42 - ANALYSIS OF THE RESPIRATORY MECHANICS AFTER A HEART-LUNG REHABILITATION PROGRAM IN OBESE INDIVIDUALS.

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INTRODUCTION

The obesity is a pathology of multifactorial etiology that can be associated to endocrinal, hormonal, environmental, socio-economic disturbances, as well as unhealthy alimentary habits and sedentarianism (GREENSPAN, 2000; SINISGALLI; RODRIGUES; MAIR, 2005).

It is an illness of difficult control, with high indices of failures and returns, being able to appear organic and psico-social repercussions (BERNARDI et al, 2005; PINE; FREITAS; CORSO, 2004).

Excessive weight and the epidemic obesity contribute for the atenuated trend of the manifestation of adverse metabolic effects on the arterial pressure, cholesterol levels and triglicerides present in the blood. Other harmful effects such as cardiovascular problems, diabetes, bone disturbances and respiratory complications may appear and be determinative factors in questions of lessened lifetime for the obese. For these individuals the respiratory complications are classified as non-fatal, however it is recognized as an aggravation when associated with obesity, since it may result in, as the main symptom, lack of air. The dispneia found in these individuals is due to the high accumulation of fat in the abdominal region, which causes an upward compression of the diaphragm and consequently makes it difficult the movement of the lungs during inspiration (MANCINI, 2001; OPAS, 2003; SINISGALLI; RODRIGUES; MAIR, 2005).

Inserted within this context the inefficacy of the respiratory muscles, the muscular strength and cardio-respiratory endurance can be reduced when compared to normal values (PAISANI; CHIAVEGATO; FARESIN, 2005).

The obese individuals suffer from alterations in respiratory mechanics due to increasing deposition and the disproportionate accumulation of fat, makes it difficult the action of the diaphragm muscle because it will be acting against the extended abdomen pressure and the intercostal muscles put into motion an increased mass of the thorax cover favoring a reduction in volume and pulmonary capacity, of the pulmonary complacency and the increase of pulmonary resistance leading to an increase of the respiratory work, a inspiratory overload, an increase of oxygen consumage and breathing energy cost (PAISANI et al, 2005; COSTA, 2003).

Thus, the adequate and assisted management of the weight of this risk group requires basic attention of long and short term strategies, that includes prevention, treatment and maintenance of weight. In this treatment a multi-sectorial and integrated field approach becomes necessary, where in this approach it must be included a formulation of a program of action and support for a healthy alimentary re-education, regular physical activity and training of the compromised respiratory musculature (OPAS, 2003; PAISANI et al, 2005).

Of what has been exposed, the present study intended to evaluate the respiratory mechanics through the analysis of the muscular strength (Maximum Inpiratory Pressure-IPMax and Maximum Expiratory Pressure-EPMax), of pulmonary volumes (volume minute - VM and volume chain-VC) and of the slow vital capacity (SVC) in obese patients, before and after a cardio-pulmonary rehabilitation program.

MATERIAL AND METHODS

The population involved in the study was composed of 47 individuals that had presented obesity, associated or not it co-morbidities, enrolled in the waiting list of Jan/2006 from the project Doce Vida (Sweet Life) at the Potiguar-RN University.

The sample was selected in intentional non-probabilistic form, being constituted of 33 patients diagnosed with obesity, from both sexes, with age varying between 18 to 65 years and that they had or had not associated co-morbidities. However of these participants, there was an evasion of 13 (thirteen) of them, where 5 (five) had presented hemodynamic instability of difficult control, 3 (three) osteoarticulatory complications and 5 (five) had not justified their leave. The criteria for inclusion consisted of patients aging over 18 (eighteen), with ICM above of 30Kg/m ², absence of acute or chronic pulmonary illness, in possession of a cardiologic medical report authorizing practice of physical activity, possessing capacity to carry through the physiotherapy maneuvers and measures, they must not be submitted to respiratory physiotherapy treatments or other programs similar to the rehabilitation programs here considered and to have the capacity for understanding the term of free and conscious assent. The study it was carried through during the period of 04/24 to 09/04/06 at the Clinic-school of the Potiguar-RN University and initiated after the signature of the term of free and conscious assent.

For the development of the research we have used a formulary of evaluation adapted from Regenga (2000) and Costa (2003), composed of socio-demographic and clinical (anamnese, physical examination) data, respiratory evaluation and complementary exams. The respiratory evaluation was composed of the maximum inspiratory pressure (IPMax) and maximum expiratory pressure (EPMax) carried through a Gerar branded manovacuometer (Brazilian Made) with calibration and operational limit of - 300 á +300 cmH2O, volume minute (VM), chain volume (CV) and slow vital capacity (SVC) through a Ferraris Mark

Wrigh branded respirometer with operational limit of 100 liters, a Cybershot DSC - S80 Sony digital camera.

