CASE REPORT

# Assessment and physical therapy treatment for peripheral artery occlusive disease of the upper limb: a case study

Danielle Aparecida Gomes Pereira[I]; Marcelle Xavier Custódio[I]; João Paulo Ferreira de Carvalho[I]; André Maurício Borges de Carvalho[II]; Inácio Teixeira da Cunha-Filho[III]
[I]Physical therapist, Centro Universitário de Belo Horizonte (UNI-BH), Belo Horizonte, MG, Brazil.
[II]Angiologist, UNI-BH, Belo Horizonte, MG, Brazil.
[III]PhD. Physical therapist, UNI-BH, Belo Horizonte, MG, Brazil.

Correspondence

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## ABSTRACT

The aim of this paper was to present a case study proposing a protocol for assessment and rehabilitation of a patient with upper limb intermittent claudication. Case description: 50-year-old woman with obstruction of the left brachial artery secondary to catheterization performed 4 months ago. Monophasic sound was observed during continuous Doppler ultrasound assessment of both the radial and ulnar arteries. During the arm crank test, ischemic pain started at 2 minutes and 30 seconds of cranking, while maximal pain was reached at 9 minutes and 26 seconds. The patient was treated by arm cranking exercises performed three times a week for 8 weeks. After the treatment, arm crank time increased: ischemic pain onset was at 5 minutes and 7 seconds and maximal pain was reached at 18 minutes. The patient reported disappearance of cyanosis and improvement in performance of daily activities. The assessment protocol comprehended both subjective (validated Brazilian Portuguese version of SF-36 questionnaire) and objective (arm crank) measurements and was well tolerated, besides being able to detect changes in the patient's functional capacity. Changes detected at pain onset and at maximal pain may have occurred spontaneously, but it cannot be ruled out that this intervention can be potentially beneficial for individuals with upper limb claudication. The results observed in this case study warrant further studies involving larger sample size.

Keywords: Arterial occlusive disease, physical therapy, upper limb.

## RESUMO

O objetivo deste artigo é apresentar um estudo de caso em que se propõe um protocolo de avaliação e intervenção para uma paciente com claudicação de membro superior. Descrição do caso: mulher de 50 anos com 4 meses de evolução de quadro de obstrução de artéria braquial esquerda pós-cateterismo. Na avaliação com Doppler contínuo, observou-se presença de som monofásico em artérias radial e ulnar. No teste do cicloergômetro, a dor isquêmica iniciou aos 2 minutos e 30 segundos e atingiu o ponto máximo aos 9 minutos e 26 segundos. Foi realizado tratamento em cicloergômetro três vezes por semana durante 8 semanas. Após o tratamento, o tempo de teste em cicloergômetro aumentou: dor inicial aos 5 minutos e 7 segundos e máxima aos 18 minutos. A paciente relatou desaparecimento da cianose e melhora na realização de atividades de vida diária. O protocolo de avaliação proposto envolvendo medidas objetivas (cicloergômetro) e subjetivas (questionário SF-36 traduzido e validado em português) foi bem tolerado, tendo sido capaz de detectar alterações no estado funcional da paciente. As alterações detectadas no tempo de surgimento de dor inicial e de dor máxima podem ter acontecido de modo espontâneo, mas não se pode descartar que a intervenção possa, potencialmente, ser benéfica para indivíduos com claudicação de membros superiores. Os resultados observados neste estudo de caso avalizam futuros estudos envolvendo maior número de participantes.

Palavras-chave: Arteriopatia oclusiva, fisioterapia, membros superiores.

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## Introduction

Peripheral occlusive arterial disease (POAD) is characterized by improper limb perfusion, usually due to atherosclerotic process.[1] The main signs and symptoms are pain, reduction in cutaneous temperature, absence or reduction in affected limb pulses, cyanosis, hypoperfusion, ulcerations and intermittent claudication, the latter being the most frequently observed in lower limbs.[1] In the upper limbs, the claudicating symptom may occur especially when the activity is performed with elevated arms.[2-4] POAD in the upper limbs has lower incidence and is more frequently associated with iatrogenesis secondary to catheterization.[2,3]

Forms of treatment for POAD are surgical intervention, drug therapy and physical therapy rehabilitation program as alternatives for reduction in claudicating symptoms, improvement in functional capacity, prevention of vascular occlusion progression and cardiovascular complications.[5] However, there are no specific protocols for the functional assessment of upper limb claudication, not even specific protocols for rehabilitation of these patients, probably due to low incidence/prevalence of upper limb claudication. Despite presence of claudication and functional limitation observed in that condition, assessment and treatment protocols have not been systematized. Therefore, this article aims at presenting a case study that proposes an assessment and intervention protocol for a patient with upper limb claudication.

## Case description

A 51-year-old female patient with POAD in the left upper limb, secondary to brachial artery obstruction after catheterization had developed this condition 4 months ago, when the catheterization was performed, with progressive worsening of symptoms, culminating in work leave due to the claudicating symptom that imposed functional restrictions on her.

Complaints included limiting pain to perform household chores (classified as stage II in Fontaine's

classification adapted for upper limbs: occurrence of ischemic pain during physical effort[4]), paresthesia and loss of left upper limb strength. The patient was hypertensive, controlled by drug therapy, and had history of coagulation disorder. She was using Diovan® (80 mg) qd, Angipress® (25 mg) qd and acetylsalicylic acid (500 mg) qd.

On physical examination, her left upper limb was cyanotic, there was low cutaneous temperature and absence of radial pulse on palpation. On ultrasound evaluation (continuous Doppler), there was presence of monophasic flow in the radial and ulnar arteries.

