Title of the PhD project: Effect of personalized home-based physical activity program on risk factors of carotid plaque rupture in patients with asymptomatic carotid stenosis

Disciplines: Exercise physiology and cardiovascular physiology


Doctoral school: Interdisciplinary Doctoral program in health-sciences (EDISS) - ED 205

Description

Scientific background and rationale: Our previous work has shown that the prevalence of intraplaque hemorrhage (IPH), the main factor of the risk of carotid plaque instability, was reduced in patients with high level of physical activity. In these patients, markers of oxidative stress and percentage of circulating intermediate monocytes (CD14+/CD16+) were decreased compared to patients with high sedentary profile. Finally, it was suggested that venous blood clot properties and structure, which are particularly involved in the risk of thrombosis in this pathologic population, could be modified with physical activity. Magnetic resonance imaging (MRI) of the carotid plaque is considered to be the most accurate imaging tool for detecting IPH. In this context, according to the benefit / risk ratio, it has been found that carotid endarterectomy surgery could be inadequate in some categories of patients (asymptomatic) even with a high percentage of stenosis.

Aim: Therefore, the purpose of this project will be to evaluate by MRI, the effect of a 6-month personalized home-based physical activity program (via the use of connected activity wristbands and a regular re-evaluation of the patient's goals of their number of step per day) on the IPH in patients with non-operated asymptomatic carotid plaque.

Description of the project methodology: This prospective randomized study will be done in collaboration of the vascular surgery department of the Hospital Edouard Herriot (co-supervision of the PhD by Pr Antoine Millon). 70-80 patients with asymptomatic carotid stenosis greater than 50% will be recruited and randomly assigned to physical activity group or control group. The subjects will be invited to 2 additional visits before randomization (T1). During the first visit at T1, they will undergo a high-frequency carotid plaque MRI to determine the presence of IPH. Their blood will also be collected for the analyses of oxidative stress markers, % of CD14+/CD16+ monocytes and for the characterization of the proprieties of venous blood clot, using state-of-art techniques. Their physical fitness will be also assessed by a 6-minute walk test, a maximal isometric quadriceps strength test while their level of physical activity and sedentary behavior will be determined by questionnaires.

The patients of the physical activity group will follow a 6-month personalized and home-based physical activity program through connected activity wristbands and re-evaluation of goals of their number of step per day every month. The patients of the control group will follow the same medical treatment than the physical activity group without changing their lifestyle. At the end of the 6 months of intervention (T2), all the subjects will be evaluated similarly as in T1.

Expected results: We expect that IPH, plasma oxidative stress, percentage of CD14+/CD16+ monocytes will be reduced and that the clotting time and fibrinolysis of the clot will be increased. Also, physical fitness test will be improved after the 6-month program.

Perspectives: To implement individualized physical activity program for patient with non-operated carotid plaque in their therapeutic approach.

Skills required: Experience in biology laboratory techniques and physical fitness evaluation, strong knowledge in exercise physiology and cardiovascular physiology. Basic knowledge in cardiovascular MRI would be a plus.

Bibliography:


Key-words: Atherosclerosis, exercise training, MRI, carotid plaque, intraplaque hemorrhage, coagulation, monocytes, oxidative stress

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Application should include: CV, application letter, Names and addresses of two references. The application file should be sent before May 14, 2017 to: (vincent.pialoux@univ-lyon1.fr). The open competitive recruitment process is in two steps: 1. Internal laboratory procedure. 2. Interdisciplinary jury of EDISS.