The evaluation procedures were carried through in a seated position and in the following manner: filling out the evaluation form and respiratory function measurements.

In the respiratory evaluation it was carried through with the patient comfortably seated, nasal clip was inserted and the mouth was connected to the manovacuometer's mouthpiece, for the measurement of the IPMax, with calibration at - 300cmH2O, was requested an expiration until the residual volume (RV), followed by a deep inspiration until the total pulmonary capacity (TPC), being sustained for 03 (three) seconds, repeated three times, the highest result was considered. For the measurement of the EPMax with calibration at +300 cmH2O, it was asked a deep inspiration up to the total pulmonary capacity (TPC), followed of an expiration until residual volume (RV), being sustained for 03 (three) seconds, repeated three times, the highest number was taken into account. In order to attain the value of the volume minute (VM) the seated patient made use of the respirometer connected to a CPAP mask, which in turn was placed over the patient's face, which was then asked to breathe normally for a period of 01 (one) minute. During this procedure the researcher made the counting of the Respiratory Frequency (f). After this first

minute we obtained the value for the volume minute (VM) in the respirometer. From this point we could also get the value of the current volume (CV), through the result of the division between the VM and the f (CV= VM/f), registered in milliliters (ml). In order to obtain the value for the slow vital capacity (SVC) the patient was seated, with respirometer attached to the facial mask and this placed in the patient's face, afterwards it was requested of the patient to inspire up to the total pulmonary capacity (TPC), followed by a slow expiration held for the longest possible time, and its value registered in milliliters (ml).

After that it was applied a cardio-pulmonary rehabilitation program adapted from Regenga (2000) and the Pulmonary rehabilitation program from UNIFESP, through 03 (three) months, with a frequency of 03 (three) times per week and with sessions of 60 (sixty) minutes. The session was split into four stages composed of exercises of warmup with global stretches (1 series of 30 seconds), the aerobic conditioning was carried through in stepmaster and/or ergometric bicycle for 20 minutes, with maximum functional capacity (VO2máx) worked at 70%, calculated in the following Karvonen formula: ([maximum cardiac frequency - cardiac frequency of rest] x 70% + cardiac frequency of rest), the muscular strengthening of superior members (MSSM) and scapular waist were carried through with the help of weights to work the anterior, posterior, lateral and medial chains as well as fortifying inferior members (MMII). We made use of shin pads, being made exercises for all the chains. We suggested abdominal exercises in dorsal decubitus with bent legs followed by trunk pushups. All the exercises had been carried through in 3 (three) series of 15 (fifteen) repetitions and finally the relaxation where 2 (two) times per week there was global allonge associated with coordination and breathing exercises, and once a week was executed a breathing training, of corporal scheme, of spatial orientation, and of the sensorial aspects, perceptive and cognitive, with application of relaxation techniques. After three months of the program the patients were submitted to a reevaluation in the same inicial manner. For the statistical analysis we used the Wilcoxon Test, in order to verify whether there was a significant difference between the observations, before and after the cardio-pulmonary rehabilitation program.

RESULTS AND DISCUSSION:

After the gathering of data we found the following results. Of the 20 patients, 95% were females and only 5% were male. The average age was 48.8± 13.7 years. As for the ICM, the average was 34,5Kg/m2 ,with standard deviation of 3.9 kg/m2. Comorbidities were observed in 75% of the patients, being arterial hipertension (73.33%), dislipidemy (20%), diabetes melitus (6.66%).

Studies by IBGE (2004) and OPAS (2003), the obesity affects 8.9% of adult men and 13.1% of the adult women in Brazil, which was also found in our study. Other authors such as Pinheiro et al. (2004), reports a prevalence of obesity in women from the Northeast region, but it remains steady, in relation to the Southeast. Another study carried through by Abrantes et al. (2003) in the Northeast and Southeast region of Brazil showed that the obesity remains steady among men of ages between 30 and 59 years and among women, it occurs a gradual increase in the prevalence of the obesity up to the age of 70 years.

Mancini (2001) and the OMS (2003), classify obesity in accordance with the index of corporal mass (ICM), being degree I (overweight) when the ICM is between 25 - 29.9Kg/m2, degree II (obese) when the ICM is between 30 - 39.9Kg/m2 and degree III (obese serious) when the ICM is above of 40Kg/m2.

