# 52 - EVALUATION OF FUNCTIONAL CAPACITY OF PATIENTS AFTER-EFFECTS OF LEPROSY

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## INTRODUTION

Leprosy is a contagious disease caused by Mycobacterium leprae, a parasite that promotes lesion skin and peripheral nerves, may also affect other organs like the liver, eyes and testicles. Despite advances in the treatment of disease and implementation of new strategies in conducting control programs that have sharply reduced its prevalence, the disease is an important public health problem in Brazil and worldwide (LOCKWOOD, 2004; CROFT, 2000; MACHADO, 2007) .

Brazil accounts for 90% of cases in the Americas and remains in second place in the world of new cases, behind India (AFI, 2002). In Brazil, it is still considered an endemic disease with 47,000 new cases each year (STUMP, 2004 CAMPOS, 2005; RIBEIRO, 2007). In 2007 the disease had a prevalence rate of 2.3 new cases per 10 000 inhabitants, still almost three times greater than the rate accepted by the World Health Organization (WHO), less than one case per 10 000 inhabitants (MARQUES , 2003). The upper airways are the main route of entry and elimination of the bacillus spreading the disease from person to person through contact with untreated patients (LOCKWOOD, 2004).

Skin lesions may eventually be the entrance of infection. The body fluids such as milk, semen, sweat and vaginal secretions, can eliminate bacilli, but have no importance in the spread of infection (THOMAS, 2004, MENDONÇA, 2008). Early signs and symptoms manifest with whitish or reddish patches on the skin anywhere on the body, with decreased sensitivity to heat and touch that can be accompanied by intense pain, nerve hypersensitivity, lump, sensory and motor function, leading, after a long period of evolution, deformities and mutilations. Muscle weakness and painful joints may be other symptoms (MENDONÇA, 2008). The impairment of neural function requires careful attention, both in order to avoid or minimize its progression and to prevent squeal, sensory and motor deficiencies and disabilities and deformities that can result from this impairment (CROFT, 2000; MACHADO, 2007). These factors affect the physical capacity that can be aggravated by decreased functional activity of these patients.

The treatment of leprosy includes specific therapy, suppression of leprae reactions, prevention of disabilities, physical and psychosocial rehabilitation. For this there is need for thorough clinical assessment of this population (SAHNI, 2006). The aim of this study was to evaluate the exercise capacity of patients suffering from leprosy before and after an exercise program, attended the Center for Physical Rehabilitation, State University of Paraná (Unioeste), campus of Cascavel. Hypothesize that this proposal would reduce the factors that limit exercise capacity and exercise tolerance, improve quality of life in this population. Variables associated with predisposition to the limitations of daily activities of patients suffering from leprosy include deconditioning, muscle weakness, fatigue due to neuropathy (THOMAS, 2004). nactivity is a common cause of muscle atrophy and can be a contributing factor to muscle abnormalities and reduced functional status that are common among this population (Elsevier, 2008). These patients may have a deficit in maximal oxygen uptake (VO2max), muscle strength in upper and lower limbs, promoting, ultimately, an inability to tolerate the daily energy needs of many activities (MENDONÇA, 2008). The physical activity, identified as an important determinant in improving the quality of life among the HD patients may improve their physical function (SAHNI, 2006; MANTELLINI, 2006).

## METHODS RATING
## EVALUATION

We studied 19 patients with squeal of leprosy (14 men) over 18 years of age. We excluded patients with coronary artery bypass surgery less than six months, lower limb musculoskeletal limitations that would impede the attainment of functional tests, symptomatic cardiovascular disease, chronic obstructive pulmonary disease (COPD), cognitive limitations, uncontrolled hypertension, acute myocardial infarction (AMI) or cerebral vascular accident (CVA) for less than six months and patients who participate regularly in any physical activity program.

The research project was approved by the Ethics in Human Research of the State University of Paraná - UNIOESTE, and each patient signed an informed consent. Participants were evaluated before the exercise program (PRE) and immediately after 20 (twenty) weeks of the exercise program (POST).

Evaluative tests used were sub maximal incremental test distance Shuttle Walk Test (SWT), maximum oxygen uptake (VO2max), muscular strength testing of quadriceps one repetition maximum (1RM) test and hand grip. The SWT has followed the procedures described by Singh and colleagues (Singh, 2003), where patients were instructed to walk around two cones separated by 10 meters away, as long as possible, in accordance with the increasing speeds, under the guidance of a sound standard, issued by a CD player (disc player), and completed by the patient for his intolerance to maximum effort. The test was interrupted by the examiner when the patient did not achieve the milestone of two meters away from the cone or present signs of physical exhaustion, according to the standardization of the test.

