，步速低于0.8米/秒

老年人肌肉衰减征的病因

Fig. 1. Conditions potentially leading to sarcopenia. Sarcopenia can be observed at any age resulting from inflammatory diseases, malnutrition, disuse or endocrine disorders. These conditions may act as accelerants of underlying causes of age-related sarcopenia.

Clinical Nutrition 29 (2010) 154–159

Sarcopenia screening

Sarcopenia病因学分类及分级
(EWGSOP)

Table 2. Sarcopenia categories by cause

Primary sarcopenia	
Age-related sarcopenia	No other cause evident except ageing
Secondary sarcopenia	
Activity-related sarcopenia	Can result from bed rest, sedentary lifestyle, deconditioning or zero-gravity conditions
Disease-related sarcopenia	Associated with advanced organ failure (heart, lung, liver, kidney, brain), inflammatory disease, malignancy or endocrine disease
Nutrition-related sarcopenia	Results from inadequate dietary intake of energy and/or protein, or with malabsorption, gastrointestinal disorders or use of medications that cause anorexia

Table 3. EWGSOP conceptual stages of sarcopenia

Stage	Muscle mass	Muscle strength		Performance
Presarcopenia	↓			
Sarcopenia	↓	↓	Or	↓
Severe sarcopenia	↓	↓		↓

Consequences of Sarcopenia

- Decreased resting energy expenditure
- Decreased insulin sensitivity
- Decreased muscle mass and strength
- Increased risk of physical disability
- Increased risk of falls
- Increased risk of mortality

L.J.G. Greenlund, Sarcopenia - consequences, mechanisms, and potential therapies. Mechanisms of Ageing and Development 124 (2003) 287–299

Sarcopenia研究和临床诊断方法的选用
(EWGSOP)

Table 4. Measurements of muscle mass, strength, and function in research and practice[a]

Variable	Research	Clinical practice
Muscle mass	Computed tomography (CT)	BIA
	Magnetic resonance imaging (MRI)	DXA
	Dual energy X-ray absorptiometry (DXA)	Anthropometry
	Bioimpedance analysis (BIA)	
	Total or partial body potassium per fat-free soft tissue	
Muscle strength	Handgrip strength	Handgrip strength
	Knee flexion/extension	
	Peak expiratory flow	
Physical performance	Short Physical Performance Battery (SPPB)	SPPB
	Usual gait speed	Usual gait speed
	Timed get-up-and-go test	Get-up-and-go test
	Stair climb power test	

[a]Please refer to the text for a description and references on these measurements techniques.

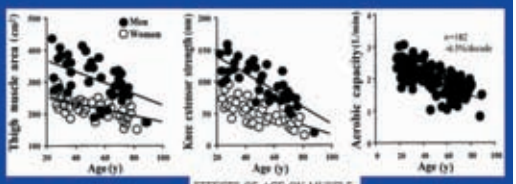
老年性肌衰征临床表现及后果

- 骨骼肌逐渐减少，肌力逐年下降
- 活动能力降低，行走、登高、坐立、举物等各种日常动作完成有困难
- 逐步发展到难以站起、下床困难、步履蹒跚、平衡障碍、极易摔倒骨折
- 增加残疾、丧失自理生活能力
- 身体虚弱、体重下降、死亡率增加

千金难买老来瘦？
the thin the better?

与年龄相关的体成分改变(肌肉重量↓、脂肪重量↑)

年龄相关的肌肉重量和力量减少，肌耐力降低，导致身体活动减少，使老年人总的能量消耗减少，从而体重增加和腹部脂肪堆积



EFFECTS OF AGE ON MUSCLE

少肌性肥胖 - 老年人双重营养负担交汇

ScienceDirect

REVIEW

Sarcopenic obesity: A new category of obesity in the elderly

Mauro Zamboni*, Gloria Mazzali, Francesco Fantin, Andrea Rossi, Vincenzo Di Francesco

Age-related body composition changes and the increased prevalence of obesity in the elderly produce a combination of excess weight and reduced muscle mass and/or strength, which has recently been defined as sarcopenic obesity (SO).

肥胖与少肌性肥胖之间的恶性循环

Fig. 2. Vicious cycle of obesity and sarcopenic obesity.

