

EFFECT OF LOCAL NEGATIVE PRESSURE ON REPRODUCTIVE FUNCTION

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Local negative pressure acting in the region of projection of the internal reproductive organs in rats widened and enlarged the network of blood vessels, thereby increasing the specific area of transcapillary exchange. Activation of ovulation was observed and the number of follicles and the number of young rats in the litter were increased. Local negative pressure had a positive action on the developing embryo, fetus, and newborn animal.

KEY WORDS: negative pressure; estrous cycle; follicles; abdominal decompression.

A negative barometric pressure has recently become widely used in obstetric practice for quickening labor and relieving pain in its course, in early and late toxemias of pregnancy [2, 6, 9, 10, 12, 13], in gynecology [5, 7, 8], in sport medicine [1, 3], and in obliterative diseases of the blood vessels of the upper and lower limbs [4, 11].

A local negative pressure creates hyperemia in the organs and stimulates the mechanisms of transmembrane metabolism.

The object of this investigation was to study the effect of local negative pressure on reproductive function in albino rats.

EXPERIMENTAL METHOD

Experiments were carried out on 75 sexually mature albino rats weighing 200-250 g. Local negative pressure, i.e., abdominal decompression, was carried out with the aid of glass funnels of different diameters in which the pressure was reduced by 40 mm Hg. Exposure lasted 30 min. Abdominal decompression was created in the region of projection of the internal reproductive organs.

In the experiments of series I abdominal decompression for 30 min was carried out daily for 10 days on 23 nonpregnant albino rats.

The animals of series II (control) consisted of 25 healthy pregnant albino rats which received no treatment.

The series III abdominal decompression was carried out on 15 albino rats during the second half of pregnancy (from the 15-16th day of pregnancy until parturition).

In the experiments of series IV the action of abdominal decompression was studied on development of the embryo in 12 rats with staphylococcal infection.

EXPERIMENTAL RESULTS

In series I the estrous cycle was studied for 15-18 days before abdominal decompression. A normal, stable estrous cycle lasting 5-6 days was found in 20 of the 23 rats. In 3 animals the disturbance of the estrous cycle consisted of absence of the stage of heat.

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Under the influence of abdominal decompression the stage of heat was lengthened from 2 to 4 days. The preparatory stages of the estrous cycle were shorter in duration under the influence of abdominal decompression, although the total duration of the estrous cycle remained virtually normal (5-6 days). In the 3 rats with the disturbed estrous cycle a stage of heat appeared and the cycle was restored.

After 10 sessions 13 rats were killed for histological treatment. The ovaries, the uterine cornua, and the brain and pituitary glands were taken for investigation. Visual examination of the animals at autopsy revealed many ripe follicles. The mean number of follicles under normal conditions was 16-17, compared with 18-20 under the influence of abdominal decompression. Congestion of all the internal reproductive organs was observed, in the form of dilatation and an increased number of blood vessels, confirmed on histological examination.

The other 10 rats of this series were inseminated after 10 sessions of abdominal decompression in the stage of "lengthened" heat on the 4th day (normal 2 days) and they produced a normal, viable progeny.

The birth weight of the rats whose mothers had undergone abdominal decompression in the period of ovulation was rather higher than normal, with a mean value of 6.5 ± 0.04 g, compared with 6.0 ± 0.05 g in the control group. The physical development of the rats was virtually indistinguishable from normal. However, there was a tendency toward more rapid development (the ears opened on the 2nd-4th day, the eyes on the 15th-16th day, the incisors were cut on the 8th-10th day, whereas in the control group the ears opened on the 3rd-4th day, the eyes on the 15th-17th day, and the incisors were cut on the 8th-11th day). The number of rats in the litter was slightly larger (mean 11-12) than in the control group (9-10).

In the experiments of series III, in which local negative pressure was applied in the second half of pregnancy, no significant differences were found in the weight and physical development of the young rats compared with normal. However, there were no cases of stillbirth or postnatal death of the young rats, whereas in the normal series stillbirth was observed in $3.0 \pm 1.1\%$ and postnatal death of the young rats in $5.0 \pm 1.2\%$ of cases. In addition, in the young rats the nipples of the mammary glands appeared early in postnatal development (3rd-4th day) whereas in the rats of the control group they did not appear until the 5th-6th day.

In the experiments of series IV rats were taken at the 1st-2nd day of pregnancy. The criterion of fertilization was the presence of spermatozoa in the vaginal smear. The time of pregnancy was counted from this discovery. Pyogenic stain D 20/269 of Staphylococcus aureus was injected in a dose of 500×10^6 bacterial cells into the left uterine cornu of rats on the 1st or 2nd day of pregnancy. The operation was carried out under urethane anesthesia.

Abdominal decompression was applied to 6 rats from the 2nd day of disease until the 15th day of pregnancy. At autopsy on the rats on the 15th day of pregnancy embryos corresponding to the period of development in the control group were found. However, the number of embryos in the uterine cornua was small -- on the average 3 or 4.

In 6 infected rats not treated by abdominal decompression no blood appeared in the vaginal smears, indicating the absence of pregnancy. At autopsy on these rats either no embryos were found or they were macerated at an early age.

Abdominal decompression thus improves the trophic function of the internal reproductive organs, as reflected in an increase in the diffusion surface of transcapillary metabolism, prolongation of the stage of heat, an increase in the number of ripe follicles, and an increase in the number of young rats in the litter.

The method of abdominal decompression is harmless, for it acts beneficially on the easily injured developing embryo, fetus, and newborn rat.

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