Patients were instructed to stop only when the tests did not feel well or reached their highest level of exhaustion. At the end of the test, the distances were recorded and were checked again the BP, HR and degree of dyspnea, pain or fatigue in the legs by EB. To perform the tests, patients were instructed to use shoes and comfortable clothes, not eating at least one hour before and not do any rigorous exercise within 24 hours preceding the test. The functional capacity measured by exercise SWT enabled the indirect calculation of maximum oxygen uptake (VO2max) in ml / kg / min, the formula 4.19 + (0.025 * total distance), used in patients with chronic diseases such as chronic obstructive pulmonary disease, cardiovascular disease and chronic kidney disease (FITTS, 1997).

Muscle strength of the extensor muscles of the knee joint was evaluated by maximum load represented by the acronym 1RM (1 repetition maximum) 20, sitting with the patient performing the extension movement of the knee with weights (ankle) joints of the ankles maintaining the maximum contraction of the quadriceps in one full repetition. For the test we used the system of trial and error increasing weight, with an initial weight set empirically, as close to but below the supposed maximum weight equivalent to the dynamic force of the patient.

If the patients completed at least a replay, it was considered successful at trial and therefore was broken motion without requiring a second replay. In this case, after a few minutes break they added more weight and was asked to try new patient. Followed this procedure until the patient could no longer move or lift the weight. The weight lifted in the last repetition was successful, corresponded to the result of 1 RM. After the fourth week of treatment were repeated tests of muscle strength of the knee (1RM) to reassess the maximum muscle strength and readjust the load. EB was used to adjust the load at each session, together with the control of HR. Through the testing of handgrip dynamometer Bulb by North Coast Medical, U / K, one can evaluate the muscle strength of flexor hands with the patient sitting with the upper limb resting on a table, the shoulder joint adduction, elbow 90th (ninety degrees) of flexion and forearm and wrist in neutral position. The patient underwent a hold of the dynamometer with his right hand and left three times, encouraged to push the device as much as possible without seeing the markup. He was considered the highest value. The exercises were performed three times per week for 20 weeks, with more or less an hour.

**PHYSICAL EXERCISES**

The exercises used were: heating (stretching), endurance (aerobic), muscle strength and slowdown. Initially, the patients underwent stretching exercises muscles of the upper and lower heating and then exercises the muscular strength of upper and lower limbs with ankle bracelets, thera tubbing, dumbbells, aerobic exercise on treadmill and stationary bicycle, and a final stage, cool-down exercises. The exercise intensity was controlled by subjective symptoms, through the Borg scale. All training sessions were controlled by a physiotherapist.

**STATISTICAL ANALYSIS**

For statistical analysis of quantitative variables, the results were expressed as means and standard deviations. The results of the qualitative variables were expressed as percentage. For analysis of data normality, we used the Kolmogorov-Smirnov test. Statistical significance was set to $\alpha = 5\%$ ($p < 0.05$).

**RESULTS**

Significant results were observed for all assessments of functional capacity after completion of the training exercise (post treatment) and substantially reflecting the ability to walk test (SWT 326.0 ± 127.3 versus 430.0 ± 168.4 meters, $p < 0.05$) changes observed corresponded to the average percentage increase for the SWT (13%) (Table 1).The VO2max of the participants prior to treatment was low but rose 11% and was measured indirectly by SWT. The strength of right and left quadriceps increased by 16% after completion of the exercise program (Table 2). As the result of grip strength we observe a significant difference of 12% after treatment.

Table 1: Distance traveled (meters) and maximum oxygen consumption (ml / kg / min) before and after treatment

| | Pre treatment | Post treatment | *p* |
|---|---|---|---|
| **Distance walked (m)** | 326,0 ± 127,3 | 430,0 ± 168,4 | $p < 0,05$ |
| **$VO_2$máx (ml / kg/min)** | 16.0 ± 4.5 | 18.1 ± 4.2 | $p < 0.01$ |

Values are expressed as mean ± standard deviation (SD) VO2max: maximal oxygen uptake.

