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Morphological Changes in the Liver during Hormonal Therapy of Scars after Experimental Abdominal Surgery

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Abstract: Comprehensive measures aimed at the development of medicine are being implemented in our country, particularly to reduce functional and organic disorders of the liver, its diseases, and complications, as well as to improve methods of treatment and prevention of these conditions, achieving significant results. The liver plays a leading role in the structure of digestive system pathologies, diseases, and mortality causes. Disorders of the digestive system are based on developmental abnormalities, dietary violations, and the structural and functional state of the digestive process. Scars after abdominal surgery can be of three types. Normotrophic scars are almost identical to the skin and appear as a thin white line after complete healing. Hypertrophic scars rise above the skin surface and are bright red. Atrophic scars are located below the skin level and include stretch marks and traces.

Keywords: liver, morphology, morphometry, scar, hormonal therapy.

Purpose of the Research: To analyze and study the morph functional changes in the liver caused by hormonal therapy of scars after abdominal surgery.

Materials and Methods: For our experiment, 30 five-month-old albino rats of both sexes were selected. All laboratory albino rats were housed in the same vivarium. The animals were provided with adequate water and fed with a balanced diet. Proper care and maintenance of the laboratory animals were considered crucial in the preparation and conduction of the experiment. The feeding regime and adherence to the dietary plan, as well as maintaining hygienic conditions during feeding, were strictly followed.

All the albino rats in our experiment were divided into three groups:

The first group of rats (intact) served as the control group, which was fed with a standard diet to compare the results with other groups.

The second group consisted of albino rats with abdominal surgery scars treated with conventional (standard) methods.

The third group included albino rats with abdominal surgery scars treated with hormonal therapy.

(Table 1). Distribution of animals based on the experimental content.

Groups (n-control, t-experimental)	Experimental content	The age of the animals	Total number of animals (*number of deceased rats*)
		5month	
I c	Control	10	10
II e	Albino rats with abdominal surgery scars treated with conventional (standard) methods.	10(1*****)	10(1*)
III t	Albino rats with abdominal surgery scars treated with hormonal therapy.	10(1*****)	10(1*****)
Total		30(2*****)	30(2*)

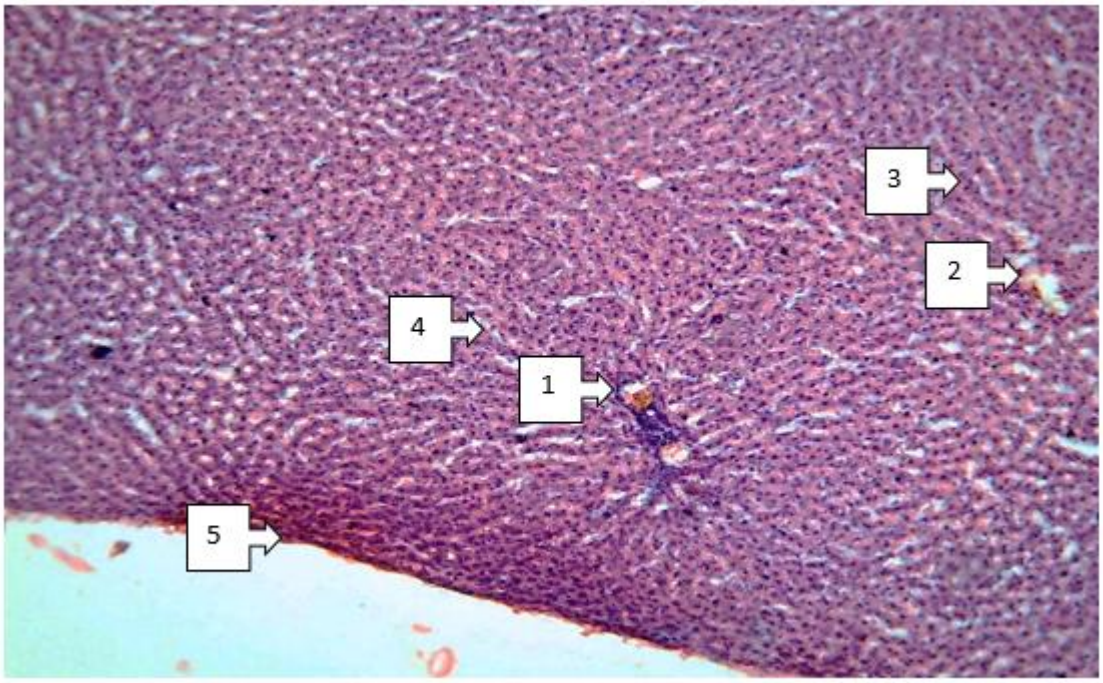
In our experiment, a total of 30 five-month-old albino rats were used, and during the experiment, 2 albino rats perished. The bodies of the deceased animals were buried in the ground, and in accordance with the act on the disposal of deceased laboratory animals, they were disinfected with a 20% chlorine solution.

