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MORPHOFUNCTIONAL STATE OF THE VESSELS OF THE LIVER IN EXPERIMENTAL THERMAL TRAUMA

Summary. *In experiment on guinea pigs with thermal injury of skin was investigated the histological and electron-microscopic changes in blood vessels of the liver at different periods after thermal injury. Found that stage of a toxemia is characterized by vascular changes that are adaptive-compensatory in nature. In the later stages after the burn (stage of late of a toxemia and septicotoxemia) found significant degradation veins, blood vessels of triads and capillaries, inhibition of regeneration.*

Key words: *liver, vessels, histological and electron-microscopic changes, thermal burn.*

Introduction

Burn disease that occurs in severe burns, takes one of the first places among other diseases and traumatic injuries, has a high mortality rate, the complexity of disease, duration of treatment and a high degree of disability [Бігуняк, 1995; Гунас, 1998; Козинець та ін., 2008].

Setting the pathogenesis of body systems at thermal injuries at this time is an actual problem in medicine.

Despite the great importance of the digestive system in effects on the body different damaging and stress factors, in the scientific literature we have little data about the structural changes in the largest gland of digestive system - liver when burns.

So important is making morphological research the state of vessels of the liver in experimental thermal injury using the modern histological techniques [Шкурупий, 1989; Гунас, 1998; Нетюхайло та ін., 2011].

The aim of this work was to establish the morphological changes of the vascular bed of the liver in experimental thermal injury.

Materials and methods

Experiments carried out on 24 mature guinea pigs. The burn applied under the ether anesthesia by water vapor at a temperature of 96-97 C on the shaved back skin surface for 60 seconds. Under such conditions developed burn of IIIA - IIIB degree. Area of destruction was 18-20% of the body surface of animals.

To establish the morphological changes of the liver, experimental animals were decapitated on 7, 14 and 21 days (respectively - early and late stages of toxemia and septicotoxemia).

For histological examination the liver was fixed in 10% neutral formalin with further pouring in paraffin. The obtained sections were stained with hematoxylin and eosin, examined in light-optical microscope and documented using a microscope MICROmed SEO SCAN and video system "Vision CCD Camera".

For electron microscopic study of tissue, pieces were fixed in 2.5% glutaraldehyde solution, after fixation was performed using 1% tetroxide solution of osmium in phosphate buffer [Горальський та ін., 2011].

Further processing was carried out according to

conventional methods. Ultrathin sections made on ultramicrotome LKB-3 (Sweden), contrasted by uranyl acetate, citrate lead according to Reynolds method and studied in the electron microscope ПЕМ-125 К.

Results. Discussion

Histological study of the liver on day 7 of the experiment showed that in the early stage of burn disease toxemia holes in the central and underlobular veins significantly expanded, filled with blood cells, mainly erythrocytes.

There is also a plethora of vessels triads (Fig. 1). Around the triads marked leukocyte infiltration.

The study of the structural components of the microcirculation of the liver showed dilated capillaries holes, increased in size edematous endothelial cells with light cytoplasm, round-oval euchromatin or pyknotic nucleus.

Near sinusoidal spaces of Disse sometimes not clearly defined.

Much more than in the capillaries of the intact animals observed Kupffer cells that have a compact basophilic nuclei and wrong outlines plasmolemma.

Submicroscopic studies of capillaries suggest about violation of structural organization of all its components.

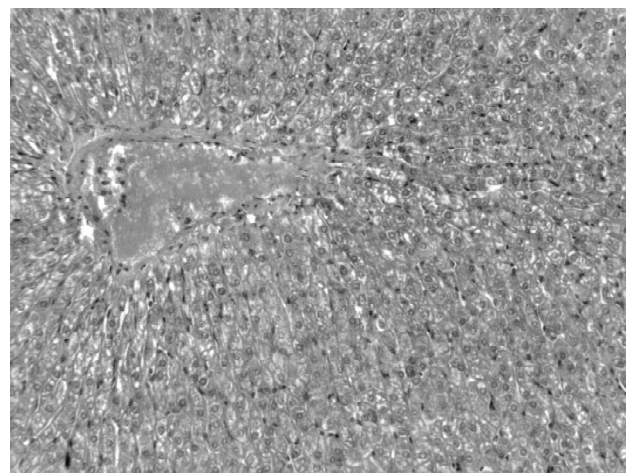


Fig. 1. The histological changes in the liver of the animal on day 7 after thermal injury. Extended central vein, destructive changes in hepatocytes of lobules. Hematoxylin-eosin. x200.

