Screening for sarcopenia in obesity

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Abstract. Sarcopenia is a progressive and generalized loss of skeletal muscle mass (SM) and function which can also be found in obese adults. The aim of the study was to evaluate the prevalence of sarcopenia in 1245 obese women (18 – 67 years, weight 114.7±24.5 kg; BMI 44.1±9.2; fat mass 49.0±6.2%) from Southern Italy. Body composition was evaluated by bioimpedance analysis (BIA) and SM calculated by using Janssen’s equation; therefore the sex-specific cut-off points of percentage skeletal muscle index were used. The whole population was divided in two age groups: A (18 -40 years; n. 808; weight 115.4±23.5 kg; BMI 43.8±8.8 kg/m²) and B (41 -67 years; n. 438; weight 113.4±26.3 kg; BMI 44.8±9.9 kg/m²). In all the sample there was 2.7% moderate and 0.6% severe sarcopenia; in group A, 1.9% moderate and 0.6% severe sarcopenia whilst in group B 4.3% moderate and 0.7% severe sarcopenia. The results of our study suggest that, based on a screening examination by BIA, moderate/severe sarcopenia can be detected in an unselected middle-aged obese population. Further studies are required to clarify the diagnosis with functional tests.

1. Introduction

In 1989 the term “sarcopenia” (Greek sarx or flesh + penia or loss) was suggested by Rosemberg to describe the loss of skeletal muscle mass due to ageing [1]. Sarcopenia describes a progressive and generalized loss of skeletal muscle mass and strength below a critical threshold, associated with reduced quality of life and increased risk of disability and death [2,3]. Moreover, ageing and physical disability are related to an increase of fat mass and, in particular, of visceral fat, an important risk factor for metabolic and cardiovascular diseases [4]. In 1996 Sarcopenic Obesity (SO) was defined for the first time by Heber et al. as the combination of reduced fat free mass evaluated by bioimpedance analysis (BIA) and fat mass excess, expressed as body weight percentage [5].

In Southern Italy a high prevalence of obesity, associated with low physical activity, is observed [6] and requires different levels of care, as defined in a recent consensus document [7]. The growing older population and the increasing incidence of obesity in western societies require accurate studies to evaluate the real prevalence of sarcopenia and its related risks.

Aim of the study was to evaluate prevalence and characteristics of sarcopenia in a group of female obese outpatients, by performing a bioimpedance analysis (BIA) as screening evaluation and using different methods for muscle mass evaluation, according to present literature.
2. Methods

One thousand and two hundred-fortyfive, 18- to-67 year-old, female obese (Body Mass Index BMI ≥ 30 kg/m²) outpatients were evaluated in the Obesity Outpatient Clinic of the Department of Clinical Medicine and Surgery of Federico II University in Naples, Italy. All sample was divided in two age groups: A) age 18-40 years; B) 41-67 years.

Anamnesis, in particular as concerning weight history, was collected. Complete clinical exam was performed and blood samples for lab test evaluation were collected in order to check the presence/absence of associated metabolic abnormalities.

Body composition and Skeletal Muscle Mass (SM) were evaluated by BIA with a Human IM Plus II (DS Medica – Milano_Italy). Measurements were performed on the non dominant body side, at room temperature (22 - 24 °C), after urination and having been supine for 20’.

2.1. Definition of Sarcopenia

The presence of sarcopenia in our population was assessed by using the cut-off points of skeletal muscle mass index (SMI%) reported in Janssen et al. 2002 study [8]. Skeletal muscle mass (SM) was calculated by using the BIA equation by Janssen et al. 2000 [9]:

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SM (kg) = \left[ \frac{h}{BIA \; resistance} \times 0.401 \right] + (gender \times 3.825) + (age \times 0.071) + 5.102
\]

where height (h) is expressed in cm, BIA resistance in ohms; for gender: men =1 and women =0; age in years.

2.2. SMI% cut-off points

As in Janssen’s study [8], absolute skeletal muscle mass was converted into percentage of skeletal muscle mass. We defined this index SMI% = SM/total body mass × 100.

