

# Clinical and microcirculatory effects of transcutaneous CO<sub>2</sub> therapy in intermittent claudication. Randomized double-blind clinical trial with a parallel design

R Fabry<sup>1</sup>, P Monnet, J Schmidt, J-R Lusson, P-H Carpentier, J-C Baguet, C Dubray

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## Abstract

**Background:** This randomized, double blind trial determined the short and long-term clinical and hemodynamic vasodilator effects induced by percutaneous applications of natural CO<sub>2</sub> gas in patients with moderate Fontaine stage II.

**Patients and methods:** 62 patients with intermittent claudication (100-500 meters) were randomized to 18 consecutive days of CO<sub>2</sub> treatment or placebo (air). The gas fluids were applied at a constant temperature of 30 degrees C on pre-humidified skin. The effects of the treatment were evaluated by total distance walked (primary criterion) and hemodynamic and microcirculatory findings. Patients also answered a quality of life questionnaire.

**Results:** The Strandness test showed a significant increase in total distance walked (+ 131 meters, 66%;  $p = 0.001$ ) and pain-free distance (+ 81 meters, 73%;  $p = 0.02$ ) after 18 days of CO<sub>2</sub> treatment. The improvement was maintained 3 and 12 months later. The systolic pressure index (ABI) increased by 37% ( $p = 0.001$ ) 1 minute after treadmill walking and ABI recovery time decreased significantly by 38% ( $p = 0.002$ ). Microcirculatory findings showed an increase in systolic pressure of the great toe (13%;  $p < 0.0001$ ), in baseline pO<sub>2</sub> (20%;  $p = 0.01$ ) and in vasomotion (78%;  $p = 0.001$ ) in the treatment group. The improvement in total walking distance was correlated with the increase in ABI and peripheral cutaneous oxygenation. Patients' subjective assessments corroborated the benefits. No significant change was observed in the placebo group.

**Conclusions:** This study demonstrates that 18 consecutive days of percutaneous CO<sub>2</sub> treatment significantly increases walking distance in patients with moderate intermittent claudication. This effect, which was associated with an increase in peripheral systolic pressure and pO<sub>2</sub>, is evidence of a better ability to withstand effort.