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EFFECT OF PULSATING LOCAL NEGATIVE PRESSURE WITH OXYGEN ON BIOELECTRICAL ACTIVITY OF THE UTERUS IN PREGNANT ALBINO RATS WITH INTRAUTERINE STREPTOCOCCAL INFECTION

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Bloodborne intrauterine streptococcal infection of albino rats during pregnancy (implantation, placentation) leads to disturbances of uterine bioelectrical activity which are restored to normal by treatment with pulsating local negative pressure together with periodic administration of oxygen.

KEY WORDS: *streptococcal infection; uterine bioelectrical activity; pulsating local negative pressure.*

It is stated in the literature that during intrauterine infection of the fetus spontaneous and recurrent abortions and premature births are frequently observed [1-3].

The object of these investigations was to study uterine bioelectrical activity at different stages of pregnancy during bloodborne fetal infection and treatment with pulsating local negative pressure (PLNP) combined with oxygen.

EXPERIMENTAL METHODS

Experiments were carried out on 98 pregnant albino rats.

To produce intrauterine infection of the fetus a culture of group A type 1 M hemolytic streptococcus, in a dose of 1 billion bacterial cells, combined with an extract of uterine

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tissue, was injected into the caudal vein of a pregnant rat on the 4th (beginning of implantation) and 7th days (beginning of placentation). Pregnant albino rats receiving an injection of physiological saline with uterine extract at the same times of pregnancy served as the control.

PLNP (60 mm Hg) with periodic administration of oxygen in a decompression chamber for 5 days after infection was used for treatment. The decompression chamber was fitted to the lower part of the abdominal wall in the region of projection of the internal reproductive organs. Exposure lasted 20 min.

In other acute experiments on eight pregnant albino rats, after the initial uterine bioelectrical activity had been recorded PLNP was applied for 10 min with a negative pressure of 40 mm Hg.

The uterine bioelectrical activity was recorded on a four-channel electroencephalograph (frequency 0.2-150 Hz). One electrode (a thin fish hook) was fixed to the body, another to the middle of the right cornu of the uterus. The following parameters of uterine electrical activity were determined: the amplitude (in μV), frequency (in Hz), and period (in sec) of the oscillations, the strength of contraction (in conventional units), and the tone of the uterus (in conventional units).

EXPERIMENTAL RESULTS AND DISCUSSION

Bioelectrical activity of the uterus consisting of alternate phases of slow and fast waves was recorded in the healthy pregnant albino rats at the end of pregnancy.

In the control group, in which uterine extract with physiological saline was injected intravenously during implantation the duration of the fast waves averaged 22.0±3.8 sec and of the slow waves 40.5±5.1 sec. Fast waves with a mean frequency of 1.38±0.13 Hz, a period of 0.71±0.09 sec, and an amplitude of 143.0±13.0 μV caused contractions with a strength of 230.5±15 conventional units (c.u.). Slow waves with a frequency of 0.25±0.0015 Hz and a period of 3.8±0.27 sec had a greater amplitude (257.0±16.1 μV) than the fast waves. However, the muscular contraction accompanying the slow waves was weaker in strength (62.5±8.6 c.u.) than that of accompanying fast waves.

Following injection of uterine extract during the period of placentation the bioelectrical activity of the uterus was virtually indistinguishable from that after injection of the extract during implantation. Blood-borne streptococcal infection and injection of uterine extract at the beginning of implantation caused changes in uterine bioelectrical activity. At the end of pregnancy the tone of the uterus increased. In 45.5% of cases the phase of fast waves was absent. In those cases when it was present, the duration of the phase of fast waves was unchanged and, just as in the control group, they alternated with slow waves. How-

