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ORIGINAL RESEARCH

PHYSIOTHERAPY IN INDIVIDUALS WITH PERIPHERAL ARTERIAL OCCLUSIVE DISEASE – A RETROSPECTIVE STUDY

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KEYWORDS
Physical Therapy Modalities; Peripheral Arterial Disease; Exercise tolerance

Introduction: Treatment for peripheral arterial occlusive disease (PAOD) may consist of intervention procedure, including surgery, and conservative techniques such as rehabilitation. The exercise-based rehabilitation is a viable alternative due to its low cost and effectiveness in functional improvement.

Objective: To evaluate results obtained through physiotherapy for individuals with PAOD in an outpatient program for a minimum of three months.

Methods: Retrospective observational study where data were gathered through a medical chart survey. Functional capacity was assessed using the shuttle walking test and six-minute walk test and functional capacity was evaluated via the Short-Form Health Survey.

Results: Forty medical charts were selected, of which 12 met inclusion criteria. Functional capacity and quality of life measures showed significant improvement. Functional capacity and SF-36 variables were analyzed using the paired t-test.

Conclusion: Twice-weekly supervised treatment displayed favorable results in functional capacity and quality of life measures.

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INTRODUCTION

Peripheral arterial occlusive disease (PAOD) is a health condition characterized by stenosis or arterial occlusion generally secondary to atherosclerosis[1-5]. It more commonly affects the lower limbs, with greater prevalence in men and increases with age, particularly among those over 70 years. In most cases, evolution of the disease is stable and without complications, such as critical limb ischemia or amputations[1].

The primary symptom is intermittent claudication (IC), related as pain, cramping, weakness or tingling in the muscles during activity, caused by ischemia, which ceases with rest[1,6]. IC is associated with reduced walking distances and subsequent decline in performance for activities of daily living. Individuals with IC who lead a sedentary lifestyle exhibit lower functional capacity, even with stable blood flow alterations[3,5].

Treatment of PAOD may consist of invasive interventions (bypass surgery and angioplasty) and conservative procedures (physical exercise and medication). Invasive intervention treatment aims to re-establish blood flow, improve claudication-related pain and increase walking distance[4,5]. Surgical procedures, however, may result in greater complications including bruising, blood transfusion and even death. Among conservative treatments, medication improves hemorheology, lowers blood viscosity and platelet aggregation and promotes vasodilation, as well as alleviating symptoms and improving performance by increasing blood flow[4-6]. Physical exercise increases the oxidative capacity of affected muscles, improving endothelial function and hemorheological action, in addition to decreasing inflammatory response and promoting possible opening of collateral vessels. This leads to increased distance and pain-free periods when walking, as well as improving time and distance until maximum claudication[5,7,8]. In comparison with other procedures used to treat PAOD, physical activity has produced effective results, alleviating symptoms and improving functional capacity without necessarily intervening in arterial patency[5,7-9]. As such, physical exercise can raise functional capacity without increasing blood flow to the ischemia-affected limb. This demonstrates peripheral adaptation to physical exercise by the muscles involved**,** possibly due to greater use of oxygen and oxidative capacity[5,7-9].

In light of its low cost and effective improvement of functional capacity, rehabilitation is a viable alternative[9]. According to meta-analysis by Gardner & Poehlman (1995), physical activity reduces IC symptoms and effectively increases walking ability. Exercise programs should consider type of exercise, frequency, duration, rehabilitation time, pain intensity level during the session and degree of supervision[2,4-6,8,10-18]. Exercises consist of walking on the floor or a treadmill at intensities close to maximum claudication. Frequency should be at least three times a week, with 30 minutes of activity, excluding interruptions due to pain. With respect to intensity, only one study has shown benefits for low intensity exercise among PAOD sufferers limited by IC, with results similar to those promoted by high-intensity activity[19]. In regard to supervision and duration, the rehabilitation program should be supervised and last at least 6 months. However, beneficial results have been reported for shorter time periods (12 weeks)[9,13,15-17] and lower supervision levels (twice a week)[18].

Considering results from previous studies showing improved symptoms and functional capacity[18], as well as viability in clinical practice and economic benefits, the present study aimed at evaluating results obtained after a minimum of three months rehabilitation in individuals with PAOD attending an outpatient care program.

MATERIALS AND METHODS

Type of study

A retrospective observational study conducted in an outpatient care program entitled “Caring for Individuals with Peripheral Vascular Disease”, based in a university institution in Belo Horizonte, Brazil. The study was approved by the institutional Research Ethics Committee, under protocol 048/2007.

Subjects

Medical charts of patients attending the outpatient program were included. Inclusion criteria were suffering from PAOD functionally limited by IC, receiving treatment between February 2004 and December 2007, and completing at least three months of intervention. Individuals with adherence lower than 80% were excluded.

