International Journal of Physical Medicine & Rehabilitation

Fouasson-Chailloux et al., Int J Phys Med Rehabil
2017, 5:2
DOI: 10.4172/2329-9096.1000393

Case Report OMICS International

Exercise Oxymetry in the Diagnosis of a Clinically Challenging Bilateral Socket Intolerance and Follow-up of An Apparently Inefficient Revascularisation

Alban Fouasson-Chailloux*, Samir Henni and Pierre Abraham

Physical Medicine and Rehabilitation, Centre Hospitalier Universitaire de Nantes, France

***Corresponding author:** Alban Fouasson-Chailloux, Department of Physical Medicine and Rehabilitation, Centre Hospitalier Universitaire de Nantes, France, Tel: +33240846211; E-mail: alban.fouassonchailloux@chu-nantes.fr

Received date: February 08, 2017; **Accepted date:** February 24, 2017; **Published date:** February 28, 2017

Abstract

Socket intolerance is a cause of walking impairment in amputees. Exercise transcutaneous oxygen pressure (Ex-$tcpO_2$) is proposed to monitor exercise-induced ischemia. A man with bilateral tibial amputation was referred for left thigh pain and socket intolerance. Ex-$tcpO_2$ showed an ischemia on the left thigh and on buttocks. After vascular surgery, the patient complains from walking limitation with left buttock pain. A new Ex-$tcpO_2$ showed a normalization of the thighs ischemia but a worsening on the left buttock, due to the circumflex artery occlusion during surgery. This case illustrates questions that physician may face, Ex-$tcpO_2$ confirms vascular origin of the pain.

Keywords: Vascular claudication; Amputee; Socket Intolerance; Walking

Introduction

Peripheral artery disease (PAD) is a frequent cause of walking impairment due to pain induced by walking (intermittent claudication) [1] and can lead to lower limb amputation. Vascular claudication affects mainly calves, but other localizations such as buttocks or thighs may be reported. Socket intolerance is a frequent cause of walking impairment due to pain in lower limb amputees. Transcutaneous oxygen pressure during exercise (Ex-$tcpO_2$) can be used to monitor exercise-induced regional blood flow impairment (RBFI) throughout walking treadmill tests on both lower limbs and different areas. This method was demonstrated to be accurate to detect arteriographically proved lesions [2]. Thereby Ex-$tcpO_2$ is a unique tool to determine the concordance between symptoms and arterial lesions shown by imaging. Indeed, PAD symptoms can be improved by collateral artery development whereas symptoms may worsen by accidental occlusion of collateral arteries in case of unsuccessful revascularization.

We describe an amazing case of claudication in a patient with bilateral trans-tibial amputation, showing the interest of Ex-$tcpO_2$ both as a diagnostic tool and as a unique method of following and explaining the results of an apparently unsuccessful revascularization.

Case Description

On March 2012, a 72-year-old man with moderate renal failure and an ancient bilateral traumatic proximal trans-tibial amputation at the age of 17 was referred to our laboratory for evaluation of a severe left thigh pain while walking associated with moderate bilateral buttocks and right thigh walking aching. Until the age of 71 he was perfectly able to walk and was physically active with his two prostheses. The maximal walking distance (MWD) was estimated at 100 meters. The patient was referred for Ex-$tcpO_2$ to confirm the ischemic origin of thigh pain because of renal failure, we were reluctant to perform contrast agent injection. The patient was evaluated using a standard treadmill procedure. For $tcpO_2$ measurements, we used six $tcpO_2$ devices (TCM3 Radiometer, Copenhagen, Denmark) with probes heated to 44.5°C. $TcpO_2$ values were automatically transferred to a computer (Acknowledge BIOPAC MP150, Cerom, Paris, France) on a sample rate of 0.5 Hz. Probes were positioned on the chest, on the lower back, on the upper external quarter of each buttock and on both thighs. $TcpO_2$ was recorded for two minutes at rest, during exercise and throughout recovery. From $tcpO_2$ recorded values, we automatically calculated the decrease from rest of oxygen pressure (DROP) at each limb site. The DROP index had been described and validated [2,3]. The DROP index consists in the subtraction of limb-$tcpO_2$ changes from chest tcpO2-changes. A significant ischemia is a minimal DROP value below minus 15 mmHg.

