

Name of research institute or organization:

**University Hospital Inselspital, Department of Cardiology,
Centers for Congenital Heart Disease and Preventive Cardiology & Sports
Medicine**

Title of project:

Cardiopulmonary adaptation of short term exposure to high altitude in Fontan patients: Swiss multicenter Fontan & ALtitude COllaboratioN (FALCON) Study

Project leader and team:

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Project description:

"Fontan patients" are a group of patients with congenital heart defects of great complexity, where no bi-ventricular correction is feasible. These patients have had palliative surgery with separation of the systemic venous return from the oxygenated pulmonary venous blood, by re-directing the superior and inferior vena cava blood directly to the pulmonary artery and bypassing the heart. Hence, these patients do not have a sub-pulmonary ventricle. A Fontan circulation depends on a low resistance in the pulmonary vasculature and a low left atrial pressure. Any external or internal factor increasing pulmonary vascular resistance, such as high altitude exposure and hypoxemia, can potentially decrease cardiac output in these patients.

In order to provide guidelines about the safety of leisure and sport activities of Fontan patients at high altitude, we aimed to test the hemodynamic response of these patients' population to a short stay at Jungfrauoch (3454 m a.s.l.).

Thirty adult patients with a Fontan circulation and thirty healthy adults were recruited. On the first day, baseline testing was executed in Bern (symptom limited cardiopulmonary exercise stress test, a symptom limited, stepwise increased workload test with a non-invasive inert gas rebreathing method for cardiac output measurement during exercise, analysis of heart rhythm and heart rate variability). On the second day, scheduled within 12 weeks, the participants travelled to Grindelwald (1034m), where they spent the night, with a continuation of the journey the next day by public transport to the Jungfrauoch (3454 m a.s.l.), where the baseline tests were repeated in a similarly scheduled way.

This was the first study to expose stable Fontan patients to a real high altitude location, as if visiting as tourists, and to perform exercise tests thereat. This will allow us to counsel Fontan patients on the hemodynamic changes of the circulation during such a short leisure trip to high altitude and will help to avoid that these patients expose themselves to high altitude without proper advice.

Key words:

Congenital heart disease, Fontan circulation, high altitude exposure

Collaborating partners/networks:

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