With regards to the co-morbidities, the arterial hipertension was the most frequently found in the sample, since in Costa (2005) and Robergs; Roberts (2002) report that the hipertension is a characteristic risk factor of the obese population due to a larger peripheral resistance, favoring the increase of the sistemic arterial pressure.

Table 1: Averages of variables of Maximum Inspiratory Pressure (IPMax) in cmH2O, maximum Expiratory Pressure (EPMax) in cmH2O, Current Volume (CV) in ml, Volume Minute (VM) in ml, Slow Vital Capacity (SVC) in ml, before and after treatment porgram and the Wilcoxon Test

Variables	Before Rehab Program	After Rehab Program	p-value
MaxIP	-69.75	-78.25	0.0437*
MaxEP	+73.5	+94.00	0.0002*
CV	758.72	992.86	0.009*
VM	10612.3	15068.75	0.0064*
SVC	2456.95	3539.45	0.0003*

*p<0.05

In Table 1 we find the values of the average variables IPMax (Maximum inspiratory Pressure), EPMax (Maximum expiratory pressure), CV (current Volume), VM (Volume minute) and SVC (Slow vital capacity) before and after the cardio-pulmonary rehabilitation program. Where we observed the improvement in the average values as well as a statistically significant difference for the better through the Wilcoxon Test in of all the variables in the table.

Paisani et al. (2005), reports a study that evaluates the volume and capacity pulmonary behavior, respiratory muscular strength, respiratory patterns and the possible pulmonary complications after surgery, where it became evident a great variability between the pre-surgery IPMax and EPMax values, observing patients with low values of muscular strength and others with normal values or even above of the expected.

However, Costa et al (2003) describes in his study, that there did not occur any significant differences in the EPMax values, but in the IPMax an increase was found significant, as well as in our study, however, with regards to the EPMax it goes as counterpoint against our study since there occurred a significant improvement. This improvement of the EPMax through the strengthening of the abdominals during the program may be justified by the reports of Brum et al. (2005) and the Cardiac Rehabilitation Guideline (2005) which point out the chronical effects of the exercise related with the peripheral adaptation: better control and blood flow distribution, specific adaptations of the skeleton muscles and still type, intensity, duration and involved muscular mass.

Presto; Presto (2005) affirm that the normal values for chain volume (CV) are of approximately 500 mL. Our study exhibits an increase in Chain Volume (CV), which is in accordance with Azeredo (2000) who reports the association of the aerobic exercises, with allonges and diaphragm breathing exercises favors the reequilibrium of the inspiratory and expiratory muscles minimizing the decurrent alterations of the muscular atony, favoring the diaphragmatic activity and thus promoting an increase in the chain volume. Due to this increase in the CV, the increase of Volume Minute (VM) is justified which is obtained through the product of CV by the respiratory frequency.

With regards to the Slow Vital Capacity (SVC) we found a significant improvement between initial and final values. However it had not been found up to the present moment, data in the literature that would correlate this improvement in SVC values after a cardio-pulmonary rehabilitation program.

CONCLUSION

Before the analysis of the results, we conclude that the application of the Cardio-pulmonary rehabilitation program for three months in obese individuals, promoted significant improvement in the values of the Maximum Inspiratory Pressure (IPMax), of the Maximum Expiratory Pressure (EPMax) of the Chain Volume (CV) of the Volume Minute (VM) and of the Slow Vital Capacity (SVC), strengthening the importance of a well oriented physical activity with the objective of minimizing the risks of respiratory complications.

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ANALYSIS OF THE RESPIRATORY MECHANICS AFTER A HEART-LUNG REHABILITATION PROGRAM IN OBESE INDIVIDUALS.

ABSTRACT

The intention of the present study was to evaluate the respiratory mechanics through the analysis of the muscular strength (Maximum Inpiratory Pressure-IPMax and Maximum Expiratory Pressure-EPMax), of pulmonary volumes (volume minute - VM and volume chain-VC) and of the slow vital capacity (SVC) in obese patients, before and after a cardio-pulmonary rehabilitation program. 33 obeses patients with ICM above of 30Kg/m ² have been evaluated, both sexes, with age ranging 18 to 65 years, with or without associated co-morbidities, however, 13 patients withdrew from the program. The study was carried through in the period between 04/24 to 09/04/06 in the Clinic of the Potiguar University. As instrument of collection of data a fiche of adapted evaluation record of Regenga (2000) and Coast (2003) were used, respiratory evaluation (IPMax, EPMax, VC, VM SVC). The study began after the signing of a free and conscious consent term. After that an adapted program of cardio-pulmonary rehabilitation of Regenga (2000) and the Pulmonary rehabilitation program of the UNIFESP were applied, during 03 months, 03 times per week. For statistical analysis the Wilcoxon Test was used, in order to verify if significant difference between the observations exists, before and after the cardio-pulmonary rehabilitation program. As a result we got improvement for IPMax - 69.75 average pre-habilitation and post-rehabilitation -78.25 with p= 0.0437, pre-rehabilitation average EPMax of +73.5, post-habilitation +94.00 with p=0.0002, average VM pre-rehabilitation of 758.72, post-habilitation 992.86 with p=0.009, average VM pre-rehabilitation of 10612.3, post-habilitation 15068.75 with p=0.0064 and average SVC pre-rehabilitation of 2456.95, post-habilitation 3539.45 with p=0.0003. In the face of the analysis of the results, we conclude that the application of the Cardio-pulmonary rehabilitation program for three months in obese individuals promoted significant improvement in the values of the IPMax, EPMax, VC, VM and of the SVC. We suggest the continuity of the study to validate the benefits promoted by the cardio-pulmonary rehabilitation program.