The euthanasia of the experimental animals was performed at appropriate intervals, in the morning, on an empty stomach, using a one-time decapitation method under ether anesthesia. After opening the abdominal cavity, the liver was separated. The width of the liver was then measured using a millimeter ruler.

Pic-1 Macroscopic preparation obtained from the liver of 5-month-old albino rats in the control group.

Results and Conclusions

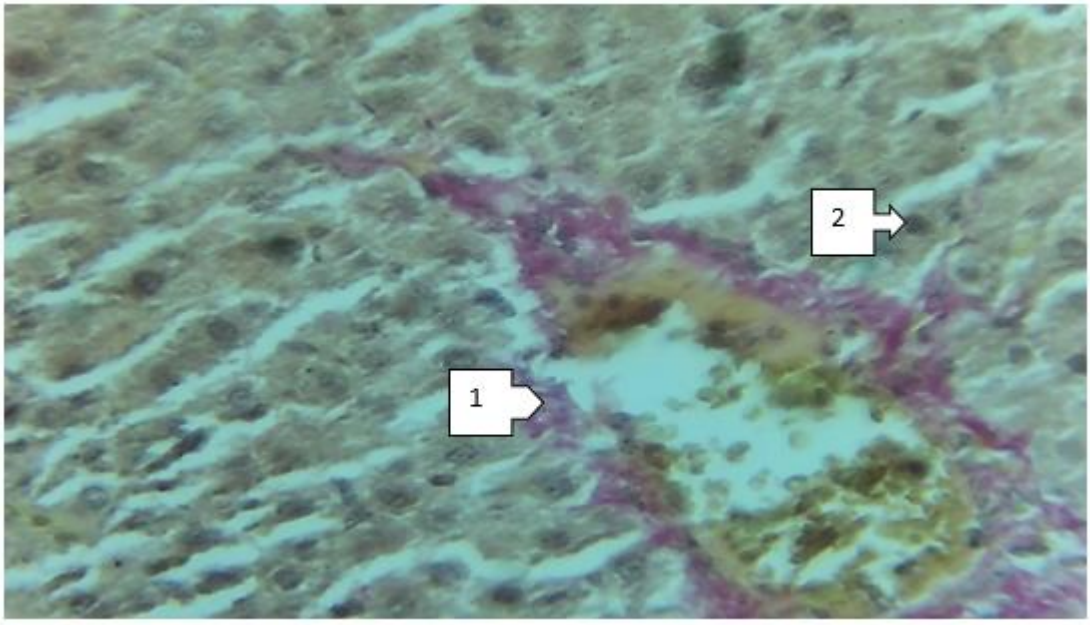
The liver is covered by a connective tissue capsule, which extends into the liver parenchyma and forms a fragmented structure. Only in the portal tract area is the lobular appearance clearly distinguishable. In rats, as in humans, fibrous layers do not separate the liver into distinct lobules. The boundaries of the segments are conditional lines between the portal tracts. The liver cells and hepatocytes are arranged in relatively regular rows within the fragments, forming two-layered radial liver plates. The transverse size of the hepatocytes (the distance from the center of one hepatocyte nucleus to the proximal nucleus of another hepatocyte) ranges from 21.0 to 28.0 microns, with an average of 25.1 ± 0.45 microns. They have a polygonal shape with distinct borders. The cytoplasm is amphophilic, donor-like. In the perinuclear zone and along the sinusoidal space, there is a pale cytoplasm background with fine granular basophilic material corresponding to the granular endoplasmic reticulum.



Pic 2. Microscopic appearance of the liver of a 5-month-old albino rat. Stain: G-E. Magnification: 4x10.