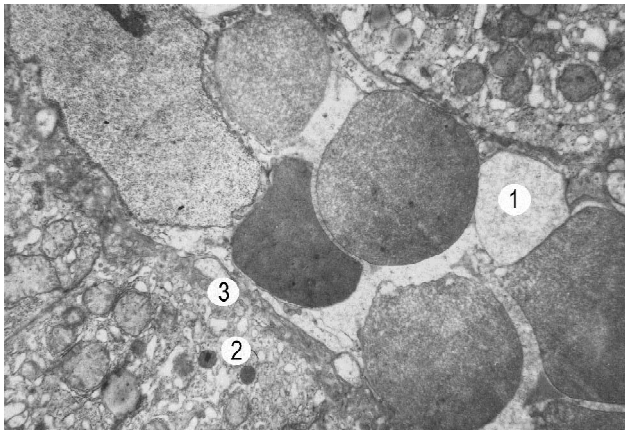


Fig. 2. Fragment liver capillary animals on day 7 after thermal injury. Wide clearance (1), enlightened cytoplasm of endothelial cells (2), not numerous microvilli in space of Disse (3). x16000.

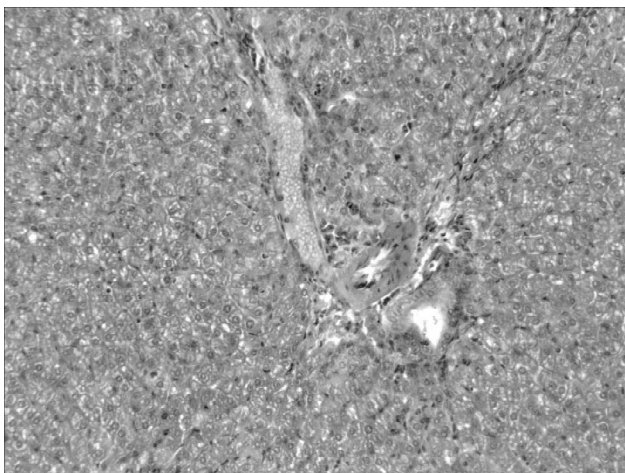


Fig. 3. Histological changes in the liver of the animal at 14 days after the burn. Changing the structure of triad, leukocyte infiltration. Hematoxylin-eosin. x200.

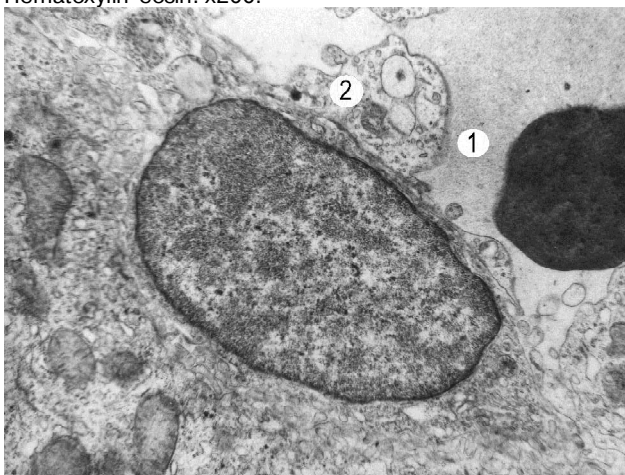


Fig. 4. A fragment of liver blood capillaries animals at 14 days after thermal injury. Extended lumen (1), changed structure of endothelial cells (2). x25000.

The holes of the most blood capillaries are expanded (Fig. 2).

For endothelial cells is typical edema, enlightenment of the cytoplasm, reduce of number of pinocytosis bubbles.

In round-oval nuclei prevails euchromatin and karyolemma have rare intussusception. In the cytoplasm there is a small number of organelles: short expanded tubules granular of endoplasmic reticulum, few number of ribosomes and polysomes.

Golgi apparatus is well defined is and its components are vacuolated. Edema of mitochondrial is accompanied by matrix enlightenment and reduction of cristae. In the cytoplasm of endothelial cells there is a few number of lysosomes.

Spaces of Disse are uneven, have a widened sections and snug fit of endothelial cells to the vascular pole of hepatocytes. In the lumen of blood capillaries often observed active macrophages.

They are increased in size, have a large area of cytoplasm. Plasmolemma of macrophages is uneven, forms numerous cytoplasmic grow and intussusception, indicating the active phagocytosis of these cells.

14 days after burn injuries in the liver we can observed destructive and necrobiotic changes in lobules, desolated central vein in the background of plethora in vessels of triads.

Around portal tracts in loose connective tissue of stroma observed leukocyte infiltration (Fig. 3)

In some areas of hepatic particles, sinusoid is dramatically expanded and with full blood filling; also found empty, with small lumen of capillaries, that are narrowed.

For ultrastructure of capillaries in this term experiment are typical expanded holes, altered wall components.