Debra L. Waters. Sarcopenia and Obesity. Clin Geriatr Med 27 (2011) 401–421

老年人少肌性肥胖

老年人体成分变化特征：

体重增加：

主要脂肪组织尤其是内脏脂肪增加

肌肉组织减少，

主要是四肢骨骼肌减少

少肌性肥胖：Sarcopenic obesity（SO）

不良的健康与临床结局

少肌性肥胖的诊断方法

目前，少肌性肥胖没有统一的诊断标准

Baumgartner 标准

- 四肢肌肉重量除以身高平方(ASM/h²)，值比同性别年轻对照人群的均值低两个SD
- 体脂百分比：男性>27%，女性>38%（BMI约为27 kg/m²）

Davison标准

体脂肪含量>人群水平60%

肌肉重量<人群水平60%

Korean标准

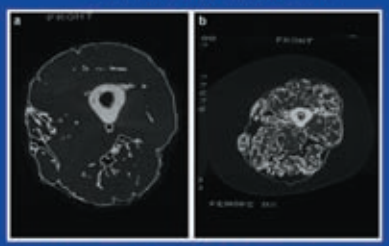
- 四肢肌肉重量除以身高平方(ASM/h²)或除以体重(ASM/Wt)，值比同性别年轻对照人群的均值低一个SD
- 内脏脂肪面积≥100 cm2

少肌性肥胖形态学特征

肌肉减少，脂肪增加，

肌肉内脂质浸润

intramuscular lipid, myosteatosis



a.体重正常者　b.少肌性肥胖者

少肌性肥胖发生率

Baumgartner 标准

- SO的患病率随着年龄的增加而逐渐增高，60-69岁人群的患病率为2%，80岁以上人群中患病率为10%左右

Davison标准

- 70岁以上人群的大样本研究发现，男性SO的患病率为9.0%，女性为7.4%。

Korean标准

- 采用ASM/h2标准发现SO的患病率为男性16.7%，女性5.7%。
- 用ASM/Wt标准得出SO的患病率男性35.1%，女性48.1%。
- SO合并患有代谢综合征风险的OR值为8.28（95%CI 4.45-

SO与MS的危险性

组别	odds ratio，OR
sarcopenic obesity	8.28（95% CI 4.45–15.40）
obesity	5.51（95% CI 2.81–10.80）
Sarcopeina	2.64（95% CI 1.08–6.44）

SO患MS危险性高于肥胖、肌肉衰减综合征

Soo Lim et al. Diabetes Care, Jul 2010; 33: 1652–1654.

少肌症的干预建议

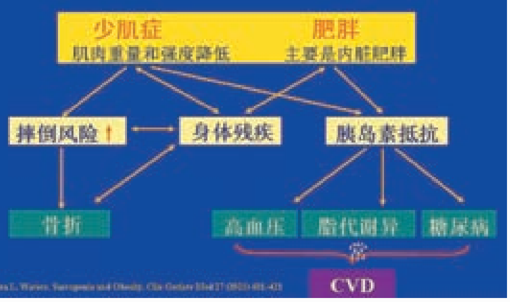
Table 2. Sarcopenia Recommendations

- Aging is associated with a physiological anorexia, decreased protein and energy intake, and weight loss. This is associated with a decline in muscle mass and increased mortality.
- The metabolic efficiency in older persons is decreasing, requiring a higher protein intake for protein synthesis than in younger persons.
- This suggests that a balanced protein and energy supplement may be useful in preventing and reversing sarcopenia as part of a multimodal therapeutic approach. (A)
- Persons with obesity and sarcopenia have very poor outcomes. Appropriate dietary approaches for this group, other than aggressive resistance exercise, are unknown.
- As 15% to 38% of older men and 27% to 41% of older women ingest less than the recommended daily allowance for protein it is suggested that protein intake be increased. (B)
- It is recommended that the total protein intake should be 1 to 1.5 g/kg/day. (B)
- It is suggested that a leucine-enriched balanced essential amino acid mix may be added to the diet. (B)
- A trial of balanced amino acid supplementation alone and with exercise in sarcopenia is recommended.
- Creatine may enhance the effects of exercise in sarcopenic patients. (A)
- Long-term studies of the effect of creatine on sarcopenia need to be carried out.
- Based on treatment trials in patients with sarcopenia and on well-established human physiology, patients receiving anabolic therapies will have increased dietary energy needs to support increases in lean body mass. Whether the increase in dietary energy needs will require explicit nutritional support is an individualized decision. (B)
- Based on some treatment trials in patients with sarcopenia and on physiologic hypotheses, for optimal deposition of muscle mass, patients receiving anabolic therapies probably require adequate protein intake. Whether meeting dietary protein needs will require explicit nutritional support is an individualized decision. (B)
- There is a need for a reasonably powered clinical trial to test these hypotheses in sarcopenic patients.
- 25(OH) vitamin D levels should be measured in all sarcopenic patients. (A)
- Vitamin D supplementation in doses sufficient to raise levels above 100 nmol/L should be given as an adjunctive therapy. (A)
- Either vitamin D2 or D3 is an acceptable replacement. (A)
- Doses of 50,000 IU of vitamin D a week are safe. (A)
- Short-term resistance exercise improves strength and gait speed. (A)
- Aerobic exercise improves quality of life years (QALY) and is cost effective. (A)
- Epidemiology studies suggest positive effects of physical fitness on health.
- We recommend resistance and aerobic exercise for 20 to 30 minutes, 3 times a week. (A)