1. Liver triad: Bile duct, artery, vein.
2. Central vein: Sinusoids directed from the periphery towards the central vein.
3. Hepatocyte cells: (Single or binucleate, small, round, hyperchromatic nuclei, and cytoplasm stained widely eosinophilic).
4. Sinusoidal spaces.
5. Liver capsule (Glisson's capsule).

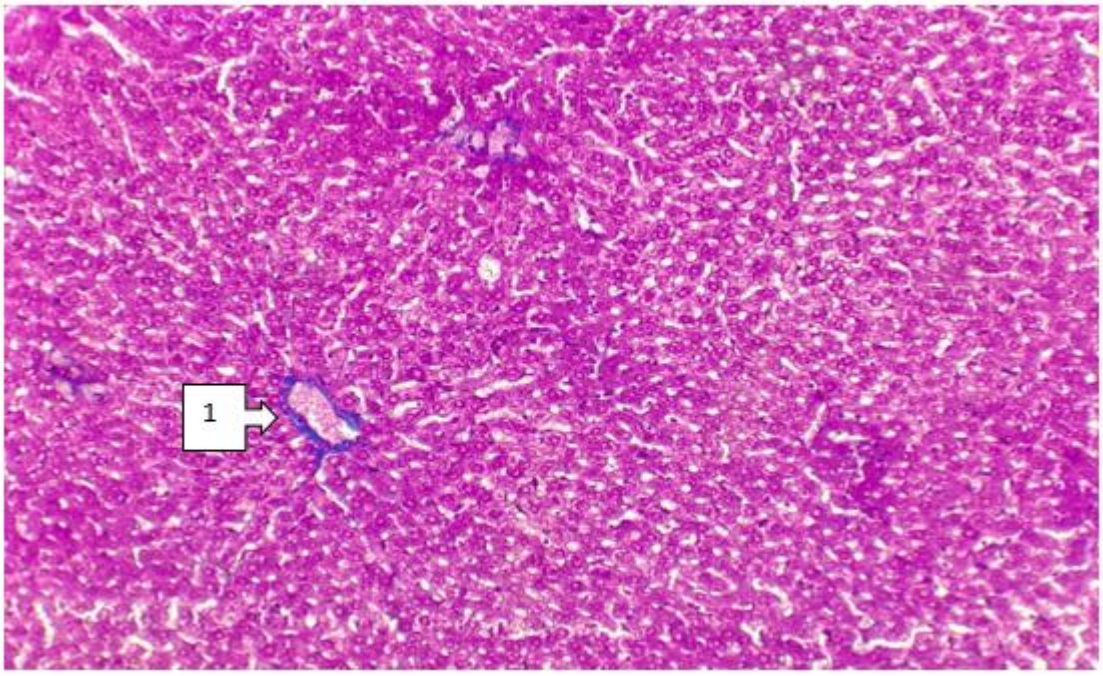
In the standard liver tissue stained with the Van-Gieson method, the central vein was not enlarged, and the vessel walls were not thickened. The hepatocyte size was not enlarged, and the number of binucleate hepatocytes was within the normal range. The liver hepatocyte cells stained dark brown, and the cytoplasm stained a pale liver color, as shown in pic 6.



Pic 3. Microscopic appearance of the liver of a 5-month-old albino rat in normal condition. Stained with Van-Gieson, magnification 4x10:

1. Central vein;
2. Hepatocytes.

When the micropreparations made from the liver of 5-month-old albino rats were stained using the Masson method, only thin collagen fibers were observed around the central vein. These fibers strengthen the vein structure. Additionally, we found normal collagen fibers around the portal tracts (portal areas). These fibers are located around the portal veins and bile ducts.

