ACTA SCIENTIFIC MEDICAL SCIENCES

Volume 3 Issue 3 March 2019

Research Article

Morphological Changes of the Diaphragm in Chronic Purulent Pneumonia (Experimental Study)

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Received: January 07, 2019; **Published:** February 12, 2019

Abstract

We used the model of experimental chronic purulent inflammation of the lungs of 12 mongrel white rats weighing 180-200 g. at the age of 1.5 years, by the method of Batyrova Z. B., and Shamirzaeva N. H. (2002). The control group (n = 8) consisted of healthy animals. During the examination on 30th and 45th days from the beginning of the experiment we determine moderate dystrophic and compensatory changes in the diaphragm tissue as a result of purulent inflammation of the lungs. Morphological changes in the diaphragm tissue are characterized by focal infiltration of lymphoid elements, moderate interstitial edema with impaired blood circulation of the muscular wall of the diaphragm tissue.

Keywords: Diaphragm; Chronic Purulent; Morphological

Introduction

Currently the chronic obstructive pulmonary disease (COPD) is one of the most common human diseases in the world. COPD leads to disabilities. It results in significant economic and social damage to society [1]. The main cause of death in COPD is the development of severe respiratory failure [2,3,5,8]. The increasing weakness of the respiratory muscle, the diaphragm, plays a crucial role in the development of respiratory failure in patients with COPD [4,6,7,9,10]. The diaphragm is predominantly composed of fatigue-resistant slow, type I muscle fibers and fast, type IIa muscle fibers.

The diaphragm is an important part of a single abdominal pumping mechanism. It supports the necessary blood flow to the heart [2]. The main functions of the diaphragmatic muscle provide its structural and functional changes in respiratory failure.

A critical reduction in the contractile ability of the respiratory muscles may be one of the causes of decompensation into respiratory failure in patients with COPD. At the same time, the diaphragm additionally suffers a resistive and elastic load. In turn, this leads to an increase in its work, to a compensatory hypertrophy of muscle fibers and an increase in the volume [3].

The purpose of the study is to evaluate the morphology of the diaphragm in experimental chronic pulmonary inflammation (e-CPI). The task of the study is to identify morphological changes in the tissue of the diaphragm in e-CPI.

Materials and Methods of the Study

We examined 22 (why 22 rats? In the beginning of the article they were 20 in general) white male rats weighing 180-200 g. We divided the subjects into 2 groups. In the first group, healthy rats were examined (8). In the second group (14), rats with the e-CPI model were examined. The model was reproduced by the method of Batyrova ZB and N. Shamirzaev [11]. E-CPI caused by prolonged mechanical intra-tracheal-bronchial irritation of the respiratory tract. Under sterile conditions, using local Novocain anesthesia, a longitudinal incision was made along the median line on the front surface of the animal's neck, 1.5-2.0 cm long. up to 8-10 cm long. At the same time, the distal end of the thread was located in the lumen of the trachea, and its proximal end was fixed on the skin. The wound was sutured in layers tightly. Slaughter of animals was carried out by instant decapitation on days 30-45 from the moment of reproduction.

For morphological studies, we took pieces of the diaphragm and lung tissue after slaughter and fixed them in a 10% solution of neutral formalin. We stained paraffin histological sections 5-6 microns thick with hematoxylin by eosin. Microscopy of the preparation was carried out under an XS-213 light-optical microscope and a Leica microscope.

The results of the study

The macroscopic picture of the diaphragm in healthy rats in the center is transparent, white, with dense reddish edges. Microscopically in some cases, interstitial edema and full-blooded blood vessels are seen. Macroscopic picture of e-CPI: the surface of the lung is smooth, dull. Light non-falling, in places of pale gray-red or dark red color, doughy consistency. Edematous tissue with fibrin filaments. Under the pleura and in the parenchyma, small hemorrhages were found. On the section of the bronchial lumen a frothy cloudy liquid flow, sometimes painted pink (Figure 1).

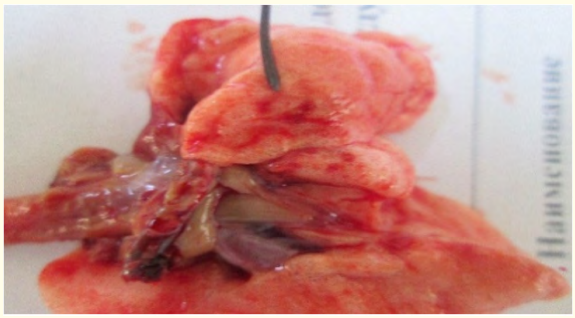

Figure 1: The surface of the lung rat on the 40th day of purulent pneumonia.

As seen in figure 2, the surface of the diaphragm is dim, full-blooded vessels.

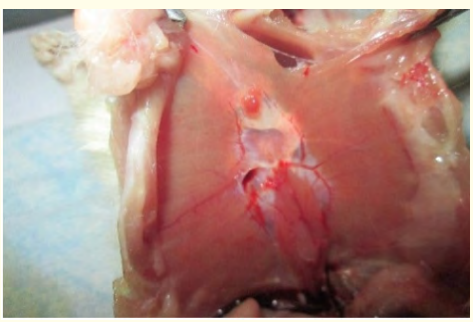

Figure 2: The diaphragmatic muscle on the 40th day of purulent pneumonia (front view)

As seen in figure 3, uneven coloring is observed, alternating dense areas with elastic layers. In figure 4 the pleura is empty, fibrin overlay.