Procedures

Data were collected from patient charts before intervention and on its completion. Participants were characterized according to the variables age, PAOD risk factors, use of medication and complementary tests. Response to treatment was assessed through functional capacity in the shuttle-walking test (SWT) and 6-minute walk test (6MWT) and quality of life by the Short-Form Health Survey SF-36.

Shuttle walking test

This is a walking test consisting of 12 stages. Speed in the first stage is 0.5 meters/second and is increased by 0.17 meters/second in subsequent stages. It is conducted in a 10-meter long flat corridor, with distances marked by two cones and speed determined using a sound signal. After hearing the beep, subjects begin walking towards the opposite cone. Each new stage starts with three consecutive beeps, indicating individuals must increase their walking speed. When participants do not reach the opposite cone in two consecutive attempts, the test is interrupted[19].

Six-minute walk test

This was carried out on a 30-meter long flat corridor, demarcated by two cones, where subjects were instructed to walk as fast as possible without running for six minutes. In cases where the individual feels the need to stop the test by claudication before completing the six minutes, is allowed to the subject restart the walk before completing the total test time[20].

The following were recorded during both tests: blood pressure (BP) initial and final heart rate (HR) before starting tests, every minute and at the end of testing, onset time of claudication (OT), maximum claudication time (MT), pain alleviation time (AT) and subjective perceived effort according to the modified Borg at the beginning and end of each test.

SF-36 Questionnaire

The SF-36 questionnaire was applied in an interview, using a version translated to Portuguese by Ciconelli et al.[21]. It is a generic multidimensional instrument for assessing quality of life, composed of 36 items evaluating the following eight domains: functional capacity, physical aspect, pain, general health status, vitality, social aspect, emotional aspect and mental health. Scoring is from 0 to 100, where 0 corresponds to the worst general health and 100 the best.

Physiotherapy intervention

The intervention was carried out twice a week under the supervision of a physiotherapist and a third unsupervised session at home. The same protocols were recommended for all sessions. Supervised activity lasted 60 minutes, aiming at a minimum of 30 minutes walking (treadmill or floor) with intensity close to maximum claudication. In this case, a limit was imposed of 60% – 80% of the maximum heart rate predicted for age. Intervention was continuous during each semester.

Data analysis

Descriptive statistics were presented as mean ± standard deviation. Normality of data was analyzed using the Shapiro-Wilk test. Data related to the SF-36 did not exhibit normal distribution and were submitted to logarithmic transformation. As such, differences between pre and post-treatment for functional capacity and quality of life were assessed by the paired t-test. For analysis of SF-36 data, the eight domains of the questionnaire were grouped into two subscales: physical health (functional capacity, physical aspect, pain and general health status) and mental health (vitality, social aspect, emotional aspect and mental health).

RESULTS

Forty medical charts were selected for patients in the outpatient care program, of which 12 met inclusion criteria and 28 were excluded owing to adherence lower than 80% and/or absence of data recorded on charts.

Mean age was 63 ± 10.84 years and average body mass index 24.75 + 5.03 kg/m^2. Characteristics related to risk factors, functional capacity, surgical procedures, family history, medication, complementary tests and physical examination are displayed in table 1. Seven of the 12 charts contained data on duplex scanning, three with low obstruction (superficial femoral artery, anterior and posterior tibial artery) and four with high obstruction (iliac artery). Two of the six patients displayed an ankle-brachial pressure index (ABI), which varied from 0.37 to 0.8.

Table 1 – Clinical characteristics of patients with PAOD

Risk Factors		***Surgical Procedures***		***Medication***	
Hypertension	10	Catheterization	5	Vasodilator	8
Sedentary lifestyle	9	Angioplasty	2	Anticoagulant	8
Smoking	8	Peripheral Bypass	1	ACE inhibitors	6
Alcoholism	5	Coronary Bypass	1	Diuretics	4
Diabetes	4			Hypoglycemics	4
Dyslipidemia	3			Beta Blockers	4
Coagulation disorders	2			Hypolipidemics	4
Obesity	1			AT1 receptor antagonists	2

ACE: angiotensin-converting enzyme; AT1: type I angiotensin II receptor antagonists

Mean treatment time was 14.54 ± 4.55 weeks and percentage of absences was 8.51±4.20%. Functional capacity results pre- and post-treatment are presented in tables 2 and 3. Table 4 displays pre- and post-treatment results for quality of life.