Standard Procedure

A two-minute reference period at rest while the patient was standing still on the treadmill. Thereafter the walking period was performed at 10% grade and 3.2 km/h. Patient was blinded to the distance and time throughout the test. When exercise was stopped, the speed and slope rapidly returned to zero. During the recovery phase after walking, the patient was asked to remain stable in the standing position. Recovery lasted 10 minutes (Figure 1).

Ex-$tcpO_2$ was stopped because of a severe left thigh pain after a 101-metre-long walking distance. The ex-$tcpO_2$ curves showed a severe ischemia on the left thigh (DROP $tcpO_2$=-36 mmHg) and significant ischemia on the right one (-15 mmHg) and both buttocks (-15 at the right one and -21 mmHg at the left one) (Figure 1B). Previous ultrasound imaging and an angio-scan performed after Ex-$tcpO_2$ showed bilateral ilio-femoral stenosis and a severe stenosis on the left common femoral artery (Figures 2A and 2B). Surgical management consisted in a technically successful end arteriectomy of the left femoral tripod associated with an angioplasty of the right external and common iliac arteries. Three months after surgery, the patient complains from walking limitation with severe left buttock pain, whereas thigh pain has disappeared.

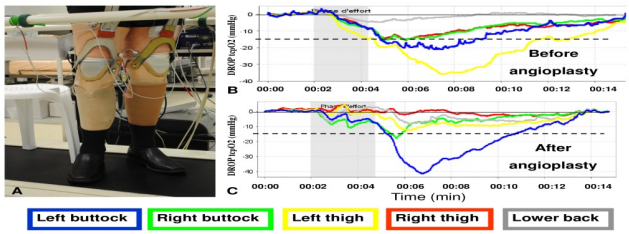

Figure 1: Left panel: (A) Installation of the patient on the treadmill. Two probes are placed on each buttocks and each thighs. The lower back and chest reference probes are not visible. Right panels: The period between 0 and 2 minutes is the resting period. The walking period is shown in grey. Post exercise recovery allows for the normalisation of DROP values within 10 minutes. Dotted line is the threshold of ischemia (DROP ≤ 15 mmHg). (B) Results of the Ex-tcpO2 before angioplasty show a severe ischemia on the left thigh and a significant ischemia on the right thigh and both buttocks. (C) Results of the Ex-tcpO2 after angioplasty shows a complete normalization of the right and left thigh ischemia but a worsening of left buttock ischemia.

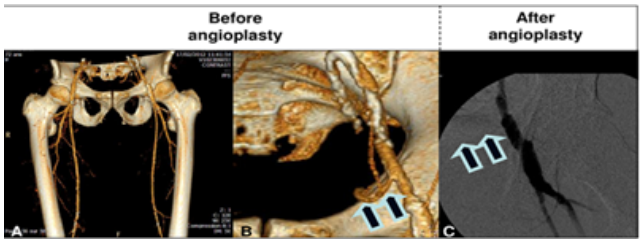

Figure 2: (A-B) Angio-tomodensitometry showing bilateral ilio-femoral stenoses and a severe stenosis on the left common femoral artery. (B) The arrows show the patent circumflex artery. (C) Per-procedure angiography shows a successfully angioplasty of the left femoral stenosis. The arrows show the position of the circumflex artery that is not visible anymore, likely due to its occlusion during the intervention.

A new Ex-tcpO_2 test was performed, stopped at 125 m for left buttock pain. The ex-tcpO_2 curves showed a complete normalization of the right and left thigh ischemia but a particularly severe worsening of left buttock ischemia (DROP tcpO_2 =-41 mmHg), consistent with the symptoms described by the patient (Figure 1C). As shown in Figures 2B and 2C, buttock ischemia was probably due to the occlusion of the circumflex artery during the initial procedure (Figure 2C). No surgical solution was found to re-vascularise the hypogastric circulation. On a 2.5 year follow-up, no improvement of walking ability was observed.