A = A minimum of a single randomized placebo-controlled trial or a meta-analysis; B = Small trials.

John E. Morley et al. J Am Med Dir Assoc 2010; 11: 391–396

老年人少肌性肥胖的不良健康临床结局



Debra L. Waters. Sarcopenia and Obesity. Clin Geriatr Med 27 (2011) 401–421

Dietary protein recommendations and the prevention of sarcopenia

- 老年人强调摄入足够量优质蛋白质的重要性
- 肾功能OK，1.2-1.3g/kg/d
- 每餐 25-30g(~10 g EAA)的优质蛋白
- BCAA、Leucine supplementation to prevent sarcopenia
  - 最大限度地提高肌肉蛋白质合成
  - 亮氨酸是胰岛素促分泌剂，
  - 促进翻译启动和肌肉蛋白质合成

Current Opinion in Clinical Nutrition and Metabolic Care 2009, 12:86–90

少肌征及少肌征性肥胖的防治

Sarcopenia has "come of age" and should be recognized as a preventable and treatable condition among geriatric patients.

J Am Med Dir Assoc 2011;12: 249–256

It is important to note that quality of life and physical function improvement as well as muscle mass maintenance should be taken into consideration in the treatment of obesity in the elderly and even more in the treatment of subjects with SO.

Increasing Dietary Protein Requirements in Elderly People for Optimal Muscle and Bone Health

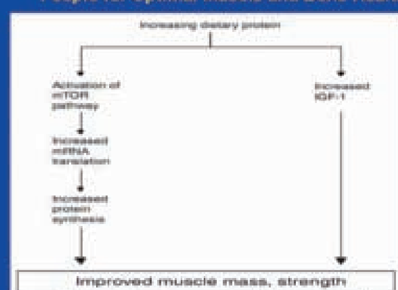


Figure 1. Potential mechanisms by which increasing dietary protein improves muscle health.

Rosa Gaffney-Stomberg et al. JAGS 57:1073–1079, 2009

少肌征及少肌征性肥胖的防治

营养
运动
药物

少肌征：　增加优质蛋白、增加能量、VD。。。
少肌肥胖：增加蛋白、BCAA、VD，控制脂肪能量

增加抗阻运动、有氧运动

药物：增加蛋白质合成、肌酸、抗炎。。。

三餐均匀分配蛋白质 最大程度提高肌肉蛋白质合成

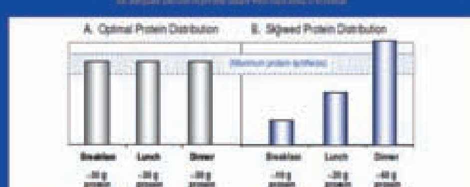


Figure 1 Protein distribution at meals. A) Ingestion of 90 grams of protein, distributed evenly at 3 meals. B) Ingestion of 90 grams of protein unevenly distributed throughout the day. Stimulating muscle protein synthesis to a maximal extent during the meals shown in Figure 1A is more likely to provide a greater 24 hour protein anabolic response than the unequal protein distribution in Figure 1B. (Adapted from Paddon-Jones & Rasmussen Curr Opin Clin Nutr Metab Care 2009, 12: 86–90.)

