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Data Article

A dataset on skeletal muscle mass index, body composition and strength to determinate sarcopenia in bariatric patients

Cláudia Amaro Santos[a,b,c,d,*], Ana Margarida Cinza[a,b], Ânia Laranjeira[a,b], Margarida Amaro[a,b], Manuel Carvalho[a,b], Jorge Bravo[c,d], Sandra Martins[e,f], Armando Raimundo[c,d]

[a] Hospital Espírito Santo de Évora, EPE, Évora, Portugal
[b] CRI.COM – Centro Responsabilidade Integrada Cirurgia Bariátrica e Doenças Metabólicas, Évora, Portugal
[c] CHRC - Comprehensive Health Research Centre, Universidade de Évora, Évora, Portugal
[d] Departamento de Desporto e Saúde, Escola de Saúde e Desenvolvimento Humano, Universidade de Évora, Portugal
[e] Universidade Europeia, Lisboa, Portugal
[f] Instituto de Saúde Ambiental (ISAMB), Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal

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ABSTRACT

Bariatric surgery is the treatment for severe obesity, with proven efficacy in reducing weight. Weight loss associated with bariatric surgery is greatly associated with a significant reduction of skeletal muscle and bone mineral mass, which leads us to induce that after bariatric surgery, patients incur an increased risk of sarcopenia. Prophylactic programs that prevent sarcopenia in bariatric surgery patients seems to be one of the crucial points for the long-term surgical success of bariatric and metabolic surgery. This article presents a initial data set of skeletal muscle mass index, body composition and strength to determinate sarcopenia in bariatric patients. The data were collected in a Central Hospital and in the University. In total, is necessary to recruit 46 patients waiting for bariatric surgery, between 18 and 60 years, men, and woman, without contradiction for exercise. The patients are randomized in two groups, for exercise group and control group. The evaluation is made on five points of timeline, be-

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* Corresponding author.
E-mail address: cmendes@hevora.min-saude.pt (C.A. Santos).

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fore the surgery, after the surgery, after de exercise program, six months, and twelve months after the exercise program.

Specifications Table

Subject	Sport Sciences, Therapy and Medicine
Specific subject area	Assessment of skeletal muscle mass index, body composition and strength to determinate sarcopenia in bariatric patients
Type of data	Table
How the data were acquired	Anthropometry: Scale and stadiometer. Body composition: Dual-energy X-ray absorptiometry - DEXA (DXA, Hologic QDR Hologic USA) Muscle strength: Manual pressure dynamometry (Handgrip) for upper limbs. The muscle strength of the lower limbs will be evaluated by the sit to stand test. The strength of lower limbs, as well as muscle fatigue, will be evaluated with an isokinetic dynamometer (Biodex®, System 3 Pro USA) Cardiorespiratory fitness: the 6-minute walk test (TC6) Sedentary Behavior and Physical Activity: Accelerometer (ActiGraph GT3X model, Fort Walton Beach, Florida, USA) for 5 days before the surgery and after the exercise program
Data format	Raw Analyzed Filtered
Description of data collection	All patients are enrolled for bariatric surgery at the hospital, aged between 18 years and 60 years, body mass index between 30 and 50Kg/m^2, men and woman, without contraindication to the practice of exercise and agree to participate in the study. Exclude patients with problems in locomotion, with previous bariatric surgery, with bariatric surgery complications and, psychiatric diseases or disorders.
Data source location	Institution: CHRC - Comprehensive Health Research Centre (Évora University) City/Town/Region: Évora Country: Portugal
Data accessibility	Tables are available with this article. The dataset is available through the following data repository. Repository name: Mendeley Data Data identification number: 10.17632/hmscsnprv3.1 Direct URL to data: https://data.mendeley.com/datasets/hmscsnprv3/3
Related research article	Santos C, Cinza AM, Laranjeira Â, Amaro M, Carvalho M, Martins S, Bravo J, Raimundo A. The impact of exercise on prevention of sarcopenia after bariatric surgery: The study protocol of the EXPOBAR randomized controlled trial. Contemp Clin Trials Commun. 2023 Feb;31:101048. https://doi.org/10.1016/j.conctc.2022.101048

Value of the Data

- The data of this article are important observing functional performance, strength, power and body composition assessments, where there is a need to choose tests with similar reliability in bariatric patients.
- EXPOBAR aims to be the first RCT in Portugal to evaluate the effects of supervised and structured physical exercise on possible sarcopenia induced by bariatric surgery.
- Population-specific data of physical performance for interval training has proven to be the most effective in fat mass loss and in preventing muscle mass loss after bariatric surgery.
- Contribute to the recommendations of the practice of exercise after bariatric surgery.

