

EFFECT OF TRANSIENT FIXATION OF RABBITS IN THE SUPINE POSITION ON STRUCTURE OF THE LIVER AND ACTIVITY OF SOME SERUM ENZYMES

N. V. Korostovtseva and T. N. Krivosheenko

UDC 612.35+612.128/-06:612.76

Morphological investigation of liver biopsy material from rabbits fixed to a frame in the supine position for 3 h revealed a redistribution of blood in the organ and degenerative changes of the hepatocytes. The changes developed 15-20 min after the animals were tied and they persisted for 24 h. Meanwhile, activity of aspartate aminotransferase, alanine aminotransferase, and lactate dehydrogenase in the blood serum increased, the increase in the last case affecting predominantly LD₄ and LD₅.

In investigations on rabbits to determine the activity of certain enzymes - aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH), and its isoenzymes - during blood loss [1, 2] and traumatic shock [4] it was discovered that the activity of these enzymes was increased in the control animals, which were simply tied to a frame, in the same way as in the experimental animals, but to a much lesser degree [5]. On the basis of these findings it was postulated that fixation of the rabbits to a frame leads to redistribution of the blood in the body and to a disturbance of the circulation in the organs and, in particular, in the liver. This hypothesis was supported by the fact that the concentrations of LD₄ and LD₅ were predominantly increased, and these are organ-specific isoenzymes for the liver [3, 6].

To verify this hypothesis a morphological study was made of the liver at various times after fixation of rabbits in recumbency in the supine position.

EXPERIMENTAL METHOD AND RESULTS

The temperature of the rabbits during fixation in the supine position fell regularly from 38.5 (37.5-39.1°) to 37.5° (36.4-38.6°). Activity of the serum enzymes, just as in the previous investigations [5], increased regularly ($P < 0.01$). The AST activity was increased 24 h after the end of fixation from 9.2 (4.1-15.1) to 15.8 (6.7-29.2) units, ALT activity from 12.6 (7.6-22.5) to 19.1 (12.1-25.2) units, and LDH from 1.1 (0.8-1.4) to 6.1 (3.0-13.2) μ moles/ml/h. Meanwhile the isoenzyme spectrum of LDH was altered, with an increase in the content of LD₄ and LD₅. The activity of all these enzymes had returned to its initial level after 3 days.

The liver structure 15-20 min after the beginning of fixation of the rabbits in the supine position differed considerably from usual (Fig. 1a). By this time a redistribution of blood in the organs was observed, with degenerative changes in the hepatocytes, more especially in the central portions of the lobules. These last changes were probably due to the fact that hypoxia was more severe in these portions (Fig. 1b). During the first 24 h, the damage to the liver became more severe, the manifestations of cloudy swelling and fatty degeneration and changes due to disturbance of the water and mineral metabolism grew in intensity, while the glycogen content of the hepatocytes was reduced (Fig. 1c, d). Later the normal structure of the organ was gradually restored (Fig. 1e).

Central Research Laboratory, Leningrad Pediatric Medical Institute. (Presented by Academician of the Academy of Medical Sciences of the USSR P. A. Veselkin.) Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 73, No. 3, pp. 32-34, March, 1972. Original article submitted March 18, 1971.

© 1972 Consultants Bureau, a division of Plenum Publishing Corporation, 227 West 17th Street, New York, N. Y. 10011. All rights reserved. This article cannot be reproduced for any purpose whatsoever without permission of the publisher. A copy of this article is available from the publisher for \$15.00.

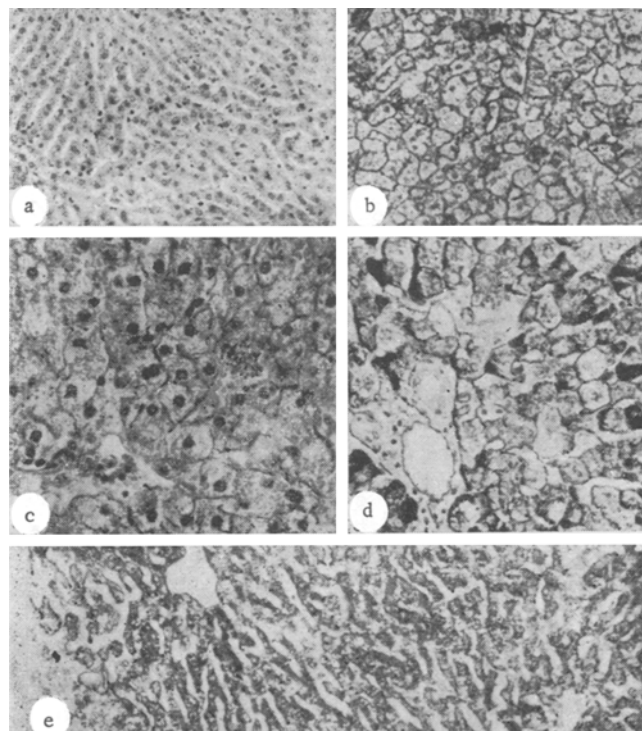


Fig. 1. Morphological changes in the liver after fixation of a rabbit in the supine position: a) normal structure of the rabbit liver (hematoxylin-eosin, 135 \times); b) liver of a rabbit 15-20 min after tying to a frame: disturbance of normal structural units, polymorphism of hepatocytes, many of the cells large with pale and granular cytoplasm (hematoxylin-eosin, 135 \times); c) liver of a rabbit 3 h after fixation; hepatocytes large and pale (hematoxylin-eosin, 300 \times); d) liver of the same animal, irregular distribution of glycogen (PAS reaction, 300 \times); e) liver of rabbit 3 days after fixation; restoration of normal liver structure (hematoxylin-eosin, 135 \times).

These experiments thus demonstrate that fixation of a rabbit, even for a short time, in the supine position is a procedure with a marked effect on the animal, accompanied by disturbances of function and changes in the structure of the liver. Nevertheless, many investigations on rabbits are undertaken on animals fixed to a frame in the supine position, with total disregard of these changes.

The results obtained are also interesting because they show that an increase in blood enzyme concentrations can develop in the absence of necrosis of the hepatocytes.

LITERATURE CITED

1. N. V. Korostovtseva et al., in: Proceedings of a Scientific and Practical Conference of Workers in the Blood and Hematology Services of the RSFSR [in Russian], Kirov (1968), p. 167.
2. N. V. Korostovtseva and S. I. Sonina, in: Proceedings of a Conference to Review Scientific Activity of the Leningrad Institute of Hematology and Blood Transfusion in 1968 [in Russian], Leningrad (1969), p. 16.
3. I. M. Markelov et al., *Klin. Med.*, No. 11, 88 (1966).
4. D. S. Simkin, Changes in the Activity of Some Enzymes in the Blood Serum in Traumatic Shock (Experimental Investigation). Author's Abstract of Candidate's Dissertation, Leningrad (1969).
5. D. S. Simkin, in: Proceedings of a Conference to Review Scientific Activity of Leningrad Institute of Hematology and Blood Transfusion in 1968 [in Russian], Leningrad (1969), p. 13.
6. R. J. Wieme and J. Marck, *Ann. New York Acad. Sci.*, 94, 898 (1961).