In the cytoplasm of endothelial cells was observed little number of pinocytosis organelles and vesicles. Spaces of Disse are uneven, have expanded and narrow area, and a small number of microvilli (Fig. 4).

Microscopic examination of the liver in the stage septicotaxemia (21 day of the experiment) set more significantly expanded and blood supply vessels, foci of necrosis and leukocyte infiltration of the gland parenchyma.

There is a plethora of central veins and sharp plethora around lobular arteries and veins of triads.

There is a moderate plethora in liver parenchyma in some areas are expanded sine wave.

In the intermediate zone of hepatic lobes and around portal tracts we can see broken lobed-beam structure of organ. In these same areas we can see narrow spaces of Disse (Fig. 5).

Submicroscopic study of blood capillaries at 21 day of the experiment testify to a deep damage all components.

Capillaries with wide lumen filled with blood cells.

Endothelial cells of blood vessels have oblong or irregularly shaped nuclei with intussusception.

In the near nuclear area of the light swollen cytoplasm observed little number of organelles, some are dilated, deformed tubules of granular endoplasmic reticulum, little number of ribosomes, small with a light matrix of

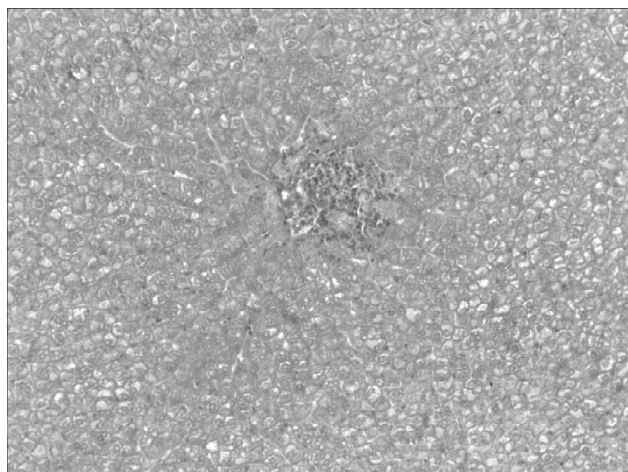


Fig. 5. The histological changes in the liver of the animal at 21 days after the burn. Destructive changes in hepatocytes lobules, leukocyte infiltration. Hematoxylin-eosin. x200.

mitochondria have irregular contours, isolated christie.

In some areas mitochondrial membrane are fuzzy and destroyed. Disse spaces in many parts are narrow, microvilli are badly observed, some of them are destroyed.

Conclusions and prospects for further development

1. Conducted microscopic and electron microscopic studies of liver in the dynamics of experiment after severe thermal injury found that in stage of a toxemia typical changes in blood vessels that are adaptive-compensatory in nature.

2. In the later stages after the burn (stage of late toxemia and septicotoxemia) found significant degradation of veins, capillaries and vessels of triads, inhibition of regeneration.

Obtained results testify to expediency continuing research morphofunctional state of liver after experimental thermal injury in terms of corrective factors.

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Тупол Л.Д.

МОРФОФУНКЦІОНАЛЬНИЙ СТАН СУДИН ПЕЧІНКИ ПРИ ЕКСПЕРИМЕНТАЛЬНІЙ ТЕРМІЧНІЙ ТРАВМІ

Резюме. В експерименті на морських свинках проведені мікроскопічні та електронно-мікроскопічні дослідження компонентів судинного русла печінки у різні терміни після термічної травми. Встановлено, що у стадії токсемії характерними є зміни судин, що носять пристосувально-компенсаторний характер. У пізні терміни після опіку (стадії пізньої токсемії та септико-токсемії) виявлена значна деструкція вен, судин триад та гемокапілярів, пригнічення процесів регенерації.

Ключові слова: печінка, судини, гістологічні та електронно-мікроскопічні зміни, термічна травма.

Тупол Л.Д.

МОРФОФУНКЦИОНАЛЬНОЕ СОСТОЯНИЕ СОСУДОВ ПЕЧЕНИ ПРИ ЭКСПЕРИМЕНТАЛЬНОЙ ТЕРМИЧЕСКОЙ ТРАВМЕ

Резюме. В эксперименте на морских свинках проведены микроскопические и электронно-микроскопические исследования компонентов сосудистого русла печени в различные сроки после термической травмы. Установлено, что в стадии токсемии характерные изменения сосудов, носящие приспособительно-компенсаторный характер. В поздние сроки после ожога (стадии поздней токсемии и септикотоксемии) обнаружена значительная деструкция вен, сосудов триад и гемокапилляров, угнетение процессов регенерации.

Ключевые слова: печень, сосуды, гистологические и электронно-микроскопические изменения, термическая травма.

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