Table 2: Strength of the quadriceps (kg) and grip strength (inches) before and after treatment

| | Pre treatment | Post treatment | *p* |
|---|---|---|---|
| **Strength quadriceps (Kg)** | 7,2 ± 3 | 12,2 ± 4 | $p < 0,0001$ |
| **Preensão palmar (pol)** | 6.4 ± 2 | 7.9 ± 1 | $p < 0.05$ |

Values are expressed as mean ± standard deviation (SD).

**DISCUSSION**

The results showed some important aspects: (1) an improvement of the parameters studied, (2) the proposed exercise program proved to be applicable, safe and sound perceptibility by patients, (3) as there was no standardization in the treatment of patients with squeal leprosy as physical exercises, the results suggest that these patients responded positively to the proposed training and exercise can have significant progress to physical performance.

The average increase between the first 104.0m (before treatment) and the second evaluation (after treatment) by SWT test showed improvement in the distance traveled by 11% and, consequently, exercise capacity and, consequently, oxygen consumption ( 13%). Significant increases in exercise capacity were observed after exercise training in patients with chronic kidney disease (FITTS, 1997; KOUIDI, 2004).

Our results showed significant changes in the performance of patients after 20 weeks of intervention, we do not know if this would occur in less time training. The ability to transport and use oxygen reflected by VO2max was reduced in patients suffering from leprosy in our sample, with an average of 16.0 ml / kg / min. The 11% increase in VO2max after exercise was satisfactory and similar to previously reported studies in a population of chronic renal failure patients.

Zebetakis and colleagues reported a 13% increase in VO2max in these patients after 10 weeks of training on a treadmill. Oh-Park and colleagues observed a 50% increase in VO2max after 24 weeks in three different exercise programs (OH-PARK, 2002). With the improvement in muscle strength of knee extensor muscles of 16%, indicates that training with the exercises was brought benefits in activities of daily living that require these muscles, like walking, running and climbing stairs.

Physical training can benefit patients with sequel of leprosy, promoting improvement in self-reliance and personal independence and social reintegration (GARBIN, 2003).

The practice of the exercises provided, as many patients as possible in the same environment by improving the interaction between them with greater motivation in the group. There was support for the multidisciplinary team (doctor, nurse, psychologist, nutritionist, social worker, occupational therapy) who attended these patients during their stay in CRF and physiotherapy direct and constant over the years, making them feel safe for any complications that could occur.

Future studies are needed to assess the impact of physical activity program in the short term these individuals. In this study, we demonstrated that we can assess and treat patients in physical exercise program with equipment of low cost and easy

applicability. It creates the prospect of a new specialty in the field of physical therapy with the goal of improving the functional capacity of patients suffering from leprosy staff responsible for implementing these patients by optimizing the overall treatment to them.

**CONCLUSION**

We can conclude that the level of physical capacity in patients with sequel of leprosy is low but you can evaluate it in walking tests and improve it by adding a program of supervised exercise in a safe, inexpensive and applicable a physical rehabilitation services in Brazil. We also conclude that the effects of physical exercise program in this study were satisfactory, showing that twenty weeks of training with the exercises have generated significant increases in functional capacity and exercise, VO2max, muscle strength of knee extensor muscle strength and hand grip. And this may be an important tool in the overall treatment of this population.

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**EVALUATION OF FUNCTIONAL CAPACITY OF EXERCISE OF PATIENTS OF LEPROSY SEQUELS**

**ABSTRACT**

Introduction: The aim of this study was to evaluate the exercise capacity of patients suffering from leprosy before and after an exercise program, attended the Center for Physical Rehabilitation, State University of Paraná (Unioeste), campus of Cascavel. Methods: 19 patients suffering from leprosy were evaluated before and after a physical training program with flexibility exercises (stretching), muscle strengthening, aerobic and relaxation. For the analysis included the incremental shuttle walking test (SWT), maximum oxygen uptake (peak VO2) testing quadriceps muscle strength by testing a repetition maximum (1RM) and grip strength. Results: The test results showed that SWT after treatment increased the distance walked by 13% and maximal oxygen consumption peak VO2 increased 11%. The strength of the quadriceps in both legs also increased by 16%. As for the grip strength has increased by 12%. Conclusions: The proposed training exercise proved to be sufficient to significantly increase functional exercise capacity and quadriceps muscle strength in individuals with leprosy sequels.

