Undernutrition, Cachexia and Sarcopenia in Older Adults

A Nestlé Nutrition Institute scientific symposium was recently held during the Asia Pacific Geriatric Congress (APGC) 2012 in Hong Kong and chaired by Dr Christopher Chor-Ming Lum, Vice President of the Hong Kong Geriatrics Society. Professor David R. Thomas (USA) discussed undernutrition, cachexia and sarcopenia in older adults and presented current treatment strategies for the effective management of these patients.

Anorexia of aging: Decreased energy intake and involuntary weight loss

Anorexia of aging is the inability to regulate food intake due to physiological changes associated with aging. Studies have demonstrated that aging is associated with lower energy and protein intake (Figure 1). The Geriatric Anorexia Nutrition (GAIN) registry investigated 1,000 nursing home residents in the United States at high nutritional risk for a period of 6 months to determine whether there were correlations between baseline nutrition/health indicators and weight gain or appetite improvement, and between continued weight loss and higher mortality. Results showed that younger age was correlated with appetite improvement while weight loss of more than 5% during the study period was associated with an approximately two-fold increase in mortality compared with patients who maintained their weight or had more than 5% weight gain (adjusted relative risk [RR] 1.95, 95% confidence interval [CI] 1.43–2.66). Moreover, a dietary intervention study involving 35 healthy men and women failed to lose excess body weight or regain lost weight during overfeeding and underfeeding, respectively. However, older men failed to lose excess body weight or regain lost weight during overfeeding and underfeeding, respectively.

Undernutrition in older adults is associated with an array of unfavourable outcomes, including longer length-of-stay, increased complications, lower functional status and mortality. Undernutrition can be effectively identified using simple nutrition screening and assessment tools, such as the Mini Nutrition Assessment (MNA). This highly specific, sensitive and validated tool is specifically designed for older adults aged 65 years or older to help identify those who are malnourished or at risk of malnutrition. Moreover, the newly-introduced Self MNA helps older adults to assess their nutritional status and needs independently.

Undernutrition syndromes: Starvation, cachexia and sarcopenia

Involuntary weight loss is attributed to three primary aetiologies: starvation, cachexia and sarcopenia. Starvation results in loss of body fat and non-fat mass due to inadequate intake of protein and energy. Cachexia is recognised as severe wasting that accompanies diseases such as cancer or immunodeficiency syndromes. Evidence has shown that cachexia is associated with an increased mortality risk in numerous diseases, including chronic kidney disease, chronic heart failure and rheumatoid arthritis. Failure to distinguish cachexia from starvation may result in poor response to feeding in ill adults. The major difference between the two conditions is that starvation, unlike cachexia, can be effectively reversed by feeding (Table 1).

Sarcopenia is characterised by loss of lean muscle mass with increased age and is considered as a major cause of disability in older adults. The definition of sarcopenia has evolved over the years. An early definition described sarcopenia as a lean body mass more than two standard deviations below the young normal mean. Evidence from studies including whole body magnetic resonance imaging and dual-energy X-ray absorptiometry suggests that sarcopenia is a more complex condition involving muscle and fat atrophy, adipose redistribution and loss of muscle function.

Table 1. Distinguishing starvation from cachexia

<table>
<thead>
<tr>
<th></th>
<th>Starvation</th>
<th>Cachexia</th>
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<tbody>
<tr>
<td>Appetite</td>
<td>Suppressed in late phase</td>
<td>Suppressed in early phase</td>
</tr>
<tr>
<td>Serum albumin</td>
<td>Low in late phase</td>
<td>Low in early phase</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>May remain normal</td>
<td>Low</td>
</tr>
<tr>
<td>Total lymphocyte count</td>
<td>Low, responds to refeeding</td>
<td>Low, unresponsive to refeeding</td>
</tr>
<tr>
<td>C-reactive protein</td>
<td>Not elevated</td>
<td>Elevated</td>
</tr>
<tr>
<td>Body mass index</td>
<td>Not predictive of mortality</td>
<td>Predictive of mortality</td>
</tr>
<tr>
<td>Inflammatory disease</td>
<td>Usually not present</td>
<td>Present</td>
</tr>
<tr>
<td>Response to refeeding</td>
<td>Reversible</td>
<td>Resistant</td>
</tr>
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Figure 1. Aging is associated with lower energy and protein intake

[Graph showing the relationship between age and total calories, protein, fat, and energy intake.]

