

STRUCTURAL AND FUNCTIONAL TRANSFORMATIONS OF THE ILIAC LYMPH NODES DURING PREGNANCY COMPLICATED BY HEMORRHAGE

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Much has been published on the study of the circulation in the lymph-blood system after blood loss [1, 2]. Nevertheless, the morphologic and functional state of lymph nodes regional with respect to the reproductive organs during pregnancy complicated by hemorrhage, still remains unexplained (bearing in mind the fact that by the end of a physiological pregnancy the lymph nodes have undergone considerable transformations [4]). This investigation becomes increasingly more urgent if we look at the clinical data: among the causes of death in obsteric practice hemorrhage accounts for 20-25% of cases [3].

EXPERIMENTAL METHOD

Experiments were carried out on 24 pregnant (period of pregnancy 21 days) Wistar rats weighing 180-230 g. Under open ether anesthesia and aseptic conditions a midline laparotomy was performed. Acute blood loss was produced by dividing the left uterine artery; the volume of blood lost was 2.5 ml/100 g body weight. The anterior abdominal wall was closed in layers with interrupted sutures. Material was taken 1.5 and 4 h after damage to the artery, from the living animal under open ether anesthesia. The vascular pattern in the region of the uterus and its broad ligament was noticeably reduced in density, with marked ischemia of the uterus. The iliac lymph node regional with respect to the uterus, from the side of the damaged artery, was removed for investigation, fixed in 10% formalin, and embedded in paraffin wax. The relative area of the structural components (capsule, marginal sinus, medullary sinus, cortical plateau, primary and secondary lymphatic nodules [5]) of the iliac lymph node was calculated in serial sections stained with Mayer's helmatoxylin and eosin. The significance of differences between the mean values obtained and standard values was determined by comparing the criterion of significance with standard values of Student's test. The level of significance was $p < 0.05$. The mathematical analysis was carried out on a Neiron computer.

EXPERIMENTAL RESULTS

In the experimental group 1.5 h after division of the uterine artery a tendency was noted for the mass of the iliac lymph nodes to decrease (25.8 ± 2.7 compared with 32.6 ± 2.8 mg in the control group). This parameter 4 h after the operation (32.0 ± 1.5 mg) was virtually restored to its original level (Fig. 1).

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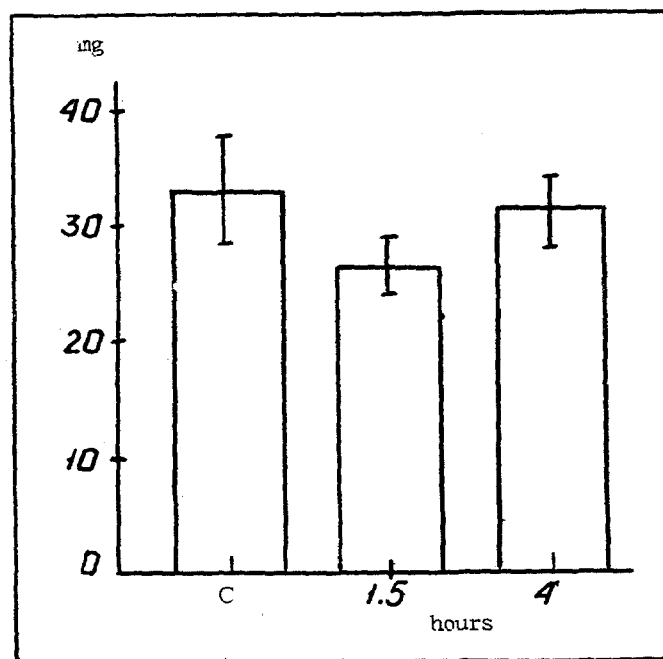


Fig. 1. Measurement of mass of iliac lymph nodes in pregnant rats after acute blood loss. C) Control (21st day of pregnancy). Ordinate, mass of lymph nodes (in mg); abscissa, time after acute blood loss (in h).

TABLE 1. Measurement of Relative Areas of Microanatomical Organization of Iliac Lymph Node in Pregnant Rats after Acute Blood Loss ($M \pm m$)

Feature studied	Control	Time after blood loss, h	
		1.5	4
Capsule, %	3.60 ± 0.28	2.92 ± 0.39	3.23 ± 0.40
Marginal sinus, %	3.13 ± 0.59	$1.38 \pm 0.52^*$	$1.72 \pm 0.47^*$
Paracortical zone, %	39.39 ± 2.35	43.76 ± 4.85	42.15 ± 2.95
Medullary sinus, %	18.33 ± 2.95	10.09 ± 5.15	10.32 ± 3.15
Medullary cords, %	15.90 ± 3.27	22.17 ± 6.20	$33.90 \pm 4.19^*$
Primary lymphatic nodules, %	8.24 ± 3.36	5.72 ± 6.27	5.18 ± 4.24
Secondary lymphatic nodules, %	4.79 ± 3.38	7.34 ± 6.34	2.27 ± 4.24
Cortical plateau, %	5.58 ± 3.46	6.34 ± 6.58	1.18 ± 4.27
Ratio of relative areas of cortical substance to relative areas of medullary substance	3.64	2.84	1.49
Ratio of relative areas of medullary cords to relative areas of medullary sinus	0.87	2.19	3.28

Legend. *) Differences significant compared with control group at $p < 0.05$ level.

Analysis of the morphometric data showed that 1.5 h after the operation the relative area of the marginal sinus was significantly reduced by 56% (Table 1). This parameter remained below the control values after 4 h also (Table 1). The area occupied by the medullary sinus had a tendency to fall after 1.5 and 4 h (Table 1).

It was noted that 4 h after division of the artery there was an increase in the relative area occupied by the medullary cords by 113% compared with the control.

The relative area of the paracortical zone had a stable tendency to increase in both groups investigated (Table 1).

After both 1.5 and 4 h a tendency was observed for the relative area of the primary lymphatic nodules to decrease (Table 1). The secondary lymphatic nodules had a tendency to increase after 1.5 h, but after 4 h they were sharply reduced in size.

Blood loss in pregnant animals thus leads to significant changes in the area occupied by the marginal sinus, evidently due to reduction of the outflow of lymph from the uterus. As regards such a large increase in the relative area of the medullary cords, in our view this takes place through a decrease in area of the medullary sinus. These changes may indicate changes in the transport functions of the lymph node during pregnancy when complicated by pathological hemorrhage.

REFERENCES

1. A. P. Zhdanov, V. N. Gavrilin, and N. N. Trubitsyna, *The Microcirculatory Bed of the Internal Organs under Pathological and Experimental Conditions* [in Russian], Alma-Ata (1990), p. 11.
2. V. É. Reikhert, V. N. Grigor'ev, and V. N. Gavrilin, *Byull. Sib. Otd. Ross. Akad. Med. Nauk*, No. 3, 52 (1989).
3. V. N. Serov, A. M. Strizhakov, and S. A. Markin, *Practical Obstetrics: A Textbook* [in Russian], Moscow (1983).
4. N. A. Sklyanova, V. A. Shkurupii, and V. N. Grigor'ev, *Byull. Éksp. Biol. Med.*, No. 11, 630 (1987).
5. T. S. Smirnova, *Arkh. Anat.*, No. 10, 96 (1987).