Discussion

Claudication [4,5] and socket intolerance [6] sometimes remain challenging diagnostic situations. In the present case, due to renal failure, we were reluctant to perform contrast agent injection as a primary tool of proximal ischemia [7]. The initial Ex-tcpO_2 helped confirm the vascular origin of the pain and argued for the injected imaging with revascularization of arterial lesions. Bilateral amputation of our patient did not allow ankle to arm pressure recording and almost precluded the use of post exercise thigh pressure measurements for technical reasons. Amputation in the present patient was of traumatic origin while with age the patient had developed atherosclerosis, but the problems observed in the present case are illustrative of the questions that physician may face in either arterial or ageing traumatic amputees. In our case, buttock claudication might be due to the relief of thigh pain unmasking buttock pain. Ex-tcpO_2 results confirm that it is not the case and the buttock pain clearly results from a worsening of buttock ischemia during exercise. Since 2003, the analysis of Ex-tcpO_2 results with the DROP index has allowed to get rid of the reliability issue of absolute tcpO_2 values and has attained highly reliable exercise results in claudicants [2]. As shown in the figure, Ex-tcpO_2 provides objective evidence that angioplasties have normalized the perfusion both on the right and left thigh as a result of technically successful angioplasties, while right buttock ischemia is almost unchanged. It cannot be excluded that the decrease in DROP at the left buttock level is due to a slightly longer walking period during the second test. We assume that this is not the explanation since no worsening was observed on the right buttock. The role of circumflex iliac arteries is clearly not dominant in models of the pelvic circulation [8]. Nevertheless, when dominant pathways (lumbar or ipsilateral and contra hypogastric arteries) are occluded, such arteries may become essential to cover muscle blood flow requirements at exercise. The very interest of the present case is that we have objective evidence to support this hypothesis. Ex-tcpO_2 appears as an original tool to help physicians argue for the vascular origin of walking induced pain in clinically challenging situations such as socket intolerance in limb amputees.

References

1. Aggarwal S, Moore RD, Arena R, Marra B, McBride A, et al. (2016) Rehabilitation Therapy in Peripheral Arterial Disease. Can J Cardiol 32: S374-381.
2. Abraham P, Picquet J, Vielle B, Sigaudo-Roussel D, Paisant-Thouveny F, et al. (2003) Transcutaneous oxygen pressure measurements on the buttocks during exercise to detect proximal arterial ischemia: comparison with arteriography. Circulation 107: 1896-1900.
3. Abraham P, Picquet J, Bouyé P, L'Hoste P, Enon B, Vielle B, et al. (2005) Transcutaneous oxygen pressure measurements (tcpO2) at ankle during exercise in arterial claudication. Int Angiol J Int Union Angiol 24: 80-88.
4. Picquet J, Jaquinandi V, Saumet JL, Leftheriotis G, Enon B, et al. (2005) Systematic diagnostic approach to proximal-without-distal claudication in a vascular population. Eur J Intern Med 16: 575-579.
5. Jacquinandi V, Bouyé P, Picquet J, Leftheriotis G, Saumet JL, et al. (2004) Pain description in patients with isolated proximal (without distal) exercise-related lower limb arterial ischemia. Vasc Med 9: 261-265.
6. Dudek NL, Marks MB, Marshall SC (2006) Skin problems in an amputee clinic. Am J Phys Med Rehabil Assoc Acad Physiatr 85: 424-942.
7. Gerhard-Herman MD, Gornik HL, Barrett C, Barshes NR, Corriere MA, et al. (2016) AHA/ACC Guideline on the Management of Patients With Lower Extremity Peripheral Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol 2016.
8. Jaquinandi V, Abraham P, Picquet J, Paisant-Thouveny F, Leftheriotis G, et al. (2007) Estimation of the functional role of arterial pathways to the buttock circulation during treadmill walking in patients with claudication. J Appl Physiol 102: 1105-1112.