20 - AEROBIC AND RESISTANCE TRAINING WITH NA INDIVIDUAL WITH DIABETES, HYPERTENSION AND OBESITY AS A RESULT OF LIVER TRANSPLANTATION: A STUDY IN SANTA CRUZ DO SUL, RS, BRAZIL.

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INTRODUCTION

Can aerobic and resistance exercises interfere in a beneficial way in obesity rates, diabetes and hypertension acquired by an individual as a result of liver transplantation?

The liver plays an important role in the human body through the control of the metabolism of carbohydrates, lipids and amino acids, in the synthesis and degradation of plasma proteins and in the vitamin stock and metals; in addition the liver is also able to metabolize and thus detoxify a great amount of xenobiotic (BAYNES e DOMINICZAK, 2000).

For Mies (1998), since the first liver transplantation done by Cannon in 1956 and Starzl et al. in 1963, it has been seen an extraordinary progress in the results of the procedure, due to improved surgical technique and a greater precision of indications and mainly because of a better understanding of the mechanisms present in the phenomenon of rejection.

In the case of transplant recipients Mesquita (2007) points out that they are not free to acquire illnesses resulting from transplantation, such as: infections, high blood pressure, diabetes, high cholesterol, thinning of the bones and become obese. These complications and/or diseases that occur after the surgery depends on the precondition of the recipient, such as nutritional condition, preexisting infections, ascites, renal failure, encephalopathy, ischemia time and preservation, surgical complications such as bleeding, hemodynamic instability.

In this sense, Leitão et al. (2003) state that the liver disease, in an advanced stage, is responsible for metabolic changes, such as malnutrition, loss of muscle mass and function, respiratory distress and other symptoms related to liver disease. The association of these factors lead to a global motor impairment and physical inactivity, interfering negatively on the daily activities and quality of life.

Based on these studies we believe that a program of regular physical activity with aerobic and resistance exercises, can improve and prolong the survival of an individual with hypertension, diabetes and obesity as result of liver transplantation.

The aim of this study was to evaluate the effects of aerobic and resistance exercises to minimize the obesity, diabetes and hypertension resulted from a liver transplant.

1 AEROBIC AND RESISTANCE EXERCISES

One of the Best forms of exercise is aerobic because it exercises the heart, lungs and blood vessels. It also minimizes the problems of heart diseases, directly fights obesity and the increase of medical treatment expenses. For ACSM (2003), the cardio respiratory resistance has been related to health because people who avoid aerobic exercises showed a correlation with a markedly increased risk of premature death (NIEMAN, 1999). In a study of Pugliese et al. (2007), done with 36 elderly type 2diabetics with hypertension and high cholesterol (average age of 71,4 ± 0,7), Who practiced aerobic exercises(during 3 months – vigorous aerobic exercise) three times a week and used a combination of bicycle and treadmill, resulted in an improvement, with aerobic training, of rigidity and reduced arterial.

According to Graves (2006), resistance exercises are valuable in the treatment of orthopedic injuries, low back pain, osteoporosis, overweight and obesity, sarcopenia and diabetes mellitus. For Campos (2001) and Pádua et al. (2007), the resistance exercises prescribed to 65% of 1RM are capable of causing significant decrease in blood glucose levels of diabetics type 1 after a session and should prove effective in the reduction and consequent long-term control. The fall in blood glucose after a session of resistance exercises prescribed to 65% of 1RM brings the exercises closer to the treatment of the diabetic.

2 PHYSISCAL EXERCISES FOR TRANSPLANT RECIPIENTS

Any dysfunction of the liver, as the organ in which occurs most of the metabolic reactions, brings a big concern and when that happens, many times a transplant is necessary. The success of transplantation depends on a complete hospital infrastructure and a multidisciplinary team highly trained with procedures and monitoring of patients severely debilitated and already immunocompromised by the cause disease (MEIS, 1998).

Exercise is defined as any body movement produced by skeletal muscles that result in energy expenditure greater than resting levels (GUEDES e GUEDES, 1995). According to Guiselini (2004), physical activities and positive habits are related to conditioning and the low risk of developing serious health problem. The same author points out that an exercise program taught by competent professionals, including medical examination, physical assessment, prescription of exercises and proper application, compatible with the state of health and fitness will hardly cause health problem to the practitioner.