Keywords: obesity, maximum inspiratory pressure, pulmonary volume.

ANALYSE DE LA MÉCANIQUE RESPIRATOIRE APRÈS L'APPLICATION D'UN PROGRAMME DE RÉHABILITATION CARDIO-PULMONAIRE CHEZ DES INDIVIDUS OBÈSES.

RÉSUMÉ

La présente étude a eu pour objectif d'évaluer la mécanique respiratoire au travers de l'analyse de la force musculaire (pression inspiratoire maximale - PImax et pression expiratoire maximale - PEmax) des volumes pulmonaires (volume minute - VM et volume courant - VC) et de la capacité vitale lente (CVL) chez des patients obèses, avant et après un programme de réhabilitation cardio-pulmonaire. 33 patients obèses à l'IMC supérieur à 30 kg/m², des deux sexes, âgés de 18 à 65 ans, avec ou sans comorbidités associées ont été évalués, cependant 13 d'entre eux ont été exclus pour absentéisme. L'étude a été réalisée pendant la période allant du 24/04 au 04/09/06 à la clinique de l'Université Potiguar. Une fiche d'évaluation adaptée de Regenga (2000) et Costa (2003) et d'évaluation respiratoire (PImax, PEmax, VC, VM, CVL) a été utilisée comme instrument de collecte de données. L'étude a démarré après signature du terme de consentement libre et éclairé. Ensuite un programme de réhabilitation cardio-pulmonaire adapté de Regenga (2000) et du programme de réhabilitation pulmonaire de l'UNIFESP a été appliqué pendant 3 mois, 3 fois par semaine. Le test de Wilcoxon a été utilisé pour l'analyse statistique, pour vérifier s'il existe une différence significative entre les observations, avant et après le programme de réhabilitation cardio-pulmonaire. Les résultats obtenus ont été une amélioration pour la PImax pré-réhabilitation moyenne de -69,75 et post-réhabilitation de -78,25 avec p=0,0437; PEmax pré-réhabilitation moyenne de +73,5 et post-réhabilitation de +94,00 avec p=0,0002; VC pré-réhabilitation moyenne de 758,72 et post-réhabilitation de 992,86 avec p=0,009; VM pré-réhabilitation moyenne de 10612,3 et post-réhabilitation de 15068,75 avec p=0,0064; et CVL pré-réhabilitation moyenne de 2456,95 et post-réhabilitation de 3539,45 avec p=0,0003. Face à l'analyse des résultats, il est conclu que l'application du programme de réhabilitation cardio-pulmonaire pendant 3 mois chez des individus obèses a promu une amélioration significative dans les valeurs de PImax, PEmax, VC, VM et CVL. Il est suggéré la continuité de l'étude pour valider les bénéfices promus par le programme de réhabilitation cardio-pulmomaire.

Mots clés: obésité, pression inspiratoire maximale, volumes pulmonaires.

ANÁLISIS DE LA MECÁNICA RESPIRATORIA LUEGO DE APLICACIÓN DE UN PROGRAMA DE REHABILITACIÓN CARDIO-PULMONAR EN PERSONAS OBESAS