## Tests

-Cycle ergometer of the upper limbs (CEUL). Test of progressive effort started with a 15-watt load, with 5-watt increments at every 3 minutes until reaching 12 minutes, and 10 watts after 12 minutes until reaching maximal ischemic pain. Time of pain onset and time during which the patient was able to maintain activity were recorded. After the test, the time needed to stop pain in the left upper limb was recorded and classified as recovery time.[6]

-Quality of life evaluation. The SF-36 questionnaire was used in its translated version into Portuguese and validated by Ciconelli et al.[7] The SF-36 is a generic, multidimensional instrument to evaluate quality of life, composed of 36 items evaluating eight domains: functional capacity, physical aspect, pain, general health status, vitality, social and emotional aspects and mental health. It has a score ranging from 0 to 100, 0 being the worst general health status and 100 being the best status.[7]

This case study is in accordance with Resolution 196, published on 10/10/96 by the National Health Counsel. All tests were applied before and after intervention with the patient's informed consent. Physical therapy treatment had frequency of three times a week and lasted for 8 weeks, consisting of an outpatient program with muscle stretching of the scaphoid waist, brachial biceps and wrist flexors, and conditioning in CEUL until reaching maximal pain. The training started with 15 watts, gradually progressing to 35 watts. The patient had to complete 20 minutes of training in the bicycle, independent of resting periods. A home program was also performed, in which the patient should insist in her daily activities until reaching maximal pain. Only then the patient should interrupt any activity, thus relieving the symptom. As soon as the pain allowed, the activity should be resumed.

## Results

There were no differences between hemodynamic variables obtained by CEUL in tests before and after the treatment. However, final load increased from 30 to 50 watts, representing a 66% increase. There was no significant difference between recovery time at the end of the test and after the treatment. Time for occurrence of pain increased in 105%, whereas time until maximal pain increased in 81% (Table 1). Quality of life evaluation showed indexes indicating improvement, especially regarding SF-35 social and emotional aspects, which reached 100% (Table 2).

Table 1 - Values obtained by cycle ergometer test of the upper limbs

| | Pretreatment | Post-treatment |
|---|---|---|
| Initial HR (bpm) | 68 | 69 |
| Final HR (bpm) | 79 | 79 |
| Initial BP (mmHg) | 110/80 | 100/80 |
| Final BP (mmHg) | 130/80 | 120/80 |
| Pain onset (s) | 150 | 307 |
| Maximal pain (s) | 566 | 1080 |
| Recovery time (s) | 167 | 161 |
| Load (watts) | 30 | 50 |

BP = blood pressure; HR = heart rate.

Table 2 - Values obtained in the SF-36 questionnaire

| Items | Pretreatment (%) | Post-treatment (%) |
|---|---|---|
| Functional capacity | 65 | 95 |
| Physical aspect | 0 | 75 |
| Pain | 22 | 62 |
| General health status | 67 | 82 |
| Vitality | - | 95 |
| Social aspect | 37,5 | 100 |
| Emotional aspect | 0 | 100 |
| Mental health | - | 96 |

## Discussion

This study aimed at presenting an assessment and treatment protocol for upper limb claudication. Both the assessment process and treatment proposed proved to be feasible and well tolerated by the patient. The assessment protocol was able to detect functional and quality of life changes during the period in which the patient was under treatment.

There were no substantial changes in hemodynamic variables, since use of beta-blocker leads to attenuated response of frequency and blood pressure. Proportion of improvement observed in the CEUL test was clinically relevant. Perhaps this can be explained by task specificity, i.e., by similarity between how conditioning was performed in the treatment and how the test was performed.

The patient also reported absence of pain during daily activities. However, such change in perception was not totally detected by the SF-36, since the score for pain reached 62%, and not 100%. This suggests that SF-36 understanding may not be satisfactory to assess patients with POAD, even if the test had been validated for the Brazilian population.[7]

It has been suggested that upper limb ischemia caused by acute arterial occlusion secondary to iatrogenesis, as observed in this study, can have spontaneous clinical improvement and

compensation for ischemic damage. Nevertheless, this patient showed progressive worsening of clinical and functional status over a 4-month period from obstruction onset to her referral for physical therapy. The patient could not perform her usual daily activities due to the ischemic symptom, and thus, similarly to the treatment used for lower limb ischemic symptom resulting from atherosclerotic obstruction, an intervention through scheduled physical activity was proposed.

The patient was submitted to a supervised regimen of physical exercises, using an intensity that allowed reaching the threshold for claudicating pain. The intervention was maintained for 8 weeks, with frequency of three times a week. In addition, the patient was instructed to perform her daily activities, despite occurrence of symptoms. In case of claudicating symptom during household chores, the patient was instructed to interrupt them until pain relief, and then resuming her activities. This procedure is similar to that proposed during supervised exercises. Therefore, although improvement in clinical and functional status of patients with iatrogenic lesion of the arterial bed more frequently occurs spontaneously, the possibility that our proposal has contributed to symptom mitigation and to improvement in functional capacity cannot be ruled out. However, it is necessary to perform further studies, including a control group and a higher number of participants to determine efficacy of proposed intervention, since the protocol demonstrates sensitivity for functional changes, whether spontaneous or not.

## Conclusion

The proposed assessment protocol, involving objective (cycle ergometer) and subjective (SF-36) measurements, was well tolerated and able to detect changes in the patient's functional status. It is possible that the changes detected by the proposed protocol have occurred spontaneously. Nevertheless, we should not rule out that the intervention might potentially contribute to symptom mitigation and restoration of functional capacity. The results found in this case study warrant future studies including a higher number of participants.

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Correspondence:
Danielle Aparecida Gomes Pereira
Rua João Gualberto Filho, 1260/604, Bairro Sagrada Família
CEP 31035-570 - Belo Horizonte, MG
Tel.: (31) 3309.9137, (31) 9103.7415
Email: d.fisio@ig.com.br

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