Prognostic impact of body composition

Sarcopenic obesity: how to recognize and fight the hidden enemy?

C. Sieber (DE)
Sarcopenic obesity: How to recognize and fight the hidden enemy?

ESPEN, Leipzig, August 31, 2013

Cornel Sieber
Chair Internal Medicine-Geriatrics
Friedrich-Alexander-Universität Erlangen-Nürnberg
Chief „Klinik für Allgemeine Innere Medizin und Geriatrie“
Krankenhaus Barmherzige Brüder Regensburg
Menue

- Background
- Diagnosis
  - Tools
  - PROs and CONs
  - Open questions
- Treatment
- Conclusion
Menue

- Background
- Diagnosis
  - Tools
  - PROs and CONs
  - Open questions
- Treatment
- Conclusion
Sarcopenia

Reduced muscle mass

and

Reduced function (gait speed) and/or strength (hand grip)

Cruz-Jentoft A et al. Age and Ageing (2010)
Obesity - Definition

• Abnormal and excessive fat accumulation, which negatively interferes with health

• BMI $\geq 30 \text{ kg} / \text{m}^2$

Prevalence of obesity

- **USA > 60 years**
  1988 – 1994  20 %
  1999 – 2000  32 %

  Flegal KM et al, JAMA 2002;288:1723-1727

- **USA > 70 years**
  1991  11.4 %
  2000  15.5 %

Mokdad AH et al. JAMA 2001;286:1195-1200
BMI and survival

Adams KF et al. NEJM 2006;355:763-778
BMI and Mortality

BMI and survival (nursing home)

N = 200

BMI:
- < 20.0 Underweight
- 20.0-24.9 Normal weight
- 25.0-30.0 Overweight
- 30.0-35.0 Adipositas Gr 1
- >35 Adipositas Gr 2 + 3

Kaiser R et al, JAMDA 2010;11:428-435
BMI and mortality („reverse epidemiology“)

Kaiser R et al, JAMDA 2010;11:428-435
BMI and ADL

# Body composition and physical disability

Odds ratios (95% CI) - New Mexico Aging Process Study 1995 (n=272)

<table>
<thead>
<tr>
<th></th>
<th>≥3 physical disabilities</th>
<th>≥1 abnormalities of balance</th>
<th>≥1 abnormalities of gait</th>
<th>falls in the past year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal Muscle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-obese</td>
<td>1,00</td>
<td>1,00</td>
<td>1,00</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>2,33 (0,68-8,81)</td>
<td>3,45 (1,23-10,7)</td>
<td>2,21 (0,99-5,05)</td>
<td>1,41 (0,80-2,52)</td>
</tr>
<tr>
<td><strong>Sarcopenic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-obese</td>
<td>2,07 (0,65-7,35)</td>
<td>2,35 (0,86-6,96)</td>
<td>1,44 (0,66-3,21)</td>
<td>2,12 (1,08-4,18)</td>
</tr>
<tr>
<td>Obese</td>
<td>4,12 (1,24-15,5)</td>
<td>6,36 (2,25-19,9)</td>
<td>3,21 (1,39-7,69)</td>
<td>3,34 (1,37-8,26)</td>
</tr>
</tbody>
</table>

Sarcopenic obesity - Prevalence

• „Sarcopenic obese“ – **BMI > 27 kg/m²**
  - Men < 70 y: 13.5%
  - Men > 80 y: 17.5%
  - Women < 70 y: 5.3%
  - Women > 80 y: 8.4%

Menue

- Background
- **Diagnosis**
  - Tools
  - PROs and CONs
  - Open questions
- Treatment
- Conclusion
Present sarcopenia definition - 1

- **Muscle mass**
  - Body weight, BMI without any impact
  - Fat – both quantity and distribution – not an issue

- **Function**
  - Walking speed and handgrip strength
Muscle mass

- For **sarcopenic obesity**, fat mass and also body weight (and BMI) will play a role in the definition

- So, we most probably have to rediscuss body weight, BMI and... also within the frame of the present sarcopenia definition (what a pity...!)
Present sarcopenia definition - 3