1. Objective

To analyze the effects of a 16-week supervised exercise intervention program on the prevention of sarcopenia, in patients undergoing bariatric surgery. As a secondary purpose, it is also intended to identify, evaluate, and synthesize evidence on the effects of physical activity and exercise on the body composition of patients undergoing bariatric surgery

2. Data Description

The present data focus on test of functional function together with strength, power, and body composition assessments in bariatric patients. The data set comprises various parameters relevant to assess related changes in skeletal muscle mass. Those parameters have been suggested by the European Working Group in Sarcopenia for Older People (EWGSOP) [1] in its initial and revised consensus statements to be used for the diagnosis and treatment of sarcopenia [2,3]. Age group and sex-specific baseline characteristics of the participants including anthropometric data are provided Table 1. Table 2 show test reliability of various functional performance tests included in the senior fitness test manual, such as the 30-s chair stand test or sit-to-stand test and the six-minutes walking test (6MWT), and test reliability of laboratory-based assessments of isokinetic peak torque as well as handgrip results. Finally, Table 3 summarizes test reliability of parameters derived from DEXA analyses such as body fat percentage, muscle mass mass (MM), skeletal muscle index (SMI) and bone mass (BM).

3. Experimental Design, Materials and Methods

This is a randomized controlled trial registered in clinicaltrials.gov NCT03497546.

3.1. Outcomes

Anthropometry: Weight evaluation will be done using a scale and height of a stadiometer. Based on these values, the body mass index will be calculated, and the abdominal circumference will be determined by a measuring tape [4].

Body composition: To evaluate body composition, the Dual-energy X-ray absorptiometry - DEXA (DXA, Hologic QDR, Hologic, Inc., Bedford, MA, USA) device will be used to measure the % fat mass, muscle mass and bone mass.

Muscle strength: The muscle strength of the upper limbs will be evaluated by manual pressure dynamometry (Handgrip) [5] in both hands, with a maximum contraction of five seconds. The muscle strength of the lower limbs will be evaluated by the sit to stand test, in which participants will be instructed to stand and sit for 30 seconds, as many times as possible. The strength of lower limbs, as well as muscle fatigue, will be evaluated with an isokinetic dynamometer (Biodex®, System 3 Pro, Biodex Corp., Shirley, NY, USA) using a protocol with two series, the first of which is 6 repetitions at 60°/sec. and the second with 25 repetitions at 180°/sec [6].

Cardiorespiratory fitness: Cardiorespiratory fitness will be assessed using the 6-minute walk test (TC6) [7].

Sedentary Behavior and Physical Activity: Accelerometer, through the feature of the application of accelerometers (ActiGraph GT3X model, Fort Walton Beach, Florida, USA) for 5 days before the surgery and after the exercise program [8].

Table 1
Anthropometric measures changes between baseline, before and after exercise program

	Evaluation 1			Evaluation 2			Evaluation 3		
	Control Group	Intervention Group	p-value	Control Group	Intervention Group	p-value	Control Group	Intervention Group	p-value
Participants [number (%)]	4 (50%)	4 (50%)		4 (50%)	4 (50%)		4 (50%)	4 (50%)	
Weight [kg]	93 ± 4,7	113,9 ± 6,4	**0,002**	83,6 ± 3,9	99 ± 2,7	**<0,001**	62,4 ± 0,5	79,3 ± 4,4	**<0,001**
BMI [kg/m²]	39,9 ± 1,4	40,7 ± 2,9	0,632	35,8 ± 1,6	35,4 ± 33,1	0,827	26,8 ± 1,6	28,4 ± 3,2	0,389
Waist [cm]	112 ± 8,7	119,5 ± 9,1	0,278	101,3 ± 10,2	104,8 ± 11,8	0,669	84 ± 10	90,3 ± 11,84	0,451

BMI – body mass index.

Table 2
Physical fitness measures changes between baseline, before and after exercise program

	Evaluation 1			Evaluation 2			Evaluation 3		
	Control Group	Intervention Group	p-value	Control Group	Intervention Group	p-value	Control Group	Intervention Group	p-value
30-s chair stand [rep]	13 ± 3,37	16 ± 4,24	0,310	15,3 ± 3,95	16 ± 2,94	0,771	14,8 ± 3,86	20,3 ± 4,35	0,107
6-min walk test [m]	402,4 ± 103,7	492,5 ± 94,3	0,246	390 ± 67,45	437,5 ± 118,2	0,511	362,5 ± 85,4	626,3 ± 199	0,051
Peak torque extension, 60°/s [Nm]	94,4 ± 14,9	155 ± 50,1	0,083	87,5 ± 11,30	134 ± 43,3	0,107	66 ± 3,39	133 ± 41,2	**0,018**
Peak torque flexion, 60°/s [Nm]	46,6 ± 9,98	78,8 ± 23,9	**0,047**	43,4 ± 10,32	70,6 ± 24,4	0,086	34,6 ± 7,03	79,8 ± 21,2	**0,007**
Work fatigue extension, 180°/s [Nm]	33,3 ± 22,9	30,1 ± 16,3	0,829	47,4 ± 2,1	42,4 ± 14,47	0,524	-1,8 ± 38,5	44,6 ± 7,2	0,055
Work fatigue flexion, 180°/s [Nm]	26,3 ± 18,9	35,7 ± 16,5	0,482	41,9 ± 10,2	46,5 ± 17,6	0,664	-45,1 ±140,9	48,5 ± 7,3	0,233
Handgrip strength – right [kg]	24,2 ± 2,5	37,1 ± 6,9	**0,013**	22,3 ± 2,2	37,8 ± 8,43	**0,012**	22,3 ± 1,3	37,7 ± 7,1	**0,005**
Handgrip strength – left [kg]	23,3 ± 2,37	34,4 ± 6,83	**0,022**	21,3 ± 2,6	33,5 ± 11,35	0,081	20,7 ± 3,2	32,4 ± 8,0	**0,034**

