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Respiratory Muscle Strength Correlated with Abdominal Circumference in Obese Individuals in Pre-Bariatric Surgery

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Abstract

Background: The presence of alterations in respiratory mechanics of obese population, cause acceleration in the breathing pattern, making it of low amplitude and causing an increase in the work. The measures of Maximal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP) can be used to quantify the strength of respiratory muscles.

Objective: To evaluate the relationship of increased abdominal circumference with respiratory muscle strength in obese patients in pre-operative bariatric surgery by comparing the values with the values predicted by the equation of Costa et al.

Methods: This study involved 154 patients. All belonging to the group of patients attended the clinic Life Worth in process of pre-operative bariatric surgery. Were Measured Inspiratory Pressures and Maximal Expiratory Pressure (MIP and MEP) by manometer. Result: the average age of 37.7 ± 10.3 years, with a mean BMI of 41.5 ± 4.6, showing the average circumference of 123.4 ± 12.2 cm. Showing a correlation of MIP and MEP with the CA to $p<0.05$.

Conclusion: Both genders, do not present a correlation of muscular strength with abdominal circumference.

Keywords: Abdominal Circumference; Obesity; Respiratory Muscles

Introduction

In recent years, obesity is one of the main problems of public health [1,2] Being a disease not transmissible and chronic, with an increase in adipose tissue, which is frequently related to health risks [3-6] Obesity is defined by a Body Mass Index (BMI) according to the classification of the World Health Organization (WHO) [1] is divided into: the top of the weight - overweight (BMI 25-29.9kg/m2) and obesity (BMI 30-34.9kg/m2) grade II (BMI 35-39.9kg/m2) level III (BMI > 40 kg/m2) [2, 7-10] There are various factors that interfere with the respiratory mechanics of obese [11] the fat stored in the abdominal cavity (Gynoid) restricts the scalability and reduces lung volumes [11,12]. There is a general concept that complacency total respiratory is reduced by the impairment chest and lung, being the component chest the more important. A reduction in the compliance of the chest wall is attributed to fat around the ribs and chest [13]. The presence of alterations in respiratory mechanics of this population cause acceleration in the breathing pattern, making it of low amplitude and provoking an increase in work [11,14] The strength of respiratory muscles can be evaluated directly by means of static as the maximal respiratory pressures, using the manuvacuômentro. The measures of Maximal Inspira-tory Pressure (MIP) and Maximal Expiratory Pressure (MEP) can be used to quantify respiratory muscle strength in healthy individ-uals of different ages [15] MIP is a measure of inspiratory muscle strength, while the MEP measures the strength of the abdominal muscles and intercostal [16] Due to the inefficacy of respiratory muscles, muscle strength and endurance may be reduced [7,17] The values of MIP and MEP are dependent not only on the strength of respiratory muscles, but also changes in lung volume in which they are incurred the measures and the corresponding pressure value of the elastic recoil of the respiratory system [15,18] The values of MIP and MEP measurements are compared with the val-ues predicted by the equations of Costa [19].

According to Arora [20] the weight has an influence on the maximal respiratory pressures and may be related to muscle mass, therefore changes in weight could affect the mass of the dia-phragm, influencing the respiratory muscle performance. Due and

efficiency of combating obesity bariatric surgery has been consid-ered the most effective method of treatment [8,21]. The objective of this study was to correlate the increase in Waist Circumference (WC) with respiratory muscle strength in obese patients in pre-operative bariatric surgery, comparing the values with the values predicted by the equation of Costa [19].