RESUMEN

El actual estudio tuve como intención evaluar las mecánicas respiratorias a través de la análisis de la fuerza muscular (Présion Inspiratória Máxima - Pimáx y Présion Expiratória Máxima Pemáx) , de los volúmenes pulmonares (Volumen Minuto VM y Volumen Corriente VC) y de la Capacidad Vital Lenta (CVL) en pacientes obesos, antes y después un programa de reabilitación cárdio-pulmonar. Habían sido evaluados 33 pacientes obesos con IMC arriba de 30Kg/m², ambos los sexos, con edad introducen 18 a los 65 años, con o sin co-morbidades asociadas, pero, ocurrió la evasión de 13 pacientes. El estudio fue llevado en el período de 24/04 al 04/09/06 en la clínica de la Universidad de Potiguar. Como instrumento de la recogida de datos utilizóse una ficha de evaluación adaptada de Regenga (2000) y Costa (2003), evaluación respiratoria (Pimáx, Pemáx, VC, VM CVL). El estudio fue iniciado ante la firma del término del asentimiento libre y esclarecido. Después fue aplicado un programa de reabilitación cárdio-pulmonar adaptado de Regenga (2000) y del Programa de Reabilitación Pulmonar del UNIFESP, durante 03 meses, 03 veces por semana. Para la análisis estadística la prueba de Wilcoxon fue utilizada, para verificar si existe diferencia significativa entre las observaciones, antes y después el programa de reabilitación cárdio-pulmonar. Como resultados nosotros consiguieron la mejora para Pimáx pré-reabilitación média de -69,75 y post-reabilitación -78,25 con p= 0,0437, Pemáx pré-reabilitación média de +73,5, post-reabilitación +94,00 con p=0,0002, VC pré-reabilitación média de 758,72, post-reabilitación 992,86 com p=0,009, VM pré-reabilitación média de 10612,3, post-reabilitación de 15068,75 con p=0,0064 y CVL pré-reabilitación média de 2456,95, post-reabilitación 3539,45 con p=0,0003. Delante del análisis de los resultados, concluimos que el uso del programa de reabilitación Cárdio-pulmonar por tres meses en individuos obesos, promovió una mejora significativa en los valores del Pimáx, Pemáx, VC, VM y CVL. Sugerimos la continuidad del estudio para validar las ventajas promovidas por el Programa de reabilitación Cárdio-pulmonar.

Palabras-llave: obesidad, presión inspiratória máxima, volúmenes pulmonares.

ANÁLISE DA MECÂNICA RESPIRATÓRIA APÓS A APLICAÇÃO DE UM PROGRAMA DE REABILITAÇÃO CÁRDIO-PULMONAR EM INDIVIDUOS OBESOS.

RESUMO

O presente estudo teve como propósito avaliar a mecânica respiratória através da análise da força muscular (Pressão Inspiratória Máxima-Pimáx e Pressão Expiratória Máxima-Pemáx), dos volumes pulmonares (volume minuto - VM e volume corrente-VC) e da capacidade vital lenta (CVL) em pacientes obesos, antes e após um programa de reabilitação cárdio-pulmonar. Foram avaliados 33 pacientes obesos com IMC acima de 30Kg/ m², ambos os sexos, com idade entre 18 à 65 anos, com ou sem co-morbidades associadas, porém, ocorreu evasão de 13 pacientes O estudo foi realizado no período de 24/04 à 04/09/06 na Clínica da Universidade Potiguar. Como instrumento de coleta de dados utilizou-se uma ficha de avaliação adaptada de Regenga (2000) e Costa (2003), avaliação respiratória (Pimáx, Pemáx, VC, VM CVL).O estudo foi iniciado após a assinatura do termo de consentimento livre e esclarecido Em seguida foi aplicado um programa de reabilitação cárdio-pulmonar adaptado de Regenga (2000) e do Programa de Reabilitação Pulmonar da UNIFESP, durante 03 meses, 03 vezes por semana. Para análise estatística foi utilizado o Teste de Wilcoxon, para verificar se existe diferença significativa entre as observações, antes e após o programa de reabilitação cárdio-pulmonar. Como resultados obtivemos melhora para Pimáx pré-reabilitação média de -69,75 e pós-reabilitação -78,25 com p= 0,0437, Pemáx pré-reabilitação média de+73,5 , pós-reabilitação +94,00 com p=0,0002, VC pré-reabilitação média de 758,72, pós-reabilitação 992,86com p=0,009, VM pré-reabilitação média de 10612,3 , pós-reabilitação 15068,75 com p=0,0064 e CVL pré-reabilitação média de 2456,95 , pós-reabilitação 3539,45 com p=0,0003. Diante da análise dos resultados, concluímos que a aplicação do Programa de Reabilitação Cárdio-pulmonar por três meses em indivíduos obesos, promoveu melhora significativa nos valores da Pimáx, Pemáx, VC, VM e da CVL.Sugerimos continuidade do estudo para validar os benefícios promovidos pelo programa de reabilitação cárdio-pulmonar.

Palavras-chave: obesidade, pressão inspiratória máxima,volumes pulmonares.