A METHOD OF CONTINUOUS RECORDING OF THE BLOOD FLOW IN THE BRAIN IN EXPERIMENTS OF SHORT AND LONG DURATION

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The method which we have used to record the temperature of the brain in an experiment of long duration in dogs [1] can be adapted for continuous recording of the blood flow. This is effected, just as in the method used by Gibbs [3] and Ludwigs [4], by supplementary heating of the thermoelectrode at its point of insertion, in order to raise its temperature above that of the brain and of the circulating blood, which allows the cooling effect of the blood flow on the temperature of the source of heat to be recorded and, consequently, the character of the local circulation to be judged.

However, the technical difficulties in the preparation of the thermoelectrode equipped with a special adaptor for supplementary external heating led us to make use of the properties of the thermistor itself for this purpose. If the supply to the bridge – one of the arms of which is the thermoelectrode – is increased, then as a result of a thermistor of very low power (about 20 μw) this will be heated. A change in the magnitude of the current flowing through the bridge may achieve heating of the thermistor to 1°C above the temperature of the circulating blood. Under these circumstances the current strength necessary to pass through the thermoelectrode

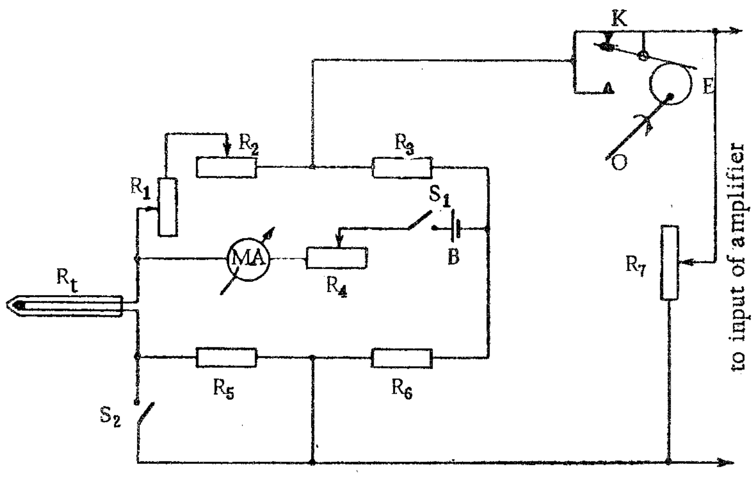

Fig. 2. Bridge circuit of the amplifier input.
R_1, R_2, R_3, R_6) Arms of the bridge; R_t) thermistor; R_4) rheostat (20 kiloohm) regulating the supply to the bridge; R_5) resistance standard; S_1) bridge supply switch; S_2) standard switch; R_7) rheostat (20 kiloohm) shunting the amplifier input; B) normal cell; K, E, O) mechanical interrupter; μA) microammeter.

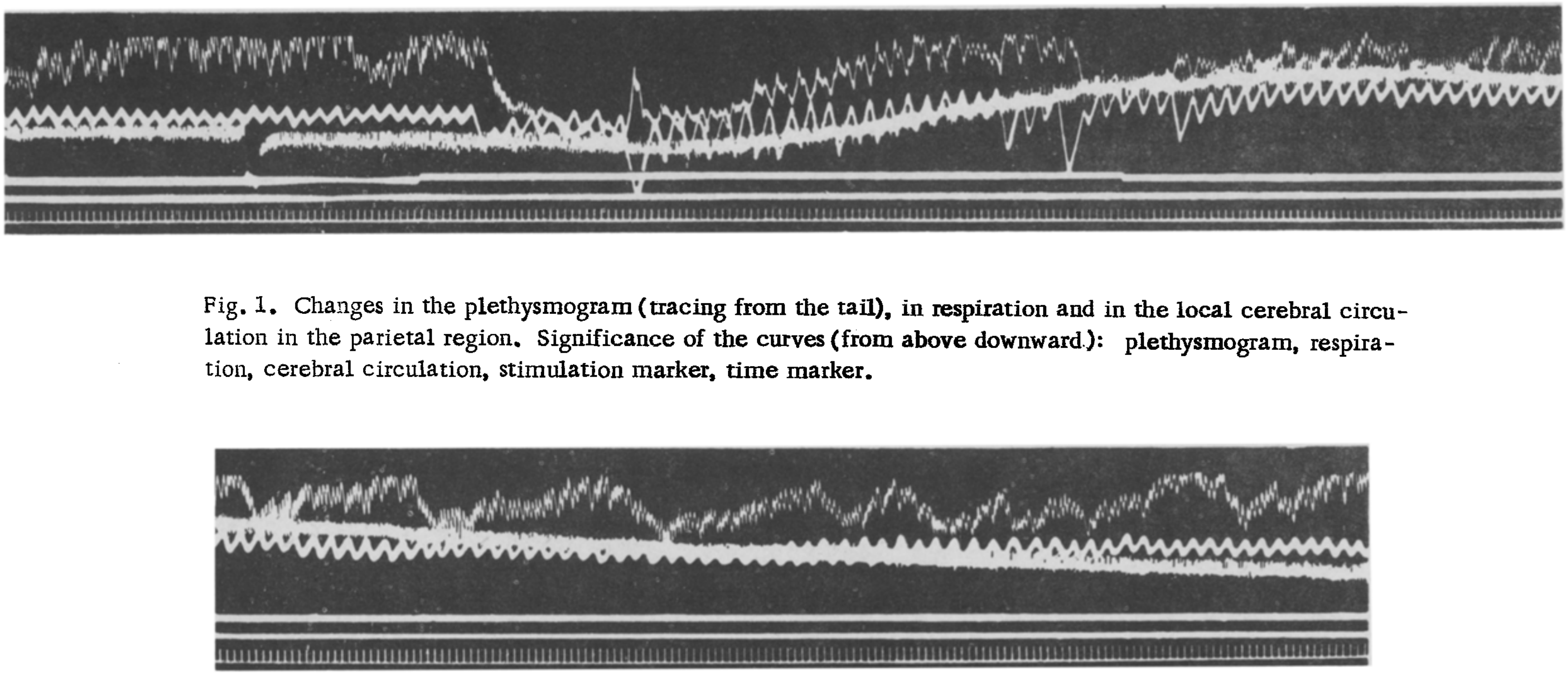

Fig. 1. Changes in the plethysmogram (tracing from the tail), in respiration and in the local cerebral circulation in the parietal region. Significance of the curves (from above downward): plethysmogram, respiration, cerebral circulation, stimulation marker, time marker.

is greater, the higher the density and the thermal conductivity of the surrounding medium (when using a thermistor with a resistance of approximately 1500 ohm, the nominal current strength passing through it must not exceed 110 μa; during registration of the blood flow the current strength is raised to 0.6 ma).

The simplicity of the adaptation allowing regulation of the supply to the bridge (Fig. 2) and the very considerable gain in sensitivity during registration of the blood flow by the thermistor included in such a circuit (6 times or over) are the advantages of this method. A similar method for registration of the blood flow in the uterus was used by I. I. Benediktov [1].

Figure 1 illustrates the effect of a change in the concentration of carbon dioxide in the expired air on the level of the blood flow in the brain in the region of the skin analysor.

SUMMARY

A change in the intensity of the direct electric current passing through the needle-formed thermoresistance (connected into the bridge circuit forming the input to the amplifier) raises the temperature of the thermistor to 1°C over that of the inflowing blood. This makes it possible to register the blood flow at various areas of the brain.

LITERATURE CITED

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