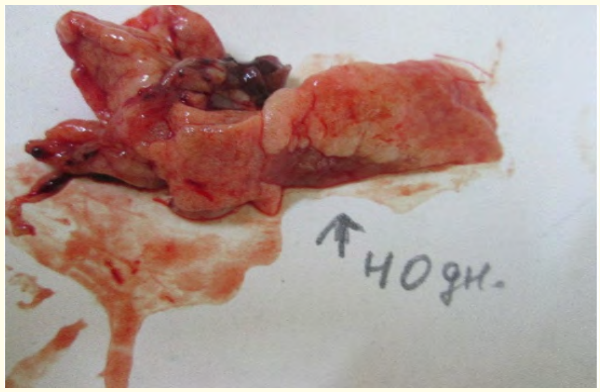

Figure 3: Model of purulent pneumonia on day 40 of experiment.

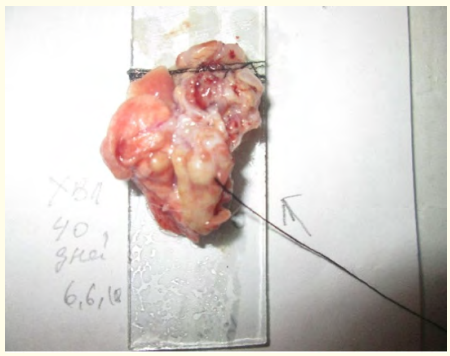

Figure 4: A section of purulent pneumonia on day 40 of experiment.

In the control group of animals (Figure 5), changes in the diaphragm were manifested only by interstitial edema and plethora.

When microscopying the diaphragm in experimental animals with e-CPI compared with the control group, the morphological manifestations were determined by dystrophic and compensatory changes. Focal contractile myocyte degeneration was noted. Uneven hypertrophy and focal atrophy with dystrophic swelling of myocytes. In the intermuscular zones there were proliferations of connective tissue interlayers, as well as focal infiltration of the stroma by lymphoid elements, moderate interstitial edema (Figure 6).

Figure 6 shows focal lymphocytic stromal infiltration and edema of the mesothelium.

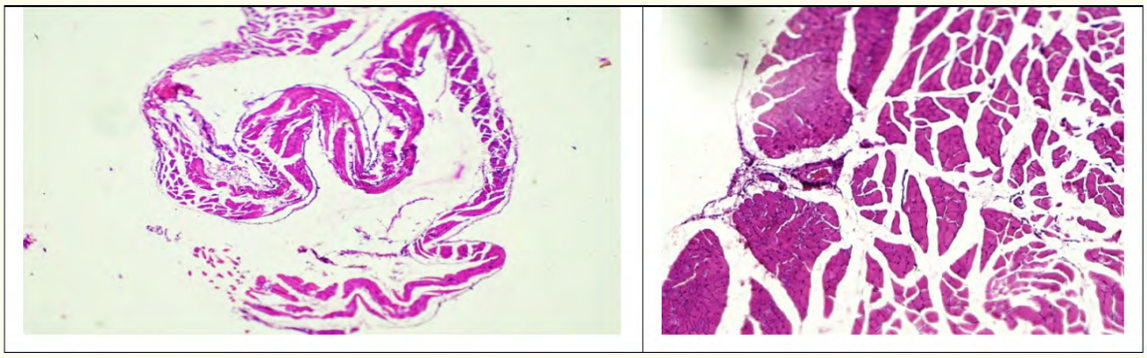

Figure 5: The diaphragm of the rat control group. Scale. 10 x 10,10h20. Coloring hematoxylin-eosin.

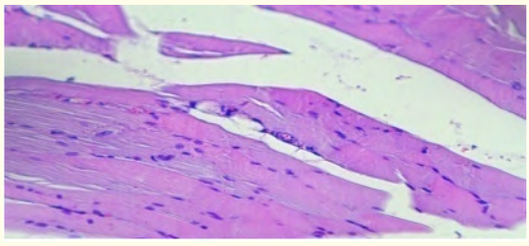

Figure 6: TRat diaphragm with e-CPI Marked interstitial edema. Scale. 10x20, 10x40. Hematoxylin-eosin staining.

We see perivascular sclerosis in figure 7 and 8. Thus, the identified changes in the diaphragm indicate the inclusion in the inflammatory process and the diaphragm occurring in the lung tissue in e-CPI.

Conclusion

1. With prolonged mechanical irritation of the bronchi and e-CPI call, cellular changes occur in the diaphragm tissue.

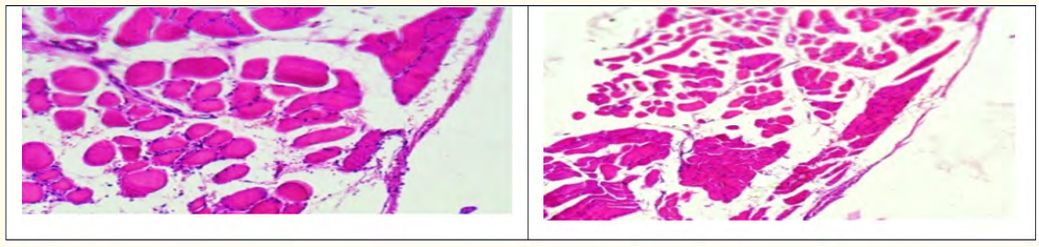

Figure 7: Rat diaphragm with e-CPI. Hypertrophy of some and atrophy of other myocytes. Severe interstