66 - EFFECTS OF DIFFERENT TYPES OF EXERCISES ON INSULIN RESISTANCE OF PATIENTS WITH TYPE 2 DIABETES

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Introduction

The Diabetes Mellitus is a major problem for world order, both in number of people affected as unfit for work and premature deaths, but also the cost of treatment. A physically active life-style, on the other hand, is an important factor in reducing a range of disorders such as heart problems, some types of cancer, diabetes, obesity, osteoporosis and others (LIM et al., 2004).

The classic Type 2 diabetes is characterized by the combination of resistance to the action of insulin and the inability of the beta cell to maintain an adequate secretion of insulin. Insulin resistance is typically more prevalent in the early stages of the disease and insulin secretory deficit in advanced stages. Determinants of the pathophysiology involves the following factors: heredity, environment, physical inactivity and aging (BAILEY, 2005).

The resistance to the action of insulin is a primary abnormality and early in the course of the disease. This characteristic of decreased ability of insulin to stimulate the use of glucose by muscle and adipose tissue, affect the suppression of lipolysis mediated by the hormone, thereby offering the high free fatty acid changes further the transport of glucose in skeletal muscle, it works as a potent inhibitor of the action of insulin. The free fatty acids may also interfere with the transport of insulin through the capillary endothelium (Boden G, 1997).

The transport of glucose, the limiting step in the metabolism of glucose in skeletal muscle, is mediated by GLUT-4 (glucose transporter of insulin-sensitive) and can be activated in skeletal muscle of two distinct signaling pathways: an insulin stimulated by the other by muscle contraction. The skeletal muscle tissue is the main responsible for the availability of glucose mediated by insulin and thus the largest site of peripheral insulin resistance. The decrease in the transport of glucose in skeletal muscle leads to decreased uptake of glucose and contributes to the pathogenesis of type 2 diabetes.

DIABETES MELLITUS AND EXERCISE

In 1887, and CHAUVEAU KAUFMAN reported reduction in the amount of glucose from the masseter muscle of horses while they chew. Four decades later, it was shown that insulin has the same effect of exercise on the induction of glucose uptake by muscles. These searches led to a series of investigations that sought to clarify possible interaction between exercise and insulin in the regulation of glucose uptake. The association between physical inactivity and insulin resistance was suggested for the first time in 1945 by H. BLOTNER Since then, cross and intervention studies have shown a direct relationship between physical activity and sensitivity to insulin.

Interventions show that changes in lifestyle, is adopting new eating habits and encouraging regular physical activity, decrease the incidence of type 2 diabetes in individuals with impaired glucose tolerance, the achievement of at least four hours per week of physical activity intensity moderate to high average fell by 70% the incidence of type 2 diabetes, compared with the sedentary way of life, after four years of follow-up (TUOMILEHTO J, et al, 2001). Programs of physical exercises have shown to be efficient on the glycemic control of diabetics, improving the sensibility to insulin and tolerance to glucose and decrease to blood glucose of these individuals.

Generally has been recommended the holding of aerobic exercises for people with type 2 diabetes. However, recent studies have shown that endurance exercise is also beneficial in glycemic control in type 2 diabetics (Whelton SP, 2002.)The exercise resistance may be especially beneficial for elderly diabetics, because during aging there is decreased strength and muscle mass, which affects the energy metabolism in a way Undesirable. The increase in strength and muscle mass through the practice of endurance exercise can reverse this framework, improving the glycemic control of these individuals (CIOLAC EG, et al, 2002).

The treatment of type 2 diabetes can be achieved through diet, oral hypoglycemic agents and / or insulin and regular physical activity. Among the recommended exercises, the aerobic exercises are always the most suitable, perhaps due to the fact that there are still the most studied. However, it is known that the demand for resistance exercises with weights has increased enormously, and could have many applications, which vary according to the goals, among them: preparation of athletes, aesthetics, rehabilitation and development of physical fitness related to health (SANTAREM, 1997).

In resistance exercises with weights, the impact on the joints is decreased, extremely important factor for patients with excess body mass because they must prevent the practice of physical exercises in which they have to bear his own weight, aiming at minimizing the risks of orthopedic injuries and irritation to the feet (PEIRCE, 2000).

According Maiorana et al. (2002), both aerobic exercises and resistance exercises with weights, can have beneficial effects in treatment of the disease, however, the processes occur through different mechanisms.

The effect of exercise on the insulin sensitivity has been demonstrated from 12 to 48 hours after the session of exercise, but back at pre-activity in three to five days after the last session of physical activity (ERIKSSON J, et al, 1997), which reinforces the need to practice physical activity frequently and regularly. The fact that only one session of exercise improves insulin sensitivity and the fact that the training provided by regresses in a few days of inactivity raises the possibility that the effect of exercise on the insulin sensitivity is merely acute. However, it was demonstrated in that study subjects with insulin resistance improves the insulin sensitivity by 22% after the first session of exercise and by 42% after six weeks of training, which demonstrates that the exercise presents both an acute effect as a chronic effect on sensitivity to insulin.

The benefits of regular endurance exercises are uncountable for people with type 2 diabetes Mellitus. These benefits are well sustained by literature and approve the value of exercise as well as to prevention and treatment of this desease.

The sedentary life-style is one factor that contributes to the development or increase in insulin resistance. Studies have shown that the insulin sensitivity may increase with physical exercises, regardless of weight reduction and changes in body composition (O'DONOVAN, et al, 2005), and that the main effect of exercise may be the increased expression of elements intracellular route of the insulin signaling, in particular those of glucose transporters (GLUT-4) in skeletal muscle.

The GLUT-4 is the largest express carrier of glucose in skeletal muscle, and their means of intracellular translocation to the plasma membrane and T tubules is in the main mechanism by which both insulin and exercise make the transport of glucose in skeletal muscle. The contraction of the muscle activity can stimulate the translocation of GLUT-4 in the absence of

insulin, and some studies suggest that there are different "pools" intracellular GLUT-4, a stimulated by insulin and a stimulated by exercise (DOUEN, et al, 1990). Therefore, the effects of insulin and muscle contraction are additive, suggesting that insulin and exercise activates the transporters of glucose by different mechanisms.

FINAL CONSIDERATIONS

Although much is known already about the influence of exercise on the health of patients with diabetes, although further studies are needed to try to clarify issues put on the agenda every day. Existing data suggest that exercise can be used as an aid in the treatment of the disease. However, emphasizes that the proper training to each group must always be a precaution taken, requiring appropriate guidance. Thus, the responses will become always positive in the physiological aspects.

From the studies we can conclude that the exercise is able to reduce insulin resistance, improving efficiency and sensitivity of the same body. While it is essential for better study about what is the most perfect program of exercises in that case. However, the benefit of exercise on the insulin sensitivity is demonstrated with both aerobic exercise and with endurance exercise. The mechanism by which these procedures for carrying improve sensitivity to insulin appears to be different, suggesting that the combination of the two types of exercise would be ideal.

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EFFECTS OF DIFFERENT TYPES OF EXERCISES ON INSULIN RESISTANCE OF PATIENTS WITH TYPE 2 DIABETES

The Diabetes Mellitus is a chronic disease that affects the metabolism of carbohydrates, proteins and lipids and is characterized by the presence of insulin resistance associated with varying degrees of deficiency in the secretion of insulin. The resistance to insulin is a progressive disorder that binds to a variety of diseases including obesity, dyslipidemia, hypertension, polycystic ovarian syndrome, ateroscleose and is defined by a defect in the insulin signaling to stimulate the use of glucose by the body . The regular physical activity is recognized as an important factor in prevention and treatment of chronic diseases. In recent decades, in industrialized countries, has reported a large increase in the incidence of diabetes. This study aimed to review scientific articles that identified factors associated with decreased insulin resistance promoted by exercise in type 2 diabetic patients, analyzing the disease from the epidemiological and pathophysiological, seeking thereby to compare the effects of different types of exercises in metabolic control, verifying the impact of various activities in cardiovascular risk factors and investigating the effect of supervised physical training on blood biochemical parameters, such as glucose. A better understanding of how the various types of exercises work with insulin resistance may contribute to the design of model programs that can be used in the treatment of the disease. Moreover, the identification and understanding of the mechanisms involved in reducing insulin resistance may provide more specific recommendations for physical exercises in this population, aimed at not only improving metabolic control, but also the reduction of morbidity.

Keywords: Type 2 diabetes, insulin resistance, Exercise.

Effets de différents types d'exercices sur la résistance à l'insuline des patients atteints de diabète de type 2

Le diabète sucré est une maladie chronique qui affectent le métabolisme des glucides, des protéines et des lipides et

est caractérisé par la présence de la résistance à l'insuline associée à divers degrés de déficience dans la sécrétion de l'insuline. La résistance à l'insuline est un trouble progressif qui se lie à une variété de maladies, y compris l'obésité, la dyslipidémie, l'hypertension, le syndrome des ovaires polykystiques, ateroscleose et est définie par un défaut de signalisation de l'insuline à stimuler l'usage de glucose par l'organisme. L'activité physique régulière est reconnue comme un facteur important dans la prévention et le traitement des maladies chroniques. Au cours des dernières décennies, dans les pays industrialisés, a signalé une forte augmentation de l'incidence du diabète. Cette étude visait à examiner les articles scientifiques qui ont permis d'identifier les facteurs associés à une diminution de la résistance à l'insuline promu par l'exercice de type 2 patients diabétiques, en analysant la maladie de la épidémiologiques et physiopathologiques, cherchant ainsi à comparer les effets des différents types d'exercices du contrôle métabolique, en notant les l'impact de diverses activités dans les facteurs de risque cardiovasculaires et d'étudier les effets de l'entraînement physique supervisé sur les paramètres biochimiques sanguins, tels que le glucose. Une meilleure compréhension de la façon dont les différents types d'exercices, travailler avec la résistance à l'insuline mai contribuer à la conception de modèle programs qui peuvent être utilisés dans le traitement de la maladie. En outre, l'identification et la compréhension des mécanismes impliqués dans la réduction de la résistance à l'insuline mai fournir des recommandations plus spécifiques pour l'exercice physique dans cette population, visant non seulement à l'amélioration du contrôle métabolique, mais aussi la réduction de la morbidité.

Mots-clés: diabète de type 2, insulino-résistance, de l'exercice.

Efectos de los distintos tipos de ejercicios de resistencia a la insulina de los pacientes con diabetes tipo 2

La Diabetes Mellitus es una enfermedad crónica que afecta el metabolismo de los hidratos de carbono, proteínas y lípidos y se caracteriza por la presencia de resistencia a la insulina asociada con diversos grados de deficiencia en la secreción de insulina. La resistencia a la insulina es un desorden progresivo que se une a una variedad de enfermedades, entre ellas la obesidad, la dislipidemia, la hipertensión, el síndrome de ovario poliquístico, ateroscleose y se define por un defecto en la señalización de la insulina para estimular el uso de glucosa por el organismo. La actividad física regular es reconocida como un factor importante en la prevención y el tratamiento de las enfermedades crónicas. En los últimos decenios, en los países industrializados, ha informado un gran aumento en la incidencia de la diabetes. El objetivo de este estudio para examinar los artículos científicos que identificaron los factores asociados con una disminución de la resistencia a la insulina promovido por el ejercicio en pacientes diabéticos tipo 2, analizando la enfermedad de los epidemiológicos y fisiopatológicos, buscando lo que para comparar los efectos de los diferentes tipos de ejercicios de control metabólico, tomando nota de la impacto de diversas actividades en los factores de riesgo cardiovascular y la investigación de los efectos de la supervisó el entrenamiento físico de los parámetros bioquímicos en sangre, tales como la glucosa. Una mejor comprensión de cómo los distintos tipos de ejercicios de trabajo con la resistencia a la insulina puede contribuir al diseño de programas modelo que pueden ser utilizados en el tratamiento de la enfermedad. Además, la identificación y la comprensión de los mecanismos implicados en la reducción de la resistencia a la insulina puede proporcionar recomendaciones más específicas para el ejercicio físico en esta población, con el objetivo de no sólo mejorar el control metabólico, sino también la reducción de la morbilidad.

Palabras clave: diabetes tipo 2, resistencia a la insulina, ejercicio.

Efeitos dos Diferentes Tipos de Exercícios sobre a Resistência Insulínica de Pacientes Portadores de Diabetes Tipo 2

O Diabetes Mellitus é uma doença crônica que prejudica o metabolismo dos carboidratos, proteínas e lipídios e se caracteriza pela presença de resistência insulínica associada a variáveis graus de deficiência na secreção de insulina. A resistência a insulina é uma desordem progressiva que se liga a uma variedade de patologias incluindo a obesidade, dislipidemia, hipertensão arterial, síndrome do ovário policístico, ateroscleose, e se define por uma deficiência na sinalização da insulina ao estimular a utilização da glicose pelo organismo. A atividade física regular é reconhecida como um importante fator de prevenção e tratamento de doenças crônicas. Nas últimas décadas, nos países industrializados, tem sido relatado o grande aumento da incidência do diabetes. O presente estudo objetivou revisar artigos científicos que identificassem fatores associados à diminuição da resistência insulínica promovida pelo exercício em pacientes Diabéticos Tipo 2, analisando a doença do ponto de vista epidemiológico e fisiopatológico, buscando assim comparar os efeitos dos diferentes tipos de exercícios no controle metabólico, verificando o impacto das diferentes atividades nos fatores de risco cardiovasculares e investigando o efeito do treinamento físico supervisionado sobre os parâmetros bioquímicos sanguíneos, tais como glicemia. A melhor compreensão de como os vários tipos de exercícios atuam na resistência insulínica pode contribuir no delineamento de modelos de programas de intervenção que possam ser utilizados no tratamento da doença. Além disso, a identificação e compreensão dos mecanismos envolvidos na redução da resistência insulínica podem propiciar recomendações mais específicas de exercícios físicos nesta população, visando não só a melhoria do controle metabólico, mas também a redução da morbimortalidade.

Palavras-chave: Diabetes Tipo 2, Resistência Insulínica, Exercício.