Abnormal electrochemical skin conductance in cystic fibrosis

Dominique Hubert, Philippe Brunswick, Jean-Henri Calvet, Daniel Dusser, Isabelle Fajac

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Abstract

Background: Electrochemical skin conductance measurement is an active electrophysiologic method in which incremental low direct voltage is applied on the skin. It generates a current due to reverse iontophoresis which previous studies suggested to be mostly related to chloride anion movements. As sweat chloride movements upon electric stimulation were likely to be impaired in cystic fibrosis (CF) patients, we designed a proof-of-concept study to measure electrochemical skin conductance in CF patients and control subjects and to test the ability of this method to discriminate CF from controls.

Methods: Electrochemical skin conductance was measured in 41 adult patients with classical CF and 20 healthy control subjects. Patients placed their hands and feet on nickel electrodes and an incremental low direct voltage was applied on the anode during 2 min. The resulting voltage on the cathode and the current generated between anode and cathode were measured and from them, two electrochemical skin conductance variables were calculated: ESC, obtained when a low voltage of 1.6 V was applied, and dESC which took into account electrochemical skin conductances obtained when low and high voltages were applied.

Results: ESC measurements on hands and feet were significantly different in CF patients (onfeet:75±10 μSi), as compared with control subjects (62±13 μSi, pb<0.0001); dESC was also significantly different and more discriminative in CF patients (on feet:34±24 μSi), as compared with control subjects(93±24 μSi,p<0.0001). dESC measurement provided a diagnostic specificity of 1 and a sensitivity of 0.93.

Conclusions: These results show that electrochemical skin conductance which is easily and rapidly measured is abnormal in CF patients.