Table 2 – Pre and post-treatment SWT results

Variable	**N**	**Pre-Treatment**	**Post-Treatment**	***p****
Onset time of claudication (minutes)	12	4.56 ± 2.44 (0.308 – 5.83)	4.33 ± 2.87 (0.127 – 7.46)	0.733
Maximum claudication time (minutes)	12	6.72 ± 1.96 (3.46 – 8.59)	7.18 ± 1.86 (2.45 – 10.39)	0.081
Distance walked (meters)	12	400.00 ± 172.88 (168.85 – 517.81)	457.50 ± 181.36 (377 – 749.56)	0.056
Walking efficiency (meters/beat)	12	3.45 ± 1.11 (1.62 – 4.50)	3.64 ± 1.10 (0.56 – 5.48)	0.377

*Significance level of the paired t-test; † $p < 0.05$; median and 95% of Confidence Interval

Table 3 – Pre and Post-Treatment results for 6MWT measurements

Variable	n	Pre-Treatment	Post-Treatment	*p**
Onset time of claudication (minutes)	11	2.65 ± 0.87 (0.73 – 3.68)	2.84 ± 1.00 (1.19 – 3.77)	0.417
Maximum claudication time (minutes)	4	4.67 ± 1.29 (0.88 – 7.87)	4.61 ± 1.04 (2.64 – 5.64)	0.870
Distance walked (meters)	11	440.50 ± 122.47 (249.80 – 438.83)	507.64 ± 153.94 (181.15 – 683.76)	0.021†
Speed (meters/ minute)	11	77.91 ± 22.57 (42.26 – 150.66)	92.80 ± 22.04 (48.02 – 163.38)	0.005†
Walking efficiency (meters/beat)	10	4.36 ± 1.54 (2.37 – 4.48)	4.86 ± 1.43 (1.06 – 5.46)	0.044†

*Significance level for the paired t-test; † $p < 0.05$;median and 95% of Confidence Interval

Table 4 – Pre and Post-treatment comparison of variables assessed by the SF-36

Variable	N	Pre-Treatment	Post-Treatment	*p**
Physical Health	11	52.48 ± 19.53 (39.36 – 65.60)	60.10 ± 24.32 (43.75 – 76.43)	0.042 †
Mental Health	12	57.34 ± 25.16 (38.46 – 73.09)	70.57 ± 28.71 (49.46 – 89.59)	0.026 †

* Significance level for the paired t-test after logarithmic transformation, † $p < 0.05$; median and 95% of Confidence Interval

DISCUSSION

After treatment, distance walked in the SWT showed a favorable clinical difference of 57.50 meters, equivalent to 14%. In a randomized clinical trial Zwierska et al.[23] evaluated 104 individuals with PAOD, submitted to 24 weeks of treatment similar to that performed in the present study, twice a week. At the end of 12 weeks, results showed a 60-meter increase in the total distance for the SWT, equivalent to 17%. A further increase of 10% (40 meters) was recorded after the 24th week. Functional improvement percentage in this retrospective study was similar, although not statistically significant (p = 0.056). This finding may be associated with the number of charts analyzed and high coefficient of variation observed in the SWT (32% to 40%). Gardner et al.[18] investigated 64 subjects for a period of 6 months, exercising 3 times a week. Participants were randomized into two treatment groups, with 40% and 80% maximum load of ergometric testing. On completion of the intervention, improvements of 6% (25 meters) and 8% (29 meters) were recorded in high and low-intensity groups, respectively. Individuals in the present study exhibited a statistically significant improvement of 15% (67.14 meters), greater than that found by Gardner et al[18] . However, it is important to emphasize the goal of a retrospective study is not to evaluate the effectiveness of treatment programs, but rather to report the results obtained from approaches already applied. Following intervention, results for the variables distance traveled, speed and walking efficiency, obtained by the 6MWT, were statistically different from pre-intervention findings. Walking efficiency is the relationship between distance walked and heart rate in beats per minute. Results demonstrate a statistically significant improvement of 11%, indicating that subjects walked longer distances with lower cardiac overload[5].

To our knowledge, it is not known which parameter of walking tests is sufficiently sensitive to indicate clinically

relevant improvement in distance walked by individuals with PAOD. Guidelines of the American Thoracic Society (ATS)[20] consider an increase of 54 meters clinically relevant, associated with reduced symptoms. In the present study, mean distance recorded in both the SWT and 6MWT was greater than 54 meters, indicating a clinically significant improvement in this population since an increase was also observed in subscales of the SF-36.

In the SF-36, an increase of 7.62% was found in the physical health subscale and 13.23% for mental health, similar to findings by Gardner et al.[18]. In a controlled randomized clinical trial, Tsai et al.[17] assessed 53 patients over a 12-week training period, applying progressive treadmill exercises. At the end of the investigation, improvements of 21.5% and 10.88% were observed for physical and mental health, respectively. Clinically relevant improvements in subjective evaluations are difficult to assess, since quality of life is a broad concept influenced by several life aspects of individuals suffering from various health conditions. Limitations of this study were the low number of medical charts that met inclusion criteria and characteristics of the type of study, which prevent control of variables.

CONCLUSION

Treatment provided in the twice-weekly supervised outpatient care program produced favorable results in functional capacity and quality of life measures. Considering the study environment, it is important to note that maintaining careful medical chart records are skills to be developed during the training of Physical Therapist.

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