SLOW POTENTIALS AND CONTRACTILE ACTIVITY OF THE UTERUS

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Simultaneous recordings were made of the slow potentials and mechanical activity of the uterus in chronic experiments on nonpregnant rabbits. Correlation analysis showed that the slow uterine potentials are secondary relative to mechanical activity and are the result of changes in tissue resistance.

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To study certain problems in clinical obstetrics, the method of recording the integrated uterine electrical activity, consisting of waves with an individual duration of 18-20 sec or more, has been used [3, 5, 7, 9].

The object of the present investigations was to examine the connection between this activity and the contractile activity of the uterus.

Conflicting opinions are expressed on this problem in the literature. Some authors [8, 9] state that the slow potentials coincide with mechanical activity of the uterus, while others [2, 4] consider that the electrical waves precede muscular contractions.

EXPERIMENTAL METHOD

Altogether 52 experiments were performed on 15 sexually mature rabbits weighing 2.8-3 kg under chronic experimental conditions with electrodes and a rubber balloon inserted into the uterus. The bioelectrical (through a dc amplifier) and mechanical activity of the uterus [1] were recorded simultaneously on a self-writing instrument specially constructed from three type N370-AM ampere-voltmeters. The rubber balloon was connected to an electroplethysmograph (Triodyn, Hungary) and to one channel of the recorder.

The investigations were carried out from the second until the tenth day of the postoperative period. Background curves of electrical and mechanical uterine activity were first recorded for 10-15 min, and then without interrupting the recording, oxytocin was injected subcutaneously into the animal in a dose of 0.1 unit/kg body weight and the recording continued for 30-40 min.

For cross-correlation analysis of the curves obtained, the sign of the first product determined every 6 sec was used as their characteristic. A segment of the curve 6 min in duration was selected for analysis, and the cross-correlation coefficients were calculated for a total number of 30 signs [6].

EXPERIMENTAL RESULTS

The graphs of cross-correlation functions showed that the curves of bioelectrical and mechanical activity of the rabbit's uterus consisted of identical waves, the duration of which varied with the days of the postoperative period (from 18-40 sec). With displacement of the curve of uterine mechanical activity relative to the curve of biopotentials, in every case the maximum of the cross-correlation function shifted to the right of the ordinate by 3, 6, 9, and 12 sec, indicating delay in the slow potentials characteristic of the organ as a whole relative to the mechanical contraction wave. The maximal values of the cross-correlation coefficients varied from +0.45 to +0.80 (Fig. 1).

The reaction to oxytocin took the form of activation of both electrical and mechanical activity of the uterus, arising after 3-5 min. Injection of oxytocin increased the spacing between the waves and increased the maximal cross-correlation coefficients to +0.99, but caused a decrease or the complete disappearance of the shift in the cross-correlation maximum (Fig. 1). These results show that oxytocin, which stimulates

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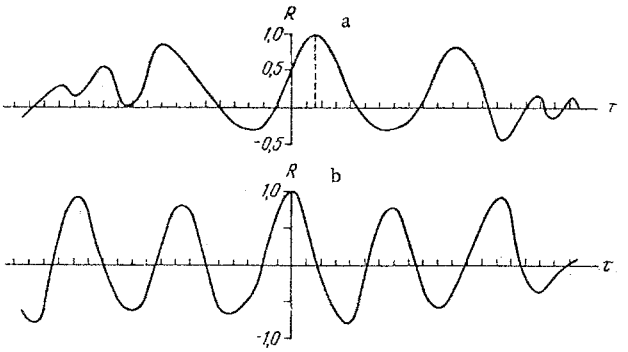

Fig. 1. Graphs of cross-correlation functions. a) Before injection of oxytocin (the broken line denotes the time of change of maximum of the cross-correlation function, 9 sec); b) after injection of oxytocin (time shift absent); R) cross-correlation coefficient; τ) time of shift (6 sec).

contractile activity of the uterus, leads to a more marked correlation between the two processes investigated, reflected by an increase in the spacing between the waves, a decrease in the time shift, and coincidence in time between the slow waves and the mechanical activity of the uterus.

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