老年人蛋白质来源

合理膳食：
动物性蛋白质30-50%，
增加奶蛋、瘦肉、禽类、
鱼虾、豆制品、蔬菜水果。

口服营养支持（ONS）
肠内营养（*enteral feed*）口服或加餐

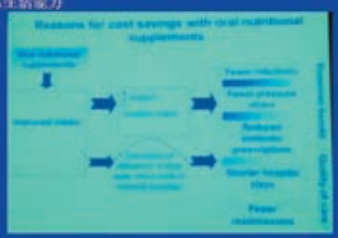
2011年美国VD、钙 DRIs

收集相关信息和现有的数据，
接受各方面提供评价和数据的网站，
复习现有的文献，
2011美国《钙与维生素D的DRIs》
－ 882p

强调决策制定的透明度，
明确参考值中的不确定性，
运用风险评估框架进行DRI科学评估

口服营养补充的临床益处

增加老年人体重、增加体重、瘦组织
补充膳食营养缺乏（能量营养素及微量营养素）
减少疾病与并发症、减少住院时间费用
改善体力、功能、日常生活能力
营养经济学效益高



Rebecca Stratton (UK) . ESPEN 2011

美国不同年龄VD的DRIs-2011

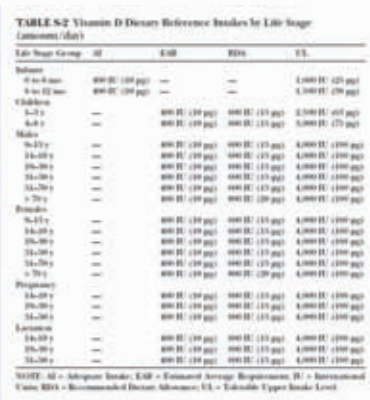
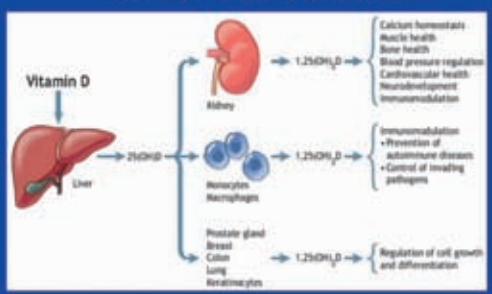


TABLE S-2 Vitamin D Dietary Reference Intakes by Life Stage (amounts/day)

Life Stage Group	AI	EAR	RDA	UL
Infants				
0 to 6 mo	400 IU (10 µg)	—	—	1,000 IU (25 µg)
6 to 12 mo	400 IU (10 µg)	—	—	1,500 IU (38 µg)
Children				
1–3 y	—	400 IU (10 µg)	600 IU (15 µg)	2,500 IU (63 µg)
4–8 y	—	400 IU (10 µg)	600 IU (15 µg)	3,000 IU (75 µg)
Males				
9–13 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
14–18 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
19–30 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
31–50 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
51–70 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
> 70 y	—	400 IU (10 µg)	800 IU (20 µg)	4,000 IU (100 µg)
Females				
9–13 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
14–18 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
19–30 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
31–50 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
51–70 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
> 70 y	—	400 IU (10 µg)	800 IU (20 µg)	4,000 IU (100 µg)
Pregnancy				
14–18 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
19–30 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
31–50 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
Lactation				
14–18 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
19–30 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)
31–50 y	—	400 IU (10 µg)	600 IU (15 µg)	4,000 IU (100 µg)

NOTE: AI = Adequate Intake; EAR = Estimated Average Requirement; IU = International Units; RDA = Recommended Dietary Allowance; UL = Tolerable Upper Intake Level

维生素D增加骨骼肌力量

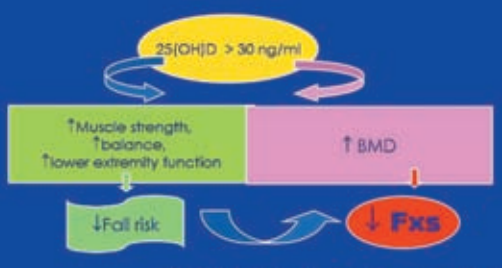


Holick MF. Wagner CL. CMAJ. 2006; 174(9): 1287

少肌性肥胖的防治

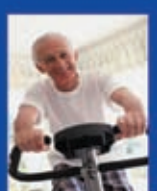
- 一些研究提议使用激素（睾丸激素、脱氢异雄(甾)酮和生长激素）纠正能量相关的肌肉重量和强度的丢失，用于治疗老年人少肌症，但是结论尚不一致。
- 阻力训练是目前纠正老年少肌症的最有效措施，且对高龄老人和虚弱的患者来说安全性高。
- 目前为止，没有专门针对SO的临床研究。

补充VD增加老年人肌力、减少跌倒骨折23－53%



Flicker L. Should older people in residential care receive vitamin D to prevent falls? *J Am Geriatr Soc*. 2005;53:1881–1889

老年人运动
有效、经济、安全



小结

- 老年人少肌征及少肌性肥胖发生率高、有不良健康和临床结局
- 增加认识、提高筛查评估、早期干预
- 营养和运动是主要防治措施
- 个体化：针对不同危险因素、设定不同目标和策略
- 老年营养与代谢的 新领域，需要更多研究与技术

谢谢