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resonance imaging have demonstrated that aging is associated with a decrease in skeletal muscle mass,\textsuperscript{2, 13} Reduction in muscle mass leads to physical disability and sarcopenia has been associated with adverse outcomes including disability, functional impairment, decreased physical performance, loss of independence, falls, loss of muscle strength, hospitalisation and mortality.

More recent evidence showed that age-related loss of muscle mass and strength occurs in relatively healthy, well-nourished older adults\textsuperscript{14} and loss of muscle strength in sarcopenia may be independent of muscle mass loss.\textsuperscript{15} Consequently, sarcopenia was redefined as loss of muscle protein mass, function and quality that accompanies advancing age.\textsuperscript{15} The combined evaluation of muscle strength and muscle mass loss is a good predictor of outcome.

**Nutritional supplementation and resistance exercise improve clinical outcomes**

Current strategies for the treatment of undernutrition, cachexia and sarcopenia in older adults focus on improving appetite and food intake, attenuating muscle wasting and stimulating muscle anabolism (Figure 2).

Appetite is determined through the eight-item Council on Nutrition Appetite Questionnaire (CNAQ) and its four-item derivative, the Simplified Nutritional Appetite Questionnaire (SNAQ). These short, simple appetite assessment tools can effectively predict weight loss in adults.\textsuperscript{16} Intervention for involuntary weight loss focuses on provision of adequate nutrients, often in the form of high-density oral nutrition supplements and, subsequently, the use of orexigenic drugs to improve appetite.\textsuperscript{17} A review of 62 trials involving a total of 10,187 participants was conducted to investigate potential improvements in nutritional status and clinical outcomes following oral protein and energy supplementation in older adults for a maximum of 18 months.\textsuperscript{18} Results showed that supplementation produced a small but consistent weight gain. The pooled weighted mean difference for percentage weight change showed a benefit of 2.2\% (95\% CI 1.8–2.5; 42 trials). Mortality was reduced significantly when limited to trials in which participants (n=2,461) were defined as undernourished (RR 0.79, 95\% CI 0.64–0.97). The risk of complications was also reduced (RR 0.86, 95\% CI 0.75–0.99; 24 trials).\textsuperscript{19}

Progressive resistance exercise training is an effective, non-pharmacological therapy to improve muscle mass and quality in older adults.\textsuperscript{20} Recently, a study investigated the impact of nutritional supplementation on muscle mass, strength and physical performance during prolonged resistance exercise training in frail older adults (n=62). Results showed an increase in lean body mass and improvements in strength and physical performance.\textsuperscript{21}

Stimulation of muscle anabolism is achieved through use of agents including insulin, growth hormone and testosterone. These agents do not improve appetite but have been shown to result in weight gain.\textsuperscript{22}

**Summary**

Anorexia of aging is the inability to regulate food intake due to physiological changes associated with aging. Undernutrition can be effectively identified using simple nutrition screening and assessment tools, such as the MNA\textsuperscript{1} which is a highly specific, sensitive and validated tool specifically designed for older adults aged 65 years or older. Involuntary weight loss is attributed to three primary aetiologies: starvation, cachexia and sarcopenia. Starvation, unlike cachexia, can be effectively reversed by feeding. Sarcopenia is defined as loss of muscle protein mass, function and quality that accompanies advancing age. Current strategies for the treatment of undernutrition, cachexia and sarcopenia in older adults focus on improving appetite and food intake, attenuating muscle wasting and stimulating muscle anabolism. Oral protein and energy supplementation results in weight gain and reduces risk of complications and mortality in older adults. Resistance exercise training is an effective, non-pharmacological therapy to improve muscle mass and quality in older adults. Stimulation of muscle anabolism is achieved through use of agents including insulin, growth hormone and testosterone.

**References**


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**Figure 2. Current strategies for the treatment of undernutrition, cachexia and sarcopenia in older adults**

- **Improve appetite and food intake**
- **Attenuate muscle wasting**
- **Stimulate muscle anabolism**

**Oral protein and energy supplementation results in**

- **weight gain and reduces risk of complications and**
- **mortality in older adults**

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