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Functional capacity of an individual with Chagas disease submitted to a program of resistance exercises: a case study

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Abstract: The present study aimed to evaluate the performance in activities of daily living in individuals with Chagas disease in the pre- and post-program phases of resistance exercises. A case study was conducted with a patient (female, 64 years old, 68 kg, 153 cm) with Chagas disease. After a clinical medical evaluation, it was submitted to an anthropometric evaluation. The physical exercise program lasted five weeks, in which the patient was submitted to a resistance training program. Before and after the exercise program, the Autonomy of Functional Capacity was evaluated through the GDLAM Protocol. Descriptive statistics were used to present the results. The data were analyzed using the Software Statistical Package for the Social Sciences (SPSS, version 22.0) for Windows. The results showed that in the initial evaluation, the patient did not obtain satisfactory GDLAM

indices. After the training program, there was a small improvement in the times of the GDLAM protocol regarding the LPS test (Getting up from the sitting position) where at the beginning the patient obtained the time of 19.1s and after 13.0s, in the LPDV (Rising from the ventral decubitus position) at the beginning 06.5s and after 04.9s, in the LCLC (Getting up from the chair and getting around the house) at the beginning 67.9s and after 56.7s, the C10m test (Walking 10 meters) was the only one that kept the same result where at the beginning we obtained the time 07.7s and repeated the time after the resistance training program. Further studies with a larger number of individuals with this pathology are suggested to identify the magnitude and influence of resistance exercise on the functional capacity of people living with Chagas disease.

Keywords: Chagas disease. Functional Capacity. Resistance Training

1. Introduction

Chagas disease was discovered in 1909 by Carlos Chagas, who described it as an inflammatory disease caused by the protozoan *Trypanosoma Cruzi* (BILATE; NETO-NETO, 2008). In Brazil, four to six million people are infected (DIAS *et al*., 2000). This disease is one of the major public health problems in Brazil and the Americas (PETTI, 2008). The transmission of Chagas disease occurs through feces eliminated by insects of the family *reduviidae* (subfamily *Triatominae*), contaminated with *Trypanosoma cruzi* (MARIN-NETO; SIMONS; SARABANDA, 1999). According to these authors, there is an inoculation at the site of the hematophagous bite by the contaminated insect.

In symptomatic individuals, the disease mainly affects cardiac function, causing the destruction of cardiac muscle and nerve cells (ALMEIDA *et al*. , 2014). These triggers irreversible changes in the structure and function of the heart, such as myocardial remodeling, conduction disorders and arrhythmias, which consequently leads to heart failure and functional limitations of these individuals (MADY *et al*., 1997).

To Guimarães *et al*. (1999), patients with heart failure are limited by dyspnea and marked fatigue during physical exercise, a condition also observed at rest. These patients also have low exercise tolerance when compared to normal individuals (COSTA *et al*., 2005).

From the end of the 1980s, the first results emerged on the importance of regular physical exercise for patients with heart failure (HF) and the guarantee that cardiac rehabilitation programs were safe (MENDES *et al*. , 2011). Physical training began to be recommended for patients with left ventricular dysfunction (MENDES *et al*., 2011). According to the consensus for the treatment of chronic HF, the regular practice of physical exercises is indicated in order to achieve improvement in the quality of life of patients with this dysfunction (MEYER *et al*., 1999).

Moderate physical training has a positive effect on cardiocirculatory variables, acting as an important positive immunomodulator, reversing, even partially, inflammatory changes resulting from heart failure (ROSA; BATISTA, 2005; WISLOFF *et al*., 2007). However, few studies in the literature have devoted themselves to the study of applicability and benefits of physical exercise for people living with Chagas disease. In this context, the present study aims to analyze the effects of a resistance training program on the functional capacity of a person living with Chagas disease.

2. Methodology

2.1 Search type

A descriptive study of the case study type was carried out. This type of study describes the facts and phenomena of a given reality (TRIVIÑOS, 1987).

2.2 Population and sample

The individual/case studied was a 64-year-old woman, 1.53cm tall, 68kg, with Chagas disease, who underwent a five-week physical exercise program. She signed the free and informed consent form (TCLE) before participating in the study.

Before the beginning of the training program, the research participant was submitted to medical care to verify his/her health status, and release to practice physical activity. Soon after, an anthropometric and functional evaluation was performed.

2.3 Anthropometric evaluation

For the measurement of weight and height, a Camry electronic digital scale EB9013 and a measuring tape measuring 5.00 meters (supported on the wall), respectively, were used to measure weight and height. For waist and hip circumference measurements, we used a flexible anthropometric tape with a measurement scale of 0.1 cm.

2.4 Resistance training protocol

Resistance training was performed in three weekly sessions lasting 50 minutes, with an interval of 24 to 48 hours between them. The sessions were composed of resistance exercises, with stimulation of the main muscle groups of the body. Before each session, cardiovascular safety parameters were evaluated, with the measurement and recording of blood pressure and resting heart rate. During the sessions, we used the Subjective Perception Scale borg effort to verify the intensity of the training. The Borg Scale (6-20) is a categorical matrix with interval numbers and equal distance between the different perceptions of effort (BORG, 1970). The training consisted of mobility exercises at the beginning of the session, muscle exercises alternated by segment (shoulder development, elbow flexion and extension; shoulder adduction and abduction for upper limbs and lower limbs hip flexion, knee flexion, knee extension).

2.5 Evaluation of Functional Autonomy

The GDLAM protocol for assessing functional autonomy comprises the simulation of ADL (Activities of Daily Living), through the following tests: Walking 10m (C10m); Get up from the Sitting Position (LPS); Get up from the Ventral Decubitus Position (LPDV); Getting up from the Chair and Getting Around the House (LCLC) (GDLAM, 2004). The following are the descriptions of the tests used in the study, as well as the materials that are required for each of them.

a) C10M: Walking 10 meters

The test is used to identify the time it takes the individual to travel the 10-meter course. For the test, a chair was used that had a height of 43 to 50cm, a train of 5.00 meters to measure the distance of the route, a cone and a stopwatch for time marking.

b) LPDV: Rising from the ventral decubitus position

The test aims to identify the agility of the individual to get up from the ground. The individual is in ventral decubitus and at the command of an oral stimulus, he needs to get up as soon as possible from the ground and stand (ALEXANDER; Jessica; CHANNER, 1997). For the test, a mattress was required for the participant to lie down and a stopwatch to check the time.

c) LCLC: Sit and get up from the chair and move around the house

The test verifies the individual's ability with regard to his agility and balance. We put a chair and mark with two cones diagonally at a distance of four meters back and three meters on the left and right side. It starts if the test with the individual sitting in the chair with his feet off the ground, after the sign lifts from the chair and goes to the right, skirts the cone and back to chair, sits removing both feet from the floor. Without taking it time, redo the same circuit to the left, thus making the entire route and circulating each cone twice in the shortest possible time (ANDRENOTTI; OKUMA *et al*., 1999). We used a room to perform the test, with a chair fixed to the floor that has the height of 43 to 50cm, a train of 5.00 meters, two cones and stopwatch to mark the time.

d) LPS: Getting up from the sitting position

The test aims to assess the functional capacity of the lower limbs and consist of: the individual part of the sitting position in a chair without any armrests, the chair must have a distance of 43 to 50cm from the floor, then will lift and sit five times without stopping (GURALNIK *et al*., 1994; GURALNIK *et al*., 1995, GURALNIK *et al*., 2000). The material used was a chair, without armrests at a floor height of 43 to 50cm and a stopwatch to mark the time.

In the table below, the reference data of the evaluation of autonomy of functional capacity are presented through the GDLAM protocol.

Table 1. Reference data for the GDLAM protocol

Classification	C10M (s)	LPS (s)	LPDV (s)	LCLC (s)	IG (scores)
Weak	+7,09	+11,19	+4,40	+43,00	+28,54
Regular	7,09-6,34	11,19-9,55	4,40-3,30	43,00-38,69	28,54-25,25
Good	6,3-5,71	9,54-7,89	3,29-2,63	38,68-34,78	25,24-22,18
Very good	-5,71	-7,89	-2,63	34,78	22,18

Source: adapted from Rocha and Guedes Junior (2013, p.305).

2.6 Statistical analysis

For data analysis, we used descriptive statistics to characterize the sample and present the other results. The data were analyzed using the statistical software Statistical Package for the Social Sciences (SPSS, version 22.0) for Windows.

3. Results and Discussion

The subject in question is a 64-year-old woman, married, brown, studied until elementary school and never practiced physical activities. After the training program, there were no differences in body mass index (BMI) (figure 1). On the other hand, in waist circumference, waist-hip ratio and waist-to-height ratio, there was a reduction in the measurements of these variables (figures 2, 3 and 4, respectively).

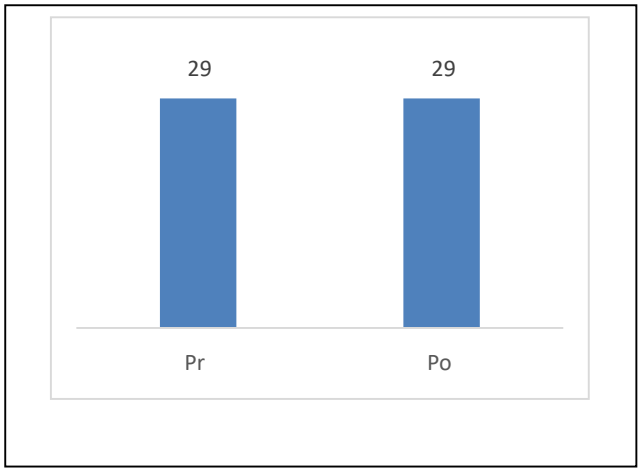

Figure 1. Bmi. Source: Data collected by the author

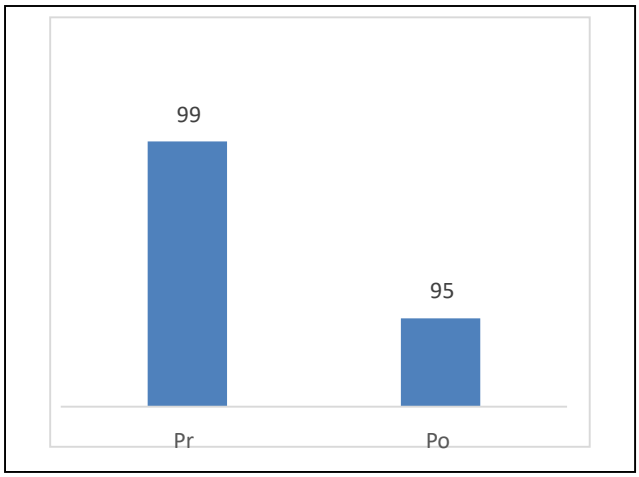

Figure 2. Circumference of the waist. Sources: Data collected by the author

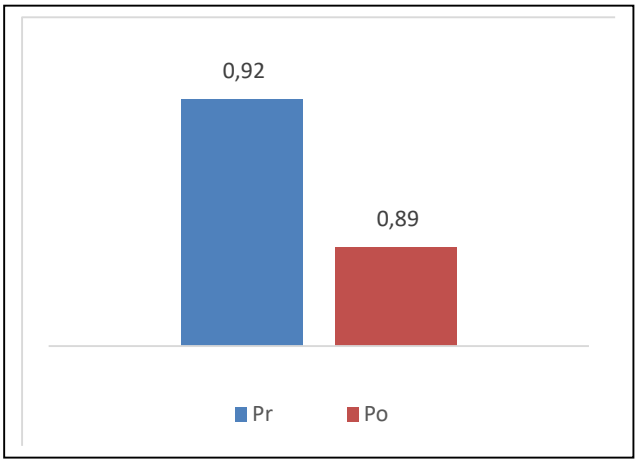

Figure 3. Hip Waist Ratio. Sources: Data collected by the author

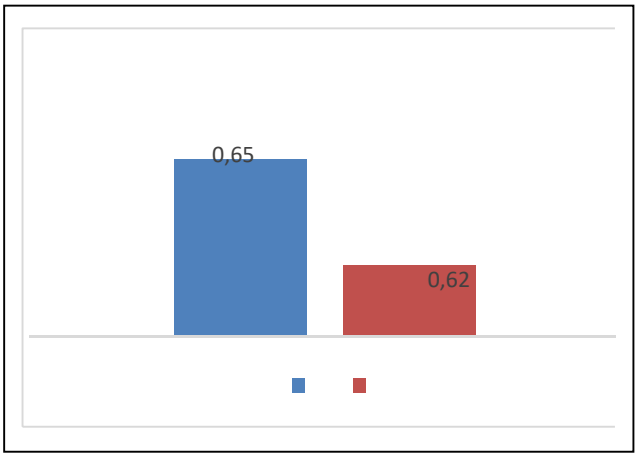

Figure 4. Waist height ratio. Sources: Data collected by the author

Table 2 shows the results of the GDLAM protocol tests. It can be observed that after the 5-week training program, the research participant reduced the execution times in the LPS, LPDV and LCLC tests.

Table 2. Descriptive data on functional autonomy assessment (GDLAM)

Classification	C10M (s)	LPS (s)	LPDV (s)	LCLC (s)
Pre	7,07	19,01	6,05	67,09
Post	7,07	13,00	4,09	56,07

Sources: Data collected by the author

The regular practice of physical exercises is related to the improvement of the functional capacities of elderly individuals (VIRTUOSO, 2006). It could not be different with regard to people who are affected by chagas disease. In the symptomatic chronic phase, a certain portion of the chagasics, after remaining asymptomatic for several years, may present complications related to the cardiovascular and digestive system over time (GILBER, 2007).

In the present case study, a program of resistance exercises was elaborated and applied to verify the differences before and after training in the functional capacity of an old woman, evaluated through the GDLAM protocol. The results showed that there was a reduction in the execution times of the LPS, LPDV and LCLC tests.

Bêta *et al*. (2015), observed gains in the activities of daily living of volunteers who underwent a resistance training program. Another study with results similar to ours is that of Costa *et al*. (2005), which used a program of resistance exercises in three weekly sessions, comprising sets of 12-15 repetitions, for a woman affected by chagas disease, observing improvement in cardiorespiratory capacities, reduction of body weight and fat percentage.

In the study conducted by Moreira *et al*. (2011), no improvement was observed in functional capacity where the GDLAM protocol was based before and after the study development period, the control group remained physically active for eight weeks regarding research with recreational activities, such as dance and ecological walks, with a frequency of three weekly times lasting thirty minutes, the study identified a significant worsening of the variables of the GDLAM protocol.

Chagas disease not only affects the functional capacities of the individual, it also causes problems in the cardiovascular system, thus generating a picture of heart failure (HF). HF is a clinical syndrome resulting from numerous diseases that affect the heart, making it unable to maintain adequate levels of blood supply to tissues, with consequent impairment in energy production (JESSUP; BRONZENA, 2003; HUNT *et al*., 2009). Hf manifestations are dyspnea and early fatigue, which may limit exercise tolerance and promote fluid retention, which results in pulmonary congestion and peripheral edema (HUNT *et al*., 2009).

Esposito *et al*. (2011), found that resistance training promoted changes in the morphological characteristics of patients with HF, such as increased type I (more resistant to fatigue), increased capillary vascular density and production of adenosine triphosphate (ATP), which preserves and increases muscle strength, culminating in greater tolerance to physical exercises. Savage *et al*. (2011) measured the performance in activities of daily living of 13 patients with HF and 11 healthy controls, their relationship with aerobic capacity and muscle strength and the effect of physical resistance training to improve muscle strength and physical deficiency. The results showed that the intervention of resistance training increases muscle strength, thus reducing the inability of this variable in HF.

Our research has some limitations. The fact that we conducted a case study and a training program of only 5 weeks, cannot be answered more reliably if resistance training can more effectively influence the functional capacity of elderly living with Chagas disease. Another weakness was the non-performance of a comparison test to verify the differences in functional capacity before and after the training program.

4. Conclusions

The 5-week program of resistance training was efficient for improving the functional capacity of the old woman living with Chagas disease. We suggest that further studies be conducted, with a larger number of individuals with this pathology, in so that the real influence of a program of resistance exercises on the functional capacity of elderly with Chagas disease can be verified.

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