According to Nieman (1999), the practice of cardio respiratory physical conditioning programs reduces the risk and promotes the correction of hypertension, decrease the activation of elastase increasing the stiffness of the vascular conduits, reducing peripheral resistance and improving the flexibility of blood vessels. People with diabetes mellitus type 1 can perform exercises similar to those done by normal individuals, but they always have to take into account the need to reach the dose of insulin administered and the introduction of moderate aerobic exercises (PANCORBO, 2005).

In addition to reducing body weight, exercise has beneficial effects on coronary risk factors such as the fall in systolic a diastolic blood pressure, reductions of serum triglycerides, increase in serum levels of HDL cholesterol, improving the tolerance and sensitivity to insulin (ACSM, 2003). According to Mies (1998), exercise is important for the health of the transplant recipient, because through this practice it is possible to control the weight and also strengthen the muscles of individuals. According to Parolin, Zaina and Lopes (2002), the most common problems in post-transplant are hyperlipidemia, osteoporosis, obesity,

hypertension and diabetes mellitus.

3 INVESTIGATION METHOD

3.1 Characterizations of the research subject

The research subject was a male person, 55 years old, weighing 96,700kg and 1,74m tall, living in the city of Santa Cruz do Sul, RS, Brazil, that acquired diabetes, hypertension and obesity due to a liver transplant done ten years ago. The study patient is taking certain medicines such as Pristiq, Gabapentin, Novolin and Myfortic – mycophenolate sodium in order to prevent liver transplant rejection and, consequently, other diseases.

3.2 Methodological approach

This research was based on a pre-experimental study that, according to Goldim (2000), is characterized for studying one or more individuals intentionally and observing the variables from a factor introduced in its habitual normal conditions.

3.3 Methodological procedure

Upon signing an informed consent (IC) in accordance with resolution 196/96 of the Health Ministry for researches with human beings, registered in the National Committee of Research Ethics – CONEP – FR- 369371, a data collection was performed by a Physical Education professional during the physical assessment procedures conducted in the area of a laboratory in a space exclusively for that purpose.

This study was carried out in accordance to the following steps:

- 1st step: Conducting an anamnesis and an anthropometric assessment, checking the weight, height, skinfold thickness (ST), bone diameters, postural deviations, blood pressure (BP) heart rate (HR) and the gathering of copies of complete clinical examinations.

- 2nd step: Performing the test of maximum load using the subjective perception of the Borg scale, according to table 1.

- 3rd step: Prescription of the training to be developed, being done three times a week with 24 sessions and an average time of 20/40 minutes of walk and 30/40 minutes of weigh training intercalated.

-4th step: Post-training re-evaluation comparing tests and evaluations to verify the physical and physiological changes.

The 24 sessions were done 2hours and 30minutes after feeding as determined by the Brazilian Association of Diabetes (2007), which is of 2 hours.

In resistance training, the exercises were performed three times a week, alternating upper limbs with lower limbs, prioritizing the major muscle groups. In the first two weeks two sets of 10 repetitions were made in order to familiarize the individual with the apparatus and make any necessary corrections in the execution of the exercises. In the third week, it was changed to three series of 10 repetitions and four series of 10 repetitions for the muscles that aim to correct the postural deficiency identified in the functional evaluation. The interval between series was of 30 seconds.

Below, in Table 1, it is possible to analyze the training macrocycle.

Table 1- Training macrocycle.

Periodization - Macrocycle – 2010								
Modality: bodybuilding	Age: 55 years			Gender: Male		Session lenght: 80 min.		
Months	October				November			
Training week	1ª	2ª	3ª	4ª	5ª	6ª	7ª	8ª
Stages of progression	Begining	Begining	Increase I	Increase II	Increase III	Maintenance I	Maintenance II	Maintenance III
Training Mesocycle	Introduction	Introduction	Development I	Development II	Development III	Development IV	Stabilizer I	Stabilizer II
Periods of Training	Learning	Learning	Conditioning	Conditioning	Recovery	Conditioning	Conditioning	Recovery
Number of weekly sessions	3	3	3	3	3	3	3	3
Total minutes/week	210	210	250	250	250	250	250	230

The walk was done varying the intensity between 3,5Km/h in the first two weeks, increasing to 4,0Km/h until the fifth week and to 4,5Km/h until the end of the training and the time of 15 minutes in the first two weeks, going to 20 minutes in the third and fourth week and to 25 minutes from the fifth to the eight week, shown below on Table 2.

Table 2- Schedule of walk execution.

Week	Variables	1ª	2ª	3ª	4ª	5ª	6ª	7ª	8ª
Monday	Time	15min/	15min	20min	20min	25min	25min	25min	20min
	Intensity	3,5 Km/h	3,5 Km/h	4 Km/h	4 Km/h	4 Km/h	4,5 Km/h	4,5 Km/h	4 Km/h
Tuesday		Break	Break	Break	Break	Break	Break	Break	Break
Wednesday	Time	15min	15min	20min	20min	15min	25min	25min	20min
	Intensity	3,5 Km/h	3,5 Km/h	4 Km/h	4 Km/h	4 Km/h	4,5 Km/h	4,5 Km/h	4 Km/h
Thursday		Break	Break	Break	Break	Break	Break	Break	Break
Friday	Time	15min	15min	20min	20min	25min	25min	25min	20min
	Intensity	3,5 Km/h	3,5 Km/h	4 Km/h	4 Km/h	4 Km/h	4,5 Km/h	4,5 Km/h	4 Km/h
Saturday		Break	Break	Break	Break	Break	Break	Break	Break
Sunday		Break with walk orientation							

4 ANALYSIS AND DISCUSSION OF RESULTS

The 24 training sessions planned in this study were able to reduce the body mass in 4,2 kg, the BMI in 1,39 kg/m² and the fat weight in 0,74 kg. However, there was an increase of fat in 0,75%, and also an increase in six skinfolds with an overall

average of 18,54%. The patient also had a reduction in WHR of 0,977 to 0,962. In a study about the WHR, Machado and Sichieri (2002) point out that the fat located in the abdomen is a risk factor for diabetes mellitus and cardiovascular diseases, being the alcohol consumption one of the causes. According to Fiani, Monteiro and Foss (2008), if the individual increases the body mass the tendency is to increase blood glucose levels. Obesity and especially abdominal fat have a decisive influence on cardiovascular diseases for associating with hypertension, insulin resistance and diabetes.

Concerning the BP the individual was only able to normalize it and reduce the resting HR. The post-test data also indicate a marked improvement of cardiovascular capacity witha gain in VO2max of 16,02 ml/kg.min. Monteiro et al. (2007) found that na exercise program for hypertensive patients conducted in Bauru, SP, reduced BP and there were improvements in the correlations between base values of HDL-C and alterations of post-exercise HDL-Cas well as an increase of VO2max in 42%.

Regarding the data of total cholesterol, the individual had an increase of 2,64%, but with an increase in HDL-C of 20,00%. The triglycerides increased in 1,36%. Lehmann et al. (1997) and Torres et al. (1998), apud Angelis et al. (2006), emphasize that other studies have also demonstrated improvement in lipid profile after physical training (from few days to three months) in individuals with DM type 1, including reduction of the levels of total cholesterol, LDL-cholesterol and triglycerides and increase in HDL - cholesterol.

As for the Glycemic Index, at the beginning of all 24 training sessions he presented high values, that is, above 101 mg/dl, with an overall average of 121,54 mg/dl. As for the GI after the sessions, in 11 of them he was below 94 mg/dl, presenting an overall average of 96,50 mg/dl. Fiani, Monteiro and Foss (2008) show that WHR has a positive effect on blood glucose, estimating that for every 0.1 in the waist/hip ratio provides an increase of 15 mg/dl in glycemia.

Lehmann et al. (1997) apud Angelis et al. (2006), demonstrated that patients with type 1 DM with borderline blood pressure, subjected to na aerobic exercise program for 3 months, presented na increase of VO2max, reduction of blood pressure and heart rate, improving the lipid profile regardless of glycemic improvement.

CONCLUSION

It can be concluded that the 24 sessions of aerobic and resistance training performed in an individual 55 years old, who had a liver transplantation had in the body composition post-test a reduction of total body mass, body mass index, fat weight, in all body perimeters, decreased heart rate and resting blood pressure. There was a little increase of the total cholesterol, being the increase bigger in the HDL-C. Triglycerides had a small increase and the Glycemic index decreased in higher proportions.

After the sessions it was verified through body composition that the fat percentage increased, as well as cardiovascular capacity. Therefore we conclude that aerobic and resistance exercises, guided by a Physical Education professional, minimize the effects of diseases acquired due to a liver transplant, such as diabetes, hypertension and improve the VO2max and the HDL-C.

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AEROBIC AND RESISTANCE TRAINING WITH NA INDIVIDUAL WITH DIABETES, HYPERTENSION AND OBESITY AS A RESULT OF LIVER TRANSPLANTATION: A STUDY IN SANTA CRUZ DO SUL, RS, BRAZIL.

ABSTRACT

The patients who undergo liver transplantation are not free from acquiring related diseases, such as: infections, bones thinning, high blood pressure, diabetes, high cholesterol besides becoming obese. This work aimed to evaluate if the effects of

aerobic and resistance exercises interfere in the reduction of obesity, diabetes and hypertension resulted from liver transplantation by comparing the pre and post-tests. The research subject was a man of 55 years old that prior to the training period had a body mass of 96,7 kg and height of 1,74 m, giving a BMI of 31,94 (kg/m²). He started the training sessions 10 years after having undergone a liver transplant. The methodological approach was characterized as a pre-experimental study. He performed 24 sessions of resistance and aerobic training which lasted around 60 and 80 minutes each, done 2hours and 30minutes after feeding. For data collection a functional assessment was done, one before and one after the training; analysis of copies of clinical examinations the individual already had and the ones made after the sessions. It was used a blood glucose meter and a digital wrist blood pressure monitor. The general results obtained showed an improvement in the BMI, in the VO2max and the HDL-C, however, with a small increase in total cholesterol and triglycerides. The patient also had a reduction in the WHR from 0,977 to 0,962. Regarding the diabetes, He managed to reduce the daily application of insulin from 20ml to 6ml, keeping the daily GI controlled, having a bigger reduction in the GI laboratory exam. The blood pressure reduced to normal levels.

KEYWORDS: liver transplant, physical exercises, diabetes.

L'ENTRAÎNEMENT AÉROBIC ET DE RÉSISTENCE CHEZ L'INDIVIDU AVEC DIABÈTE, HYPERTENSION ET OBÉSITÉ COMME UN RÉSULTAT D'UNE TRANSPLANTATION HÉPATIQUE: UN ÉTUDE À SANTA CRUZ DO SUL, RS, BR.

RÉSUMÉ

Les patients qui subissent une greffe du foie ne sont pas libres de contracter des maladies connexes, comme les infections, amincissement des os, de la pression artérielle ,du diabète, l'hypercholestérolémie, et de devenir obèses. Ce travail visait à évaluer si les effets de l'exercice aérobics et de résistance interfèrent dans la réduction de l'obésité, du diabète et de l'hypertension artérielle résultant d'une greffe du foie, en comparant avant at après-test. L'individu de recherche était un homme de 55 ans que dans la période antérieure à l'entraînement, avait une masse corporelle de 96,7 kg et 1,74 m de hauteur, donnant un IMC de 31,94 (kg / m²). Il a commencé des séances de entraînement 10 ans après l'achèvement de la transplantation hépatique. L'approche méthodologique a été caractérisée comme une pré-étude expérimentale. Ont été effectués 24 séances d'entraînement de résistance et aérobic avec une duré d' environ 60 à 80 minutes chacun, réalisée 2 heures et 30 minutes après l'alimentation. Pour la collecte de données une évaluation fonctionnelle a été fait avant et un après l'entraînement ; l'analyse des copies des examen clinique que l'individu avait déjà fait et avait fait après les séances. Nous avons utilisé un lecteur de glycémie et d'un compteur numérique de la pression artérielle du poignet. Les résultats obtenus ont montré une amélioration générale de l'IMC dans la VO2max et de HDL-C, mais avec une légère augmentation du cholestérol total et de triglycérides. Le patient a également eu une réduction du RTH de 0,977 à 0,962.Comme pour le diabète, il a réussi à limiter l'application de l'insuline à 6ml 20ml quotidienne, en gardant le quotidien IG-contrôlé, avec une diminution plus importante dans l'examen de IG laboratorial. La pression artérielle a diminué à des niveaux normaux.

MOTS CLES: transplantation hépatique, l'exercice physique, le diabète.

ENTRENAMIENTO AERÓBICO Y RESISTIDO EN UN INDIVIDUO CON DIABETIS, HIPERTENSIÓN Y OBESIDAD EN DECURSO DE UN TRASPLANTE DE HÍGADO: UN ESTUDIO EN SANTA CRUZ DER SUR, RS, BRASIL.

RESUMEN

Los pacientes que se someten a un trasplante de hígado no son libres de contraer enfermedades decurrentes, tales como infecciones, adelgazamiento de los huesos, presión arterial alta, diabetis, colesterol alto y la obesidad. Este trabajo tuvo como objetivo evaluar si los efectos del ejercicio aeróbico y resistido interfieren en la reducción de la obesidad, de la diabetis y de la hipertensión arterial, como decurso de un trasplante de hígado, haciendo la comparación del pre y pos test. Fue sujeto de la investigación un hombre de 55 años de edad que en el período anterior al entrenamiento, tenía una masa corporal de 96,7 kg y 1,74 m de altura, dando un índice de masa corporal de 31,94 (kg / m²). Ha comenzado las sesiones de entrenamiento 10 años después del trasplante de hígado. El enfoque metodológico se caracterizó por ser un estudio pre-experimental. Se realizaron 24 sesiones de entrenamiento resistido y aeróbico que ha durado de 60 a 80 minutos cada uno, realizadas 2 horas y 30 minutos después de su alimentación. Para la recolección de los datos fue hecha una evaluación funcional antes y otra después del entrenamiento; el análisis de las copias de los exámenes clínicos de que el individuo había hecho antes y después de las sesiones. Se utilizó un medidor de glucosa y un medidor digital de presión arterial de muñeca. Los resultados generales obtenidos mostraron una mejora general en el IMC, en el VO2 máx y HDL-C, pero con un pequeño aumento en el colesterol total y triglicéridos. El paciente también tuvo una reducción de la RCQ de 0,977 para 0,962. Cuanto a la diabetis, él consiguió disminuir la aplicación de la insulina diaria de 20 ml para 6 ml, manteniendo el IG diario controlado, teniendo una disminución en el IG del examen de laboratorio. La presión arterial ha disminuido a los índices de normalidad.

PALABRAS-CLAVE: trasplante de hígado, ejercicio físico, diabetis.

TREINAMENTO AERÓBICO E RESISTIDO EM UM INDIVÍDUO COM DIABETES, HIPERTENSÃO E OBESIDADE EM DECORRÊNCIA DE UM TRANSPLANTE HEPÁTICO: UM ESTUDO EM SANTA CRUZ DO SUL, RS, BRASIL.

RESUMO

Os pacientes que realizam transplante hepático não estão livres de adquirirem doenças decorrentes, tais como: infecções, adelgaçamento dos ossos, pressão alta, diabetes, colesterol alto, além de tornarem-se obesos. Este trabalho teve como objetivo avaliar se os efeitos dos exercícios aeróbicos e resistidos interferem na minimização da obesidade, da diabetes e da hipertensão arterial decorrentes de um transplante hepático, comparando pré e pós-teste. Foi sujeito da pesquisa um homem com 55 anos de idade que no período anterior ao treinamento, tinha uma massa corporal de 96,7 kg e estatura de 1,74 m, perfazendo um IMC de 31,94 (kg/m²). Ele iniciou as sessões de treinamento após 10 anos da realização do transplante hepático. A abordagem metodológica caracterizou-se como um estudo pré-experimental. Foram realizadas 24 sessões de treinamento resistido e aeróbico com duração aproximada entre 60 e 80 minutos cada, realizadas 2horas e 30minutos após a alimentação. Para a coleta de dados foi feita uma avaliação funcional antes e outra após o treinamento; análise de cópias dos exames clínicos que o indivíduo já possuía e os feitos após as sessões. Foram utilizados um aparelho medidor de glicose e um medidor de pressão arterial digital de pulso. Os resultados gerais obtidos demonstraram uma melhora no IMC, no VO2máx e no HDL-C, porém com um pequeno aumento no colesterol total e nos triglicerídeos. O paciente também teve uma redução da RCQ de 0,977 para 0,962. Quanto à diabetes, ele conseguiu diminuir a aplicação de insulina diária de 20ml para 6ml, mantendo o IG diário controlado, tendo uma diminuição maior no IG do exame laboratorial. A pressão arterial diminuiu aos índices de normalidade.

PALAVRAS-CHAVES: transplante hepático, exercício físico, diabetes.