Table 3
Body composition measures changes between baseline, before and after exercise program

	Evaluation 1			Evaluation 2			Evaluation 3		
	Control Group	Intervention Group	p-value	Control Group	Intervention Group	p-value	Control Group	Intervention Group	p-value
Body mass [kg]	48 ± 4,1	60,7 ± 10,6	0,066	41,6 ± 2,6	51,6 ± 10,8	0,121	38 ± 8	51,7 ± 11,5	0,097
Body fat [%]	45,2 ± 3,7	45,2 ± 7	0,990	45,1 ± 3,2	44,1 ± 10,4	0,860	32,8 ± 9,3	32,3 ± 12,1	0,942
Skeletal muscle mass [Kg]	50,1 ± 4,5	63,3 ± 11,0	0,069	43,8 ± 2,9	54,2 ± 11,3	0,124	42,7 ± 3,5	21,6 ± 2,6	0,113
Skeletal muscle index [kg/m^2]	20,5 ± 0,7	21,6 ± 2,6	0,479	17,8 ± 0,9	18,3 ± 3	0,765	16,2 ± 2,8	18,3 ± 2,9	0,339
Bone mineral density [kg/cm^2]	1,2 ± 0,2	1,1 ± 0,1	0,507	1,2 ± 0,1	1,6 ± 0,1	0,795	1,2 ± 0,1	0,5 ± 1,3	0,353

3.2. Intervention

The exercise program will cover a combination of aerobic and strength training, based on other experimental studies [6] already developed with morbidly obese patients, but also following the Consensus on Exercise Reporting Template (CERT) [9].

Exercise prescription includes the type, intensity, duration, frequency, and progression of physical activity. The duration of the program is 16-weeks, 3-times a week, for up to 50 minutes per session, starting 1 month after surgery, based on the recommendations of the The World Health Organization (WHO) and the American College of Sports Medicine (ACSM) [10], because the guidelines for morbidly obese patients undergoing bariatric surgery are not defined. Each session will start with 5 minutes of warm-up and finalization with 10 minutes of a cool-down, with work of flexibility and proprioception. And the warm-up and the cool-down will be developed as the component of training with the evolution by phases, both in time and in intensity. The first phase will include 20 minutes of interval training, encompassing circuit strength training. Each phase will have an increment of 10 minutes in the central block, always with a prior evaluation of the patient's response. The intensity of the exercise will be evaluated and what has been used and suggested is the Borg scale, with values in a continuous progression of the evaluation of the perceived effort of the exercise performed. And this scale allows an assessment on a scale from 0 to 20 of how rating of perceived exertion, being an evaluation of the perceived effort [11].

Those responsible for the training program will be two personal training with training in sports sciences, whose scheduling will be carried out considering the development of the program. Once de study is completed, the CG will be invited to carry out the exercise program.

3.3. Evaluation

We have five evaluations, baseline (before surgery), before the program (1 month after surgery), after the program (5 months after surgery), 6 months after the program (11 months after surgery) and 12 months after the program (17 months after surgery), as show in Table 2. De CG will be evaluated at the same time that the IG.

3.4. Results

1. Before surgery
2. Before the intervention
3. After the intervention
4. Six months after the intervention
5. Twelve months after the intervention

3.5. Statistical methods

Statistical software will be used to determine the parameters to be evaluated. Data normality will be assessed with the Shapiro-Wilk test and will be used an independent t-test or the cui-squared test, to examine differences between groups. To compare dependent variables, a two-way ANOVA will be used considering group (intervention group and control group) and five time points (pre- and post-intervention).

Ethics Statements

The work described has been carried out in accordance with the Ethical Committee of the University and Ethical Professional of the Hospital, approved with ethics protocol number 2105. Participation was voluntary, with written informed consent obtained from all participants.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships, which have or could be perceived to have influenced the work reported in this article.

Data Availability

A dataset on skeletal muscle mass index, body composition and strength to determinate sarcopenia in bariatric patients (Original Data) (Mendeley Data).

CRediT Author Statement

Cláudia Amaro Santos: Conceptualization, Methodology, Software, Data curation, Writing – original draft; **Ana Margarida Cinza:** Visualization, Investigation; **Ânia Laranjeira:** Visualization, Investigation; **Margarida Amaro:** Visualization, Investigation; **Manuel Carvalho:** Software, Validation; **Jorge Bravo:** Supervision; **Sandra Martins:** Supervision, Writing – review & editing; **Armando Raimundo:** Supervision, Writing – review & editing.

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