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Progressive Resistance Training on Elderly HIV$^+$ Patients: Does it Work?

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Abstract: Elderly people present significant alterations on body composition and physical fitness, compromising their quality of life. Chronic diseases, including HIV/AIDS, worsen this situation by increasing aging effects on body composition and muscle strength. Resistance exercises are prescribed by major health organizations for improving fitness and promoting a shift towards a healthier and more independent aging. In addition, recovering strength and physical fitness is the major goal of exercise in AIDS wasting syndrome. To analyze progressive resistance training effects on body composition, physical fitness and clinical/immunological evolution of HIV$^+$ elderly. Subjects were prospectively recruited between November 2003 and July 2004. Training program consisted of 3 sets of 8-12 repetitions of Leg press, seated row, lumbar extension and chest press, performed with free weights machines, 2 times week^{-1} during 1 year. The Research Ethical Committee of HCFMUSP approved the study and all participants signed a written informed consent. ID specialized physicians followed patients throughout the study, reporting all relevant clinical data. Body composition was assessed by anthropometric measures and DEXA before and after the training program. 14 patients, aged 61-69 years old, of both genders and without regular physical activity, with an average 9 years HIV/AIDS history, were enrolled. Strength of major muscular groups increased (74-122%, $p = 0.003$-0.021), with a corresponding improvement on sit-standing and walking 2.4 m tests ($p = 0.003$). There were no changes on clinical conditions and on most body composition measures, but triceps and thigh skinfoldssignificantly reduced ($p = 0.037$). In addition, CD4$^+$/CD8$^+$ ratio improved (0.7-0.81, $p<0.0001$), with a trend towards an increased CD4$^+$ (71 cells, $p = 0.054$) and decreased CD8$^+$ (-75 cells, $p = 0.05$) counts. Resistance training increased strength, improved physical fitness, reduced upper and lower limbs skinfolds and improved CD4$^+$/CD8$^+$ counts in elderly living with HIV/AIDS, without significant side effects.

Key words: Weight lifting, HIV, aged, body composition, physical fitness

INTRODUCTION

According to the Brazilian institute of geography and demography, Instituto Brasileiro de Geografia e Estatística-IBGE[1], Brazil presents an aged population correspondent to 9.7% of its total population. The aging index grew from 0.11 in the 80´s to 0.25 in 2004[1]. These values show that Brazilian society is aging, but still can be considered young when compared with other countries as Italy, Japan and Germany that present larger elderly populations[1].

The aging process has been widely studied in the last decade, enhancing the understanding of diseases that affect elderly people and promoting a shift towards a healthier and more independent aging process.

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Amongst the physiological modifications observed in aging we can mention the loss of functional capabilities and the modifications of metabolic functions as the most important ones[2].

Studies show that regular physical activity is the basis for a more healthful aging[3,4]. The risk of disease and health problems can decrease with exercise[3,4], which has also been offered to recover the immune function of aged, reducing the prevalence of infections and neoplasias among the exercisers[3]. Regular exercise can also decrease fat mass and increase lean mass and aerobic performance[5].

In general, physical exercise has proven to be beneficial for diseases associated to aging and these benefits may result from any type of physical activity. However, resistance exercises, as the most effective method for developing musculoskeletal strength, have shown specific benefits for determined situations and are currently prescribed by many major health organizations for improving health and fitness[3].

Elderly people when sedentary for a long time can present significant alterations on body composition and physical fitness, compromising their quality of life in many important ways. Some chronic diseases, as AIDS for instances, can even worsen this situation because such diseases potentialize the effects of aging on body composition and muscle strength.

Recovering strength and physical fitness is the major goal of exercise in patients with AIDS wasting syndrome (AW). Therefore, a resistance training program could be the basis of an exercise prescription for this group. It should be progressive, so that resistance is increased as the patient becomes stronger[6].

Some studies involving HIV^+ adults and resistance training have been carried out, but none dealing with elderly HIV^+ people so far[7-9]. The present study aims to verify the effect of progressive resistance training on body composition, physical fitness and evolution of CD4/CD8 counts in HIV^+ elderly.

MATERIALS AND METHODS

All HIV^+ patients aged 60 or more years and followed at the service to the attendance of HIV/AIDS of the Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (CAIDS-HCFMUSP) by the end of 2003 were invited to participate in this study. The first invitation was made by telephone or directly at the moment of the medical consultation, followed by written correspondence to their homes. After obtaining their written agreement to participate in the research, orientation about the program training was provided. The recruitment period extended from November 2003 to July 2004. The Research Ethical Committee of HCFMUSP approved the study after review and all participants signed a proper written informed consent.

Inclusion criteria were: being HIV^+ and older than 60 years by July, 2003, being without regular physical activity and agreeing to participate. Both gender were accepted.

Exclusion criteria were: medical contraindication to perform exercises, any physical condition that limit this type of training, use of corticosteroids or other anabolic steroids and non-adhesion to the training program (defined as an absence of at least 3 consecutive months from the training program).

After the initial interview, patients were questioned about their time of HIV infection diagnosis, health and life conditions. Additionally, relevant clinical data were obtained from patients' record forms.

The anthropometric measures performed in this study were body mass, circumferences and skinfolds. The patients also carried out two functional tests: walking 2.4m and sit-standing in CECAFI every four months. Body composition assessments by Dual-Energy X-ray Absorptiometry (DEXA) were carried out before and after the period of training and patients were followed by a infectious disease specialized physician at CAIDS-HCFMUSP throughout the study.

The supervised progressive resistance training program consisted of four different exercises (muscles trained): (1) Leg press (quadriceps), (2) seated row (latissimus dorsi), (3) lumbar extension (paravertebral muscles), (4) chest press (pectoralis major) and were performed using machines with free weights (Maxiflex Biodelta, Joinville, SC, Brazil). Exercises were performed in 3 series of 8-12 repetitions at light, moderate and heavy resistance, with 1-2 minutes of rest between the series, twice a week, during 1 year, from March 2004 to September 2005. Sub-maximum weight supported was defined as the maximum weight lifted smoothly, without Valsalva maneuver, apnea or isometry.

RESULTS AND DISCUSSION

One hundred and eight HIV^+ patients aged more than 60 years old and followed at CAIDS-HCFMUSP by the end of 2003 were invited to participate in the study. Of those, 2 refused, 2 died and 2 didn't have physical condition to participate on the training program. In addition, 88 patients didn't show interest or had not been able to participate in the study because they lived outside São Paulo City and/or presented poor clinical conditions. Thus, only 14 patients, aged 61-

69 years old (Mean±SD: 64.3±2.9), of both genders and with average 9 years duration of HIV infection agreed to participate. Three patients abandoned the training program for more than 3 months, being excluded from the study protocol. Therefore, only 11 completed the period of training and remained in the study for the final analysis. Among those eleven participants, only one did not report previous use of Highly Active Antiretroviral Therapy (HAART) and four presented previous histories of HIV associated diseases. On average, patients attended 76.4% of the intended exercises sections.

Table 1 shows muscle strength variation after one year of resistance training program with four different exercises. The average strength of each muscular group trained increased significantly: leg press 97%, p = 0.004, seated row 78%, p = 0.021, lumbar extension 122%, p = 0.003, and chest press 74%, p = 0.003.

The increased muscular strength reflected on the results of the two functional tests performed. There were a significant reduction in both, the sit-standing (2.00×1.57 sec, p = 0.003) and the walking 2.4 m (9.25×6.58 sec, p = 0.003) times, before and after the year of resistance training program, respectively, as shown in Fig. 1 and 2.

Weight did not change significantly (60.17×60.09 kg, p = 0.84), nor did most body composition measures analyzed (DEXA, body mass index and circumferences), with the exception of triceps and thigh skinfolds that showed significant reduction (11.4×9.2 mm, p = 0.037 and 13.9×12.1 mm, p = 0.011, respectively), as shown in Fig. 3.

In addition, none significant collateral effect related to the exercise program nor any new (or worsening of previously existent) AIDS related condition developed during the training period. Finally, $CD4^+/CD8^+$ ratio improved (0.7 to 0.81, p<0.0001), with a trend towards an increased $CD4^+$ (71 cells, p = 0.054) and decreased $CD8^+$ (-75 cells, p = 0.05) counts.

To the best of our knowledge, this is the first study to investigate the influence of progressive resistance training in HIV infected people older than 60 years. The training protocol followed the recommendations of American College of Sports and Medicine[3] that suggest a progression model for resistance exercises in healthy, older adults. For this population the studies

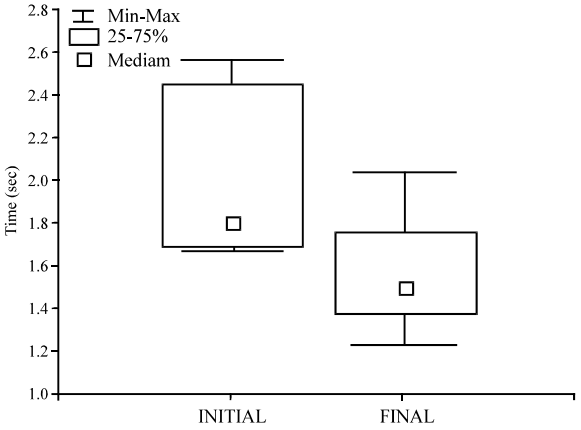

Fig. 1: Evolution of time necessary to walk 2.4 m after one year of resistance training (p = 0.003)

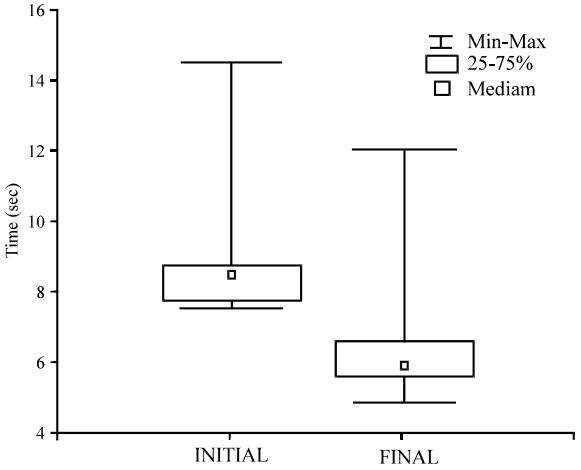

Fig. 2: Evolution of time necessary to sit-standing after one year of resistance training (p = 0.003)

Table 1: Loads variation of four exercises with one year of resistance training

	Leg press			Seated row			Lumbar extension			Chest press		
Loads (kg)	Before	After	Δ	Before	After	Δ	Before	After	Δ	Before	After	Δ
Mean	33.800	63.0	29.2	25.000	45.5	20.5	31.200	66.5	35.3	12.50	20.7	8.3
Median	31.000	60.0	29.0	22.500	38.2	18.2	28.300	60.0	35.0	10.30	17.5	7.0
Minimum	20.700	32.5	-2.5	19.000	0.0	-20.7	17.800	48.7	24.2	7.50	12.5	4.2
Maximum	48.700	95.0	56.3	35.000	80.0	46.9	45.800	89.2	49.4	30.80	35.0	18.2
25th percentile	22.500	50.0	14.2	20.000	37.5	14.5	24.300	60.0	25.0	7.50	15.0	5.0
75th percentile	45.000	78.1	46.7	32.500	68.1	33.1	40.800	83.1	42.2	15.00	25.3	10.3
p	0.004			0.021			0.003			0.003		

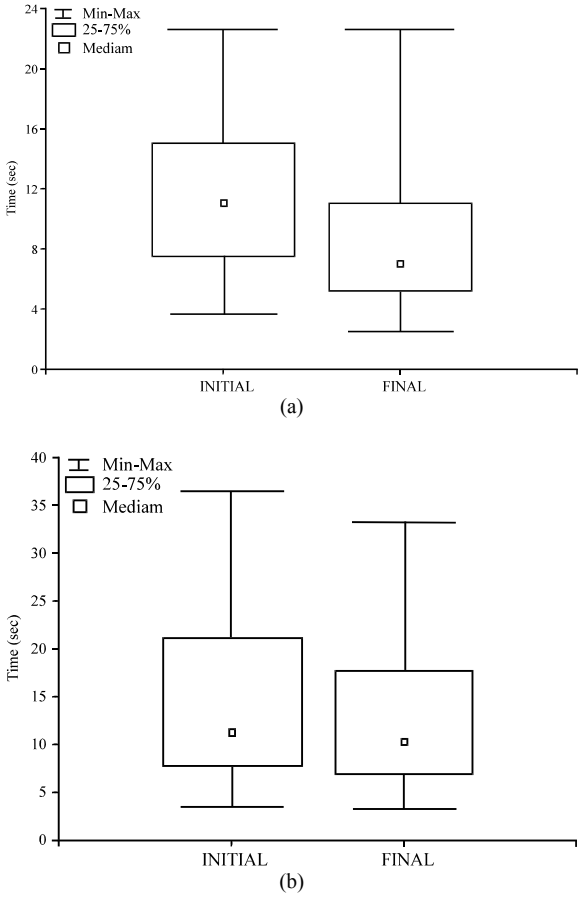

Fig. 3: Evolution of triceps (a) and thigh (b) skinfolds after one year of resistance training (p = 0.037 and 0.011. respectively)

show favorable changes regarding to the risk factors associated to osteoporosis, heart desease, cancer, diabetes and also a reduction in fat mass and an increase in lean mass and in muscular strength[4,10].

Our sample comprised 11 HIV infected people aged 60 years or more by the end of 2003, who completed the one-year training period. Patients who experienced some intercurrence during the training period didn't suffer detraining. When they restarted training it was easy for them to continue with the same loads they used before. A substantial strength increase was seen in all exercises for those patients, regardless of their age, HIV infection status and the presence of any HIV associated condition, presented by most of them. The average increase in the load supported after 12 months of resistance training varied from 74%-122% ($p \leq 0.003$-0.021), depending on the muscular group considered. In addition, the functional tests results, which showed significant improvement in sit-standing and walking 2.4 m times (p = 0.003), reflected this increase.

The strength increment is important for the quality of life of the aged population, because it improves biomechanics and cardiovascular responses, thus facilitating daily life activities. In our study, these effects were seen independently of gender and were not different for the only patient who did not use antiretrovirals, also.

Despite the significant benefits associated with HAART, HIV infection and its therapy have been associated with the development of several metabolic complications: increased central adiposity, peripheral lipoatrophy, peripheral insulin resistance, diabetes, dyslipidaemia and hypertriglyceridemia, osteoporosis and osteopenia. These complications may predispose patients to premature risk of metabolic and cardiovascular diseases[11].

In our study, no changes were seen either in body composition, assessed by DEXA after 12 months of resistance training, nor in anthropometric measures, with the exceptions of triceps (p = 0.037) and thigh (p = 0.011) skinfolds. Weight did not change significantly (p = 0.84) either.

Finally, the effects of exercises on immune function have been studied in both adult and elderly healthy populations, showing that moderate levels of training are helpful for them both[12,13]. In our study, assessment of immune response usually performed for HIV patients showed no significant variation in both $CD4^+$ and $CD8^+$ count, but $CD4^+/CD8^+$ ratio showed a significant improvement (0.7×0.81, $p<0.0001$), after one year of resistance training. In addition, there were trends towards an increasing $CD4^+$ (+71, p = p = 0.054) and decreasing $CD8^+$ (-75, p = p = 0.05) cells, both with expressive variations in the absolute number of cells considering that there were no change in HAART use among them.

CONCLUSION

In conclusion, in spite of the relatively small sample, our results are very encouraging in pointing out the relevant benefits that a progressive resistance training program can bring to elderly people living with HIV, without any major collateral effect, favouring its recommendation for such population.

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