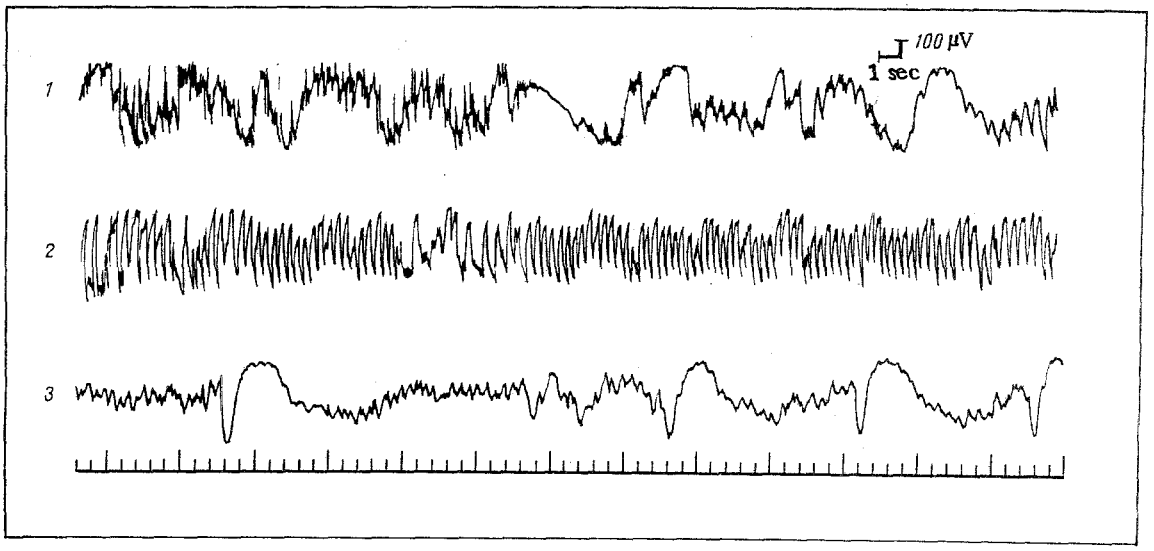

Fig. 1. Action of PLNP on uterine bioelectrical activity of healthy albino rats. 1) Initial background; 2) 1 min after PLNP; 3) 30 min after PLNP.

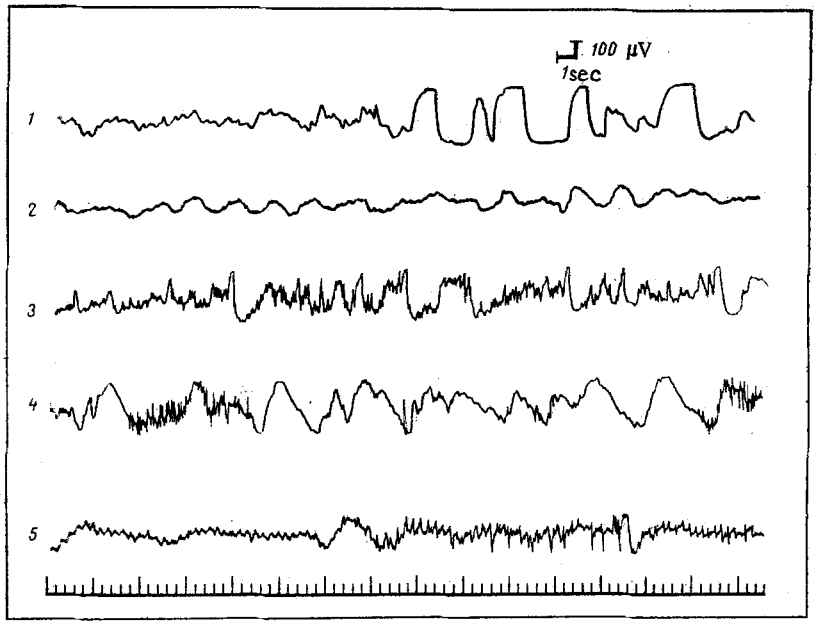

Fig. 2. Uterine bioelectrical activity of albino rats after infection and treatment with PLNP combined with oxygen. 1) Control; 2) infection during implantation period; 3) infection during placentation period; 4) application of PLNP after infection in implantation period; 5) application of PLNP after infection in placentation period.

ever, the amplitude of the fast waves fell to 103±12 μV ($P < 0.05$). There was a corresponding sharp decrease in the strength of the uterine contractions also (to 147±27 c.u.). The strength of the muscular contractions also fell during the period of slow waves, to 45.7±7.0 c.u. ($P < 0.05$).