In Janssen’s 2002 study, data from young adults (3116 men and 3298 women aged 18 - 39 years), selected among the population of NHANES III study [9, 10], were used as reference data to define cut-off values for normal skeletal muscle mass and sarcopenia. In details, subjects were considered to have a normal SM if their SMI% was greater than –1 Standard Deviation (SD) of the sex-specific mean for young adults (men: SMI% > 37.0; women: SMI% > 27.6). Class I sarcopenia was considered to be present in subjects whose SMI% was between –1 and –2 SD (men: 37.0 ≥ SMI% > 31.5; women: 27.6 ≥ SMI% > 22.1); class II sarcopenia was present if SMI% was below –2 SD (men: SMI% ≤ 31.5; women: SMI% ≤ 22.1). Data were computerized and analyzed by using SPSS 14.0 software. Mean and standard deviation of all the variables were calculated. Prevalence of sarcopenia was evaluated in our population according to the criteria described in the literature. T-Student test for unpaired data was used to evaluate the differences between groups.

3. Results

Table 1 shows the main characteristics of our 1245 obese patients population. Height and Fat Mass (%) were significantly higher in group A than in group B, while BMI was significantly lower; weight, Fat Mass (kg) and Fat Free Mass (kg) didn’t result significantly different in the two groups (Table 1).

Skeletal muscle mass (SM), calculated by Janssen et al. BIA equation [9], was 34.0 ± 3.8 kg in group A and 32.8 ± 4.3 kg in group B (p = 0.001). SMI% was 30.2 ± 4.3 % in group A and 29.6 ± 4.8 % in group B (p = 0.036) (table 1).

According to SMI% cut-off points by Janssen et al. 2002, in all sample the prevalence of moderate sarcopenia was 2.7%, while the prevalence of severe sarcopenia was 0.6%; in group A 1.9% presented moderate sarcopenia and 0.6% had severe sarcopenia, whereas in group B prevalence was 4.3% and 0.7% respectively.
Table 1. Anthropometric parameters, body composition, SM, SMI% and of 1245 female obese patients.

|                | Group A (n. 808) | Group B (n = 438) | p     |
|----------------|------------------|-------------------|-------|
|                | Mean             | SD                | Mean  | SD    |       |
| Age            | 28,9             | 7,0               | 48,9  | 5,9   | < 0,001 |
| Weight (kg)    | 115,4            | 23,5              | 113,9 | 26,2  | n.s.   |
| Height (cm)    | 162,3            | 6,2               | 159,1 | 6,6   | < 0,001 |
| BMI (kg/m²)    | 43,8             | 8,8               | 45,0  | 9,9   | 0,035  |
| Fat free mass (kg) | 57,5            | 9,4               | 57,8  | 10,3  | n.s.   |
| Fat mass (Kg)  | 57,9             | 16,5              | 56,1  | 19    | n.s.   |
| Fat mass (%)   | 49,5             | 5,7               | 48,3  | 7     | 0,002  |
| SM (kg)        | 34,0             | 3,8               | 32,8  | 4,3   | < 0,001 |
| SMI %          | 30,1             | 4,3               | 29,6  | 4,8   | 0,036  |

3. Conclusions

Most data reported in literature deal with the evaluation of sarcopenia and sarcopenic obesity in older people with heterogeneous BMI values, whilst information about the prevalence of sarcopenia in obese adults are limited. Our study highlights the presence of a high risk of sarcopenia in obese patients even at a mean age of fifty.

In conclusion, this study suggests that sarcopenic obesity is not only a “geriatric” syndrome; indeed, based on a screening by BIA, some degree of sarcopenia can be detected in an outpatient obese population. Further studies are required to better define the diagnosis with functional tests. In the future, the screening for sarcopenic obesity could be useful in all age groups in order to obtain an early diagnosis and to develop prevention strategies for this cause of physical disability in obese subjects.

References

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