Methodology

It is a study not randomized, with cross-sectional design, not controlled, experimental, mixed and aggregated. The study includ-ed 154 patients (36 men and 118 woman), with ages between 17 and 69 years. All who participated in the study, were patients who seek the Vida Vale clinic for bariatric surgery, accompanied by a multidisciplinary team specialized in the digestive system team specialized in Digestive system (Especializados em Moléstia do Aparelho Digestivo- EMAD). Included patients who had a Body Mass Index (BMI) = 35 kg/m2, with no current dependence on illicit drugs and alcoholism and presenting cognitive conditions for understanding simple orders. All volunteers were instructed on how to study procedures, in accordance with the requirements of Resolution 466/12 of the National Health Council. The study was approved by the research ethics in humans with the opinion number 1458166 and the participants investigated signed the in-formed consent form. The preoperative evaluation included clini-cal history, physical examination and measurements of respiratory muscle strength. The measures were obtained with the patient in the sitting position, using a manometer NS 120-SR of the mark In-strumentation Industries®, where the patient was instructed to put a stop nose and attaching his mouth in a disposable mouthpiece. For the measurement of MIP, individuals have expired in the filler until the residual volume and, subsequently, will generate a maxi-mal inspiratory effort against an airway occlusion. For the MEP, individuals have inspired the nozzle up to Total Lung Capacity (TLC), and then a maximum effort against expiratory an airway occlusion during this last measure, individuals held with the hands the muscles of the perioral face to prevent leakage and accumula-tion of air in the lateral region of the oral cavity. To this end, three measurements were performed and the biggest result was recorded in the record of each volunteer.

The anthropometric assessment, patients remained in ortho-static position, without shoes. The body mass index was obtained by a digital scale (Welmy; Santa Bárbara D'Oeste - SP, Brazil), with a maximum capacity of 300 kg. Height was measured by a stadiometer of own scales and the calculation of the BMI was calculated using the equation: body mass index (kg)/estatura² (m) [22] The abdominal circumference was measured with the patient standing in front of the examiner, using a tape measure in centi-meters, flexible and inelastic, directly on the skin, without com-pressing the tissue, located between the ribs and the iliac crest. Using the cut-off point of 94-102 cm for mens and 80-88 cm for woman [23-26]. The data were analyzed by SPSS software v.20 (IBM SPSS Statistics). The normality of the data was tested by means of the Shapiro-Wilk test, which proved to be parametric and therefore, have been demonstrated in mean and standard deviation. We calculated the simple frequency between men and woman. The comparison between men and woman for the variables studied was performed using the Student's t-test for independent samples. The correlations were performed through Pearson's correlation test. It was established the value of statistical significance at $p < 0.05$.

Result

Table 1 shows the basic characteristics of the 154 patients involved and evaluated in this study for bariatric surgery, with an average age of 37.7 ± 10.3 years (17 to 69 years). The mean BMI was 41.5 ± 4.6 (35 to 57), with 56.49% of patients presenting de-gree III obesity. In relation to waist circumference, 100% of the volunteers are above the established by the society in accordance with the genres (94-102 cm for men and 80-88 cm for woman). Among men and woman, the mean waist circumference was 123.4 ± 12.2 cm (99 to 163 cm).

	Men (n=36)	Woman(n=118)	P value
Age in years	39.6 ± 13.2	37.1 ± 9.2	0.310
BMI kg/m2	43.2 ± 5.5	40.9 ± 4.2	0.027*
CA cm	135.0 ± 10.7	119.8 ± 10.3	0.001*

Table 1. Demographic and anthropometric

The illustration shows the distribution of patients according to the classification of BMI. The mean body mass index was of 41,5Kg/m² with a range of 35 to 57,5 kg/m², being the most preva-lent among woman obesity III with 50.42% and 77.14% also have obesity grade III (Figure 1).

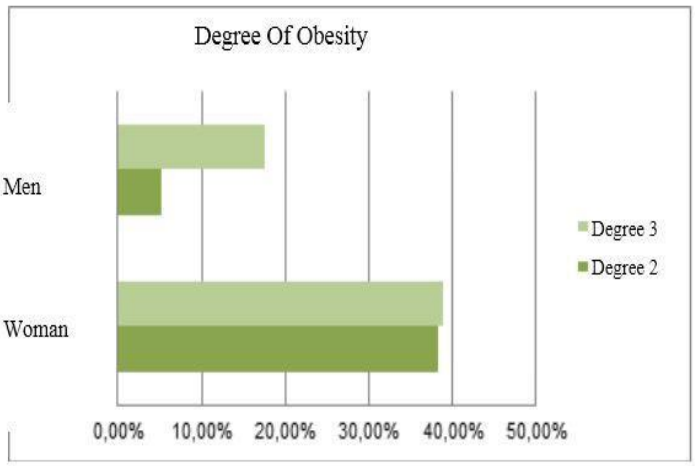

Figure 1. Percent of degree of obesity according to sex.