**KEYWORDS:** leprosy, functional capacity, exercise

**ÉVALUATION DE LA CAPACITÉ FONCTIONNELLE DES PATIENTS APRÈS-EFFETS DE LA LÈPRE**

**RÉSUMÉ**

Introduction: Le but de cette étude était d'évaluer la capacité d'exercice des patients atteints de la lèpre avant et après un programme d'exercice, ont assisté à la Centre de réadaptation physique, Université d'Etat de Paraná (UNIOESTE), campus d´ Cascavel. Méthodes: 19 patients atteints de la lèpre ont été évaluées avant et après un programme d'entraînement physique avec des exercices de souplesse (stretching), renforcement musculaire, d'aérobic et de relaxation. Pour l'analyse a porté sur la

navette supplémentaire test de marche de l'essai de marche (SWT), consommation maximale d'oxygène (VO2 pic) des tests de force musculaire du quadriceps en testant une répétition maximale (1RM) et la force de préhension. Résultats: Les résultats des tests ont montré que SWT après un traitement a augmenté la distance parcourue par 13% et maximale VO2 pic de consommation d'oxygène a augmenté de 11%. La force du quadriceps dans les deux jambes ont également augmenté de 16%. Quant à la force de préhension a augmenté de 12%. Conclusions: L'exercice proposé s'est avéré suffisant pour augmenter significativement la capacité d'exercice fonctionnelle et la force musculaire du quadriceps chez les personnes avec séquelles de la lèpre.

**EVALUACIÓN DE LA CAPACIDAD FUNCIONAL DE PACIENTES DESPUÉS DE EFECTOS DE LA LEPRA**

**RESUMEN**

Introducción: El objeto deste estudio fue evaluar la capacidad de ejercicio de los pacientes enfermos de lepra antes y después de un programa de ejercicios, asistieron al Centro de Rehabilitación Física, la Universidad del Estado de Paraná (Unioeste), campus de Cascavel. Métodos: 19 enfermos de lepra fueron evaluados antes y después de un programa de entrenamiento físico con ejercicios de flexibilidad (estiramiento), fortalecimiento muscular, aeróbicos y de relajación. Para el análisis incluyó el traslado gradual prueba de caminata de prueba de paseo (SWT), consumo máximo de oxígeno (VO2 pico) las pruebas de fuerza muscular del cuádriceps probando una repetición máxima (1RM) y la fuerza del agarre. Resultados: Los resultados del ensayo demostraron que SWT después del tratamiento aumentó la distancia recorrida en un 13% y el VO2 máximo el consumo máximo de oxígeno aumentaron un 11%. La fuerza de los cuádriceps de ambas piernas también se incrementó en un 16%. En cuanto a la fuerza de agarre se ha incrementado en un 12%. Conclusiones: El ejercicio de capacitación propuesto resultó ser suficiente para aumentar significativamente la capacidad de ejercicio funcional y la fuerza.

**AVALIAÇÃO DA CAPACIDADE FUNCIONAL DE PACIENTES COM SEQUELAS DE HANSENÍASE**

**RESUMO**

Introdução: O objetivo deste estudo foi avaliar a capacidade de exercício de pacientes com seqüelas de hanseníase, antes e após um programa de exercícios físicos, atendidos no Centro de Reabilitação Física da Universidade Estadual do Oeste do Paraná (Unioeste), campus de Cascavel. Métodos: 19 pacientes com seqüelas de hanseníase foram avaliados antes e após um programa de treinamento físico com exercícios de flexibilidade (alongamentos), fortalecimento muscular, aeróbicos e de relaxamento. Para as análises incluíram o teste de caminhada incremental Shuttle Walk Test (SWT), consumo máximo de oxigênio (pico de VO2); teste de força muscular do quadríceps pelo teste de uma repetição máxima (1RM) e força de preensão palmar. Resultados: Os resultados do teste SWT mostraram que após o tratamento houve aumento na distância percorrida de 13% e o consumo máximo de oxigênio pico de VO2 aumentou de 11%. A força do quadríceps em ambos os membros inferiores também aumentaram 16%. Quanto á força de preensão palmar houve um aumento de 12%. Conclusões: O treinamento com exercícios físicos propostos mostrou ser suficiente para aumentar significativamente a capacidade funcional de exercício e força muscular do quadríceps numa amostra de pacientes com seqüelas hanseníase.

**PALAVRAS CHAVE:** hanseníase, capacidade funcional, exercício