• **Function**
  – Objective measure; on first sight, no problem for *sarcopenic obesity* definition, but:
    • Obesity in itself may interfere with function irrespective of sarcopenia such as:
      – Arthrosis
      – Heart failure
      – Diabetic neuropathy
      – ....
Muscle mass determination

- **DXA**
  - Preferred in the U.S.
- **BIA**
  - See next talk (incl. spectroscopy)
- **CT and MR**
  - Intra-muscular fat distribution
- **MRS**
  - Intra-muscular fat type (spectroscopy)
Sarcopenic obesity: CT of thigh

FAT is not FAT

- subcutaneous
- visceral
- liver
- Muscular
  - Intra-cellular
  - Inter-cellular
FAT is not FAT

- Subcutaneous fat
  - Cardio-vascular stress
- Visceral fat
  - Pro-inflammatory cytokines
- Liver fat
  - Glucose homeostasis
- Intra- and inter-cellular muscle fat
  - Inflammation, ...?
Evaluation of visceral fat

50% difference in visceral fat mass with the same BMI in men

Després JP. Eur Heart Journal 2006; Suppl 8:B4-B12
Interaction between muscle and fat tissue

Sarcopenia and high fat diet

Control diet
25% fat

High fat diet
43% fat

same amounts of protein
(22 versus 20 en%)

Buettner & Bollheimer [2007] Obesity
MR in old rats

Gantry of 1.5 T MR- Scanner
(Magnetom Avanto, Siemens Healthcare)

8-Kanals-Spule

Anästhesiertes Tier mit Sauerstoff

Morphometrie M. Quadriceps

Lipidanalysen M. Quadriceps

Fellner et al (in press)
max. Querschnitt / [cm²]

T2-Zeit als Maß für Myosteatosis [ms]

KD 16 Monate
HFD 21 Monate

KD 16 Monate
HFD 21 Monate
Do we know what we measure?
Prevalence of sarcopenic obesity

• Korean National Health Examination and Nutrition Survey (KNHANES)
• N=2,943 >60 years
• Obesity: BMI >25 kg/m²
• Appendicular skeletal muscle mass (ASM)
• Prevalence 18% in men + 26% in women

Chung JY et al. Arch Gerontol Geriatr 2013;56:270-278
Prevalence of sarcopenic obesity related to definition used - 1

- Cross-sectional analysis of a population-based sample US
- N=4'984 >60 years
- DXA as methods applied to 8 published definitions (Baumgartner, Bouchard, Davison, Zoico, Levine, Kim 1-3)

Prevalence of sarcopenic obesity related to definition used - 2

- Prevalence of sarcopenic obesity ranged from:
  - 4.4% to 84.0% in men
  - 3.6% to 94.0% in women
  - Variation up to 26-fold depending on method used

- Conclusion: We still have a long way to go...

NIA task force

- Proposition for thresholds should come by the end of this year
- The pertinent question seems inasmuch function will become more important than mass!
„Mass meets function“
Skeletal muscle wasting and dysfunction (SMuWD)

• Mass depletion
• Contractile insufficiency
• Metabolic impairment
• Myokine dysregulation

Muscaritoli M for SIG cachexia at ESPEN
(manuscript in preparation, Table presented yesterday)
Menue

- Background
- Diagnosis
  - Tools
  - PROs and CONs
  - Open questions
- Treatment
- Conclusion
Protein intake

Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper From the PROT-AGE Study Group

Bauer J et al. JAMDA 2013;14:542-559
This review provides evidence that PRT is an effective intervention for improving physical functioning in older people, including improving strength and the performance of some simple and complex activities.

Menue

- Background
- Diagnosis
  - Tools
  - PROs and CONs
  - Open questions
- Treatment
- Conclusion
The „holy trias“

Muscle mass

Muscle function (Strength)

Muscle metabolism
Conclusions

• At present, we do not have an accepted definition of sarcopenic obesity
• We indeed need to fast find one as the “hidden enemy“ is there
• Therapeutic strategies to date will be a combination of physical exercise and a protein-rich diet
• Grant of ESPEN for „technological developments“ would indeed be helpful
How to fight the hidden enemy?

• Challenge:
  – It is hard to fight a hidden enemy
  – It is even harder to fight the hidden enemy if you do not know how he looks like!