The (Figures 2,3).

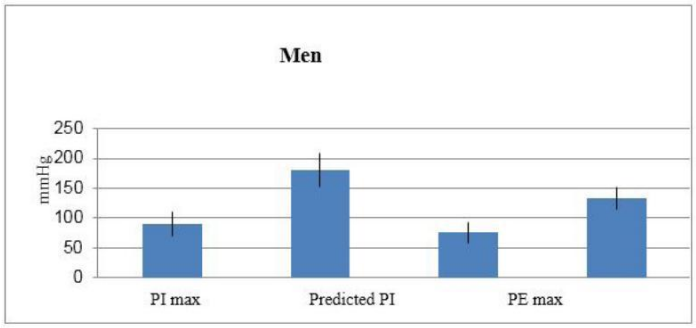

Figure 2. Comparison of strength measured with force predicted for the men.

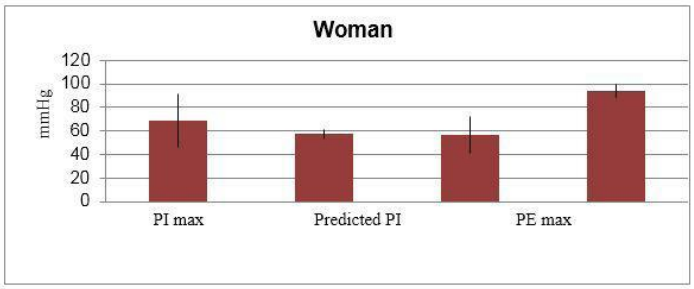

Figure 3. Comparison of strength measured with force predicted for the woman sex.

demonstrates the maximum pressures carried out, compar-ing with the pressures predicted, according to sex. With inspiratory muscle strength in woman of 120.1 ± 37.3% of predicted, expi-ration 60.6 ± 18% of predicted; among men inspiratory muscle strength 52.2 ± 19.5% of predicted and expiratory 58.5 ± 17.6% of predicted. The values of MIP and MEP measured and predicted the volunteers are shown in Table. Presenting as mean MIP of 73.7 ± 23.8 cm H2O (20 to 120 cm H2O), MEP of 61.0 ± 18.2 cm H2O (20 to 120 cm H2O). There was no correlation of MIP and MEP with the CA ($p<0.05$) (Table 2).

	Men (n=36)	Woman(n=118)	P value	Correlation with CA
MIP	89.9 ± 21	68.8 ± 22.4	0.001*	0.198
Predicted PI	180.4± 28.1	57.2 ± 4.2	0.001	0.046
MEP	75.4 ± 17.5	56.7 ± 16.1	0.001	0.332
Predicted PE	132.8 ± 18.5	94.1 ± 5.3	0.001	0.046

Table 2. Values of MIP and MEP measured and predicted.

Discussion

One of the goals of the preoperative evaluation, in patients who are candidates for bariatric surgery, is to identify if there are reductions in the volumes, strength and abilities due to the increase in weight, as described in the literature [27] obesity may alter respiratory mechanics, lung volumes, airway resistance and respiratory muscles [28] In this study, the muscle strength and maximal expiratory pressure of patients are reduced when compared to normal values. A study [29] was conducted to evaluate the muscle strength respiratory function in morbidly obese patients by means of pressure manometry. At the end of the study, concluded that overweight and obesity have significant injury in the ventilatory pressures maximal inspiratory pressure and maximal expiratory pressure, because they might interfere in the movement of the diaphragm and chest wall excursion [29] As seen in our study, the pressures are reduced, except the inspiratory muscles of woman, showing above normal values. Magnani and Caetano [30] evalu-ated the circumference and the respiratory pressures of 99 obese individuals aged between 20 and 64 years and found that obesity does not interfere with the pressure generated by muscles breath-ing, even in obese patients with the distribution of body fat more superior, shown by the waist/hip ratio. In another study [31] with 103 obese women (57 obese and 46 healthy), concluded that obese woman has a higher respiratory muscle strength when compared to healthy. The variables of the bioimpedance and obesity had a direct relationship with the respiratory muscle strength. The vari-ables of waist circumference and waist-hip/ did not influence the strength under obese. In harmony with our findings, the increase in circumference has no relation with the force.

