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ASSOCIATIONS BETWEEN METABOLIC ALTERATIONS AND CHANGES IN BODY COMPOSITION, VO2MAX AND STRENGTH IN MIDDLE-AGED TYPE 2 DIABETIC INDIVIDUALS AFTER COMBINED TRAINING.

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Resumo

Obesity and Type 2 Diabetes are multifactorial chronic noncommunicable diseases, which promote metabolic changes leading to a decrease in the functional capacity of individuals. The practice of regular physical exercises can contribute to the treatment and prevention of these diseases. Through the use of lipidomics approach, the aim of this study is to analyze the metabolic and functional changes (body composition, VO2max and strength) seeking to find associations between them in middle-aged type 2 diabetic volunteers after 16 weeks of combined training.

Palavras-chave: *Diabetes type 2, lipidomics, combined training.*

Introduction

Obesity promotes several changes in lipid metabolism, which may be associated with type 2 diabetes (T2DM), reducing the functional capacity of individuals[1]. The combination of aerobic training (AT) with resistance training (RT), so-called combined training (CT) has been recommended as an excellent strategy for treatment and prevention of T2DM. Thus, the objective of this study was to associate the lipid changes, using a lipidomics approach, with the functional changes (body composition, VO2 and strength) occurred in middle-aged individuals with T2DM after 16 weeks of CT.

Results and Discussion

The sample consisted of 34 both sexes middle-aged (51.06 ± 3.94 years), sedentary individuals with overweight (BMI = 29.46 ± 0.58 kg/m²), randomized in two groups: Control Diabetic (CD, n=17) and Training Diabetic (TD, n=17). Functional assessments as the measure of weight, height, perimeters (hip, waist, and neck), 1 repetition maximal test for strength, treadmill tests for maximal oxygen uptake (V̇O2max) and blood collection were performed before and after 72h after the last training session. The CT was composed of approximately 40 minutes of RT (3 sets of 10 - 12 repetitions and 1 min rest between sets) followed by 35 minutes of TA (45 to 60% VO2max), 3 times a week for 16 weeks.

For mass-spectrometry-based lipidomics analyzes we used Orbitrap XL Hybrid Ion Trap-Orbitrap Mass Spectrometer LTQ spectrometer, at the Innovare laboratory - Faculty of Pharmaceutical Sciences, Unicamp.

Table 1. Association between pre and post functional changes and metabolites classes.

MET	Correlation between functional changes Pre and Post and Metabolites											
GP	Peso	IMC	LEG	VO2	Cint	Abd	Quad	Pesc	MM%	MMKg	MG%	MGKg
SP				VO2	Cint	Abd	Quad	Pesc	MM%	MMKg	MG%	MGKg
GL	Peso	IMC		VO2	Cint	Abd						
PR					Cint	Abd		Pesc				
Pho						Abd		Pesc				

GP: Glycerophospholipids, SP: Sphingolipids, GL: Glycolipids, Pho: Phosphoesphingolipids, Peso: Weight, IMC: body mass index Vo2: cardiorespiratory capacity, LEG: 1RM legpress force. Circumferences: Cint: Waist, Abd: Abdomen, Quad: Hip, Pesc: Neck, MM%:% Muscle mass, MMKg: Muscle mass in kg, MG%:% Fat mass, MGKg: Fat mass in kg.

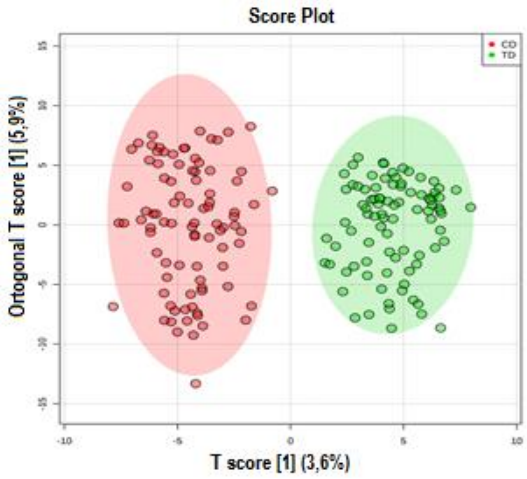

Figure 1. Orthogonal partial least square discriminant analysis (OPLS-DA) showing a segregation between the changes in Control Diabetic (CD) in red and training diabetic (TD) in green after 16 weeks of combined training. Model validation: Q2=0.688 and R2Y=0.904, p<0.01.

After 16 weeks of CT, the subjects in TD significantly increased free fat mass (pre = 53.39 ± 10.66 kg; post = 54.60 ± 11.37 kg) and reduced fat mass (pre = 29.70 ± 6.85 kg; post = 28.61 ± 6.80 kg). They also increased maximum strength in leg press (pre = 190.75 ± 74.0 kg; post = 240.62 ± 84.88 kg), bench press (pre = 28.13 ± 12.89 kg; post = 35.21 ± 14.54 kg) and VO2max (pre = 22.02 ± 4.76 ml / kg.min post 25,22 ± 5,15 ml / kg.min) (p< 0.05). The CT promoted lipidic alterations (Figure 1), in which the classes of glycerophospholipids, sphingolipids, glycerolipids, and phosphosphingolipids showed some associations with functional and body composition changes (Table 1).

Conclusion

The CT promoted lipidic and functional changes in body composition, maximum strength and VO2max in middle-aged type 2 diabetic subjects. These changes were most associated with glycerophospholipids, sphingolipids and glycerolipids metabolism pathways.

Acknowledgment and References

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