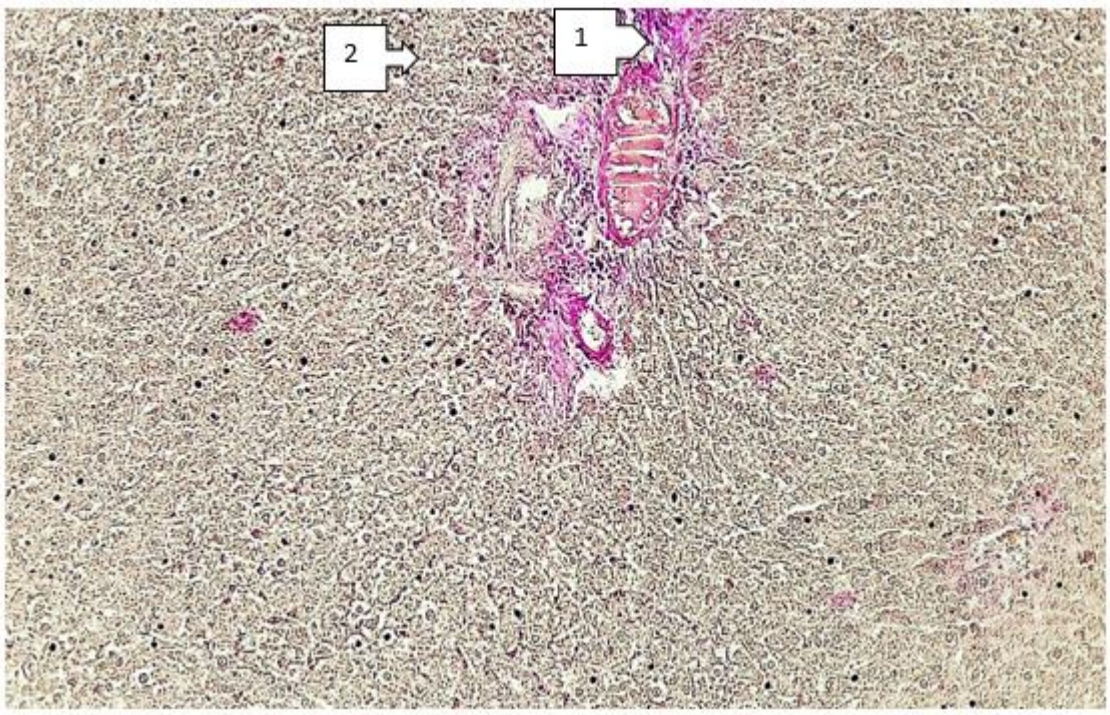


Pic 4. Microscopic appearance of the liver of a 5-month-old albino rat in normal condition. Stained with Masson, magnification 4x10:

1. Collagen fibers around the central vein.

In the first experimental group, morphological and morphometric changes resulting from the traditional treatment of scars were identified. The liver size increased, becoming slightly softer,

with rounded edges. Its color was grayish-yellow, with areas of dark red that had expanded. Congestion began at the center of the liver lobules, which later led to the widening of sinusoids, causing them to fill with blood. Congestion continued at the peripheral regions of the liver lobules, where we could observe congestion in the interlobular arteries and veins. The center of the liver lobules was dark liver-colored, while the edges changed from light brown to dark brown, and it was determined that the liver tissue appeared almost uniform. Vascular damage and increased swelling in the liver were noted. Swelling was diffusely distributed across all lobes. The fluid accumulated in the perisinusoidal spaces, perivascular spaces along the branches of the portal vein, and along the drainage system. Collagen fibers were found to be swollen (stained red), and the cellular elements were displaced and compressed by the swollen fluid. Their nuclei shrank, and the number of binucleate hepatocytes increased, which was also visible in Van-Gieson staining. This process is considered a response to the toxic effect of connective tissue.



Pic 5. Morphological appearance of the liver of a 5-month-old albino rat after the traditional (standard) treatment of post-surgical abdominal scars. Stained with Van-Gieson, magnification 10x20:

1. Swelling and collagenization along the branches of the portal vein.
2. Formation of fissures due to swelling.

In the experiment, morphological changes in the liver were studied after administering hormonal therapy to treat post-surgical abdominal scars. The liver appeared pale liver-colored, with a smooth and even surface, medium firmness, sharp edges, and an overall healthy appearance.

Microscopic examination revealed that the central vein was wide, with a well-defined and firm wall. The sinusoidal spaces directed toward the central vein were slightly widened, with clear boundaries. The Kupffer cells in the vein walls were increased in number and enlarged.

Conclusion

The use of hormones in the treatment of post-surgical abdominal scars helps prevent the progression of hypoxia in the body by maintaining normal pH levels within cells and inhibiting the release of lysosomal enzymes. This approach improves blood circulation in the microcirculatory bed, thereby meeting the oxygen demand of the tissue.

Microscopic examination revealed that the central vein was wide with a firm wall. The sinusoidal spaces directed toward the central vein were slightly expanded with clear boundaries. Kupffer cells in the vein walls were increased in number and size.

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