The increase in respiratory muscle strength in patients can be explained by an adaptation to chronic overload that accompanies obesity, shown by the largest amount of fibers of type II and a small amount of fibers of type I [32] and this is a possible expla-nation for the inspiratory muscle strength of woman being higher than the predicted value. Second Forti [33] obese woman morbid showed higher inspiratory muscle strength than eutrophic, and seem to have similarity in the behavior of the force of the expira-tory muscles, however these findings are inconclusive. Comple-menting that of the three equations used to reference value, The Harik-Khan seems to be more appropriate to calculate the values MIP for obese vicious. Although some studies [27, 29] show that the lung capacity and forces are reduced in the morbid obese pa-tient, others have shown that morbidly obese patients when com-pared to normal patients, do not present a significant difference in lung function. There is a general concept that complacency total respiratory is reduced by the impairment chest [28] however, the literature shows a large discrepancy on the subject and on stan-dardization of reference values.

The proposal of the study was to verify if the abdominal circumference has an influence on the forces of respiratory muscle of obese patients. Considering the data obtained with the evaluation, it was possible to compare the influence of BMI on the strength respiratory, noting a negative correlation between waist circumference and the MIP and MEP in patients, even those with a decrease of force, calculated by the equations proposed by Costa [19].

Conclusion

The men evaluated presented respiratory muscle strength less than the predicted, since the obese patients, only maximal expiratory pressure were reduced. Both sexes show no correlation of muscular strength with abdominal circumference.

