Externally applied pressure on the skin electrode impedance

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The objective of this abstract is to introduce the effects of externally applied pressure on the skin-electrode impedance for electrodes such as standard Ag/AgCl and orbit electrodes. This issue is of interest because it is one of the factors that affect the quality of signal collected from that electrode. Skin-electrode impedance is modeled as an electrical circuit including a resistor (R_s) in series with a paralleled resistor (R_d) and capacitor (C_d). Skin-electrode impedance is measured by an impedance interface device and a frequency response analyzer.

Pressure is applied with a regular Omron blood pressure cuff. Experiments are done in several trials to verify electrodes behaviour under pressure and their tendency to keep the changes due to applied pressure. Measurement procedure steps are as follows:

a. Two electrodes were placed on the subject's right bicep at a 7 cm distance from each other and connected to the measurement devices.

b. The Omron cuff was wrapped around subject's bicep on top of the electrodes.

c. The pressure was set to 0 mmHg or 30 mmHg appropriate for the trial.

d. Wait for 1 minute.

e. The impedance was measured.

f. Repeat, starting from step c, until all trials are completed.

Table 1 Cuff pressure per trials

Trial	T1	T2	Т3	T4	T5	T6	T7	T8	Т9	T10	T11
Cuff pressure	0	30	0	30	0	30	0	30	0	0	0
(mmHg)											

Results show that skin-electrode impedance of orbital electrodes decreases as pressure increases and after some trials they tend to keep the changes and vary less and less when pressure is applied and removed, whereas Ag/AgCl electrodes variation due to pressure are small and negligible.



Figure 1 Skin-electrode impedance of Orbital electrodes