Infection at the beginning of placentation and during organogenesis led to marked disturbances of many of the parameters of uterine bioelectrical activity toward the end of pregnancy: The frequency of the fast waves fell to 0.9±0.12 Hz ($P < 0.05$) and of the slow waves to 0.15±0.02 Hz ($P < 0.01$). The period of the waves was increased to 1.3±0.035 sec. The amplitude both of the fast waves (experiment 115±13.5 μV, control 143±13 μV) and of the slow waves (experiment 202±29 μV, control 257±16.2 μV) was reduced.

The decrease in frequency and amplitude of the fast and slow waves was combined with a decrease of the muscular contraction. For instance, the strength of muscular contraction in the period of the fast waves averaged 103±13.3 c.u. compared with 230.5±15 c.u. in the control, whereas the strength of muscular contraction in the slow phase was 30.3±3.4 c.u. compared with the normal value of 62.5±8.6 c.u. ($P < 0.01$).

The tone of the uterus was increased by 50% after infection during the period of implantation and placentation.

PLNP with periodic administration of oxygen was used for the treatment of the intrauterine infection of the fetus. The state of uterine contractions was studied under these circumstances.

To begin with, the bioelectrical activity of the uterus before and after the use of PLNP was recorded in healthy albino rats on the 20th day of pregnancy. The results showed that PLNP increased the frequency of the fast waves to 2.3±0.2 Hz from the initial level of 1.5± 0.15 Hz and shortened their period from 0.7±0.07 sec in the control to 0.35±0.028 sec in the experiment ($P < 0.01$). The phase of slow waves was absent. The strength of the muscular contractions accompanying the fast waves was increased. Before PLNP, for instance, it was 318± 19.5 c.u., but 643±13.6 c.u. after it ($P < 0.01$).

A phase of slow waves with the same characteristics as before the beginning of the experiment appeared 20-30 min after the end of PLNP treatment (Fig. 1).

Application of PLNP with oxygen for the treatment of the infected pregnant rats on the 4th and 7th days led to the appearance of a phase of fast waves, alternating with a phase of slow waves.

The duration of the phases, the frequency and period of the fast and slow waves, and the strength of the uterine contractions reached their levels in the healthy albino rats (Fig. 2).

Intrauterine streptococcal infection of the fetus during pregnancy thus leads to disturbances mainly of the strength of muscular contractions accompanying fast waves and also to changes in the duration of the phases of the fast and slow waves. The greatest changes are observed in the case of infection during placentation.

Application of PLNP under normal conditions increases the frequency and strength of the muscular contractions accompanying the fast waves. This probably accelerates labor when abdominal compression is used in obstetrics. Treatment of pregnant albino rats infected in the period of implantation and placentation by means of PLNP combined with oxygen restores the altered parameters of uterine bioelectrical activity.

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EFFECT OF ADRENALECTOMY ON GASTRIC SECRETION INDUCED BY FOOD OR HISTAMINE IN DOGS

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The effect of total adrenalectomy on gastric function was studied in chronic experiments on dogs with Pavlov gastric pouches and Basov fistulas. The decrease in the level of maximal secretion of juice was connected with changes in the hemodynamics of the stomach. A tendency for the level of acid formation in the stomach to decrease was observed. Significant differences were found in the character of secretion of proteolytic enzymes in response to different types of activators of secretion, indicating the specific nature of activation of the gastric secretory system in the case of each stimulus, as well as differences in the effect of adrenalectomy on secretion induced by them.

KEY WORDS: *adrenalectomy, gastric secretion, histamine, food loading.*

In clinical and experimental investigations serious lesions of the gastrointestinal tract arise during disturbances of adrenal function [2, 3, 6, 9].

The object of this investigation was to study the effect of acute adrenal failure on the basic indices of gastric secretion. By the use of histamine and food loading tests it is possible to determine whether the changes observed are organic or merely functional.

EXPERIMENTAL METHODS

Chronic experiments were carried out on four dogs with Pavlov pouches (gastric secretion was induced by meat in a dose of 10 g/kg body weight) and on two dogs with Basov fistulas (secretion induced by histamine in a dose of 1 ml of the 0.1% solution, subcutaneously). Total adrenalectomy was performed in one stage. For the first 3 or 4 days after the operation

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