References

1. The World Health Organization (WHO) (2004) Obesity: preventing and managing the global epidemic. São Paulo: Roca 2004.
2. The Brazilian Association for the Study of Obesity and Metabolic Syn-drome Brazilian Guidelines for obesity. ABESO - Brazilian Association for the Study of Obesity and Metabolic Syndrome. 4 ed. São Paulo, SP 2016.
3. Paisani DDM, Chiavegato LZ, Faresin SM (2005) Lung volumes, lung capacities and respiratory muscle strength following gastroplasty. Jor-nal Brasileiro de Pneumologia 31: 125-132.
4. Brolin RE (1996) Update: nih consensus conference: gastrointestinal surgery for severe obesity. Nutrition 12: 403-404.
5. Tavares TB, Nunes SM, Santos MO (2010) Obesity and quality of life: review of the literature 2010: 359-366.
6. Barbierro AF and Mello RA (2012) The causes of obesity: an analysis from the perspective of materialism. Connections 10: 1.
7. Lollio CA and Latorre MRDO (1991) Prevalence of obesity in Brazil. Health Magazine Publishes 25: 33-36.
8. Ell E, Camacho LAB, Chor Dora (1999) [Anthropometric profile of employees from a government bank in the State of Rio de Janeiro, Brazil - I: body mass index and sociodemographic factors]. Cad Saude Publica15: 113-121.
9. Halpern A (1999) The epidemic of obesity. Brazilian Journal of Endocrinology metabolism São Paulo 43: 175-176.
10. Francischi RPPD, Perreira LOCS, Klopper M, Santos RC, Vieira P, et al. (2000) Obesity: update on its etiology, morbidity and treat-ment. Journal of Nutrition 13:17-28.
11. Delgado PM and Lunardi AC (2011) Postoperative respiratory compli-cations in bariatric surgery: a review of the literature. Physiotherapy and Research 18: 388-392.
12. Pelosi P, Croci M, Ravagnan I, Tredici SPA, Lissoni A (1998) The ef-fects of body mass on lung volumes, respiratory mechanics and gas ex-change during general anesthesia. Anesthesia & Analgesia 87: 654-660.
13. Luce J M (1980) Respiratory complications of obesity. Chest 78: 626-631.
14. Rigatto AM, Alves SCC, Golçalves CB, Firm JF, Provin LM (2006) Ven-tilatory Performance in obesity. Health Magazine 7: 57-62.
15. Parreira VF, France DC, Zampa CC, Fonseca MM, Tomich GM, et al. (2017) Maximal respiratory pressures: values and those predicted in healthy individuals. Revista Brasileira de Fisioterapia 11: 361-368.
16. Mangelsdorff G, Borzone G, Leiva A, Martínez A, Lisboa C (2001) Strength of inspiratory muscles in chronic heart failure and chronic pulmonary obstructive disease [Article in Spanish]. Rev Med Chil 129: 51-59.
17. Koening SM (2001) Pulmonary complications of obesity. American Journal of the Medical Sciences 321: 249-279.
18. Souza RB (2002) Static respiratory pressures. Journal of Pulmonology 28: 165.
19. Costa D, Gonçalves HA, Lima LPD, Ike D, Cancelliero KM, et al. (2010) New reference values for maximal respiratory pressures in the Brazilian population. Jornal Brasileiro de Pneumologia 36: 306-312.
20. Arora NS and Rocheste DF (1982) Respiratory Muscle Strength and Maximal voluntary ventilation in undernourished patients 1-3. American Review of Respiratory Disease 126: 5-8.
21. Junior A, Costa JO, Giannini CG, Saragiotto DF (2003) Challenges in peri-operative management of morbidly obese patients: how to prevent complications. Revista Brasileira de Anestesiologia 53: 227-236.
22. Keys A, Fidanza R, Karvonen MJ, Kimura N, Taylor HL (1972) Indices of relative weight and obesity. Journal of chronic diseases 25: 329-343.
23. ABESO - Brazilian Association for the Study of Obesity and Metabolic Syndrome. Â 3.ed. - Itapevi, SP : AC Pharmaceutical 2009/2010.
24. Leans MEJ, Han TS, Morrison CE (1995) Waist circumference as a measure for indicating need for weight management. Bmj 6998: 158-161.
25. Oh JY, Hong YS, Sung YA, Connor BE (2004) Prevalence and factor analysis of metabolic syndrome in Korean population. Diabetes Care 27: 2027-2032.
26. Gang H, Qiao Q, Tuomilheto J, Balkau B, Borch JK, et al. (2004) Prevalence of the metabolic syndrome and its relation to all-cause and cardiovascular mortality in nondiabetic European men and women. Ar-chives of Internal Medicine 164: 1066-1076.
27. Aldenkortt M, Lysakowski C, Elia N, Brochard L, OD MR (2012) Ventilation strategies in obese patients surgery: a quantitative systematic review and meta-analysis. British Journal of Anesthesia 109: 493-502.
28. Ambrozin ARP, Manzano RM, dos Santos AL, Quitério RJ (2014) Fun-ção Pulmonar de pacientes submetidos a Cirurgia Bariátrica. ASSO-BRAFIR Ciência 4: 29-36.
29. de Carvalho Aguiar I, dos Reis IDS, Apostólico N, Pinto LA, Freitas Jr WR, et al. (2013) Capacidade Pulmonar e força ventilatória em obesos mórbidos. Manual Therapy, Posturology & Rehabilitation Journal 10.
30. Magnani KL and Caetano AJM (2007) Respiratory muscle strength in obese individuals and influence of upper-body fat distribution. São Pau-lo Medical Journal 125: 215-219.
31. Costa TR, Lima TP, Gontijo PL, Carvalho HAD, Cardoso FPDF, et al. (2010) correlation of respiratory muscle strength with anthropometric variables of women eutrophic and obese. The Brazilian Medical Association 56: 403-408.
32. Santiago-Recuerda A, Gómez-Terreros FJ, Caballero P, Martin-Duce A, Soleto MJ, et al. (2007) Relationship between the upper airway and obstructive sleep apnea-hypopnea syndrome in morbidly obese women. Obesity Surgery 17: 689-697.
33. Pazzianotto-Forti EM, Peixoto-Souza FS, Piconi-Mendes C, Rasera-Junior I, Barbalho-Moulim M (2012) Comportamento da força muscular respiratória de obesas mórbidas por diferentes equações preditivas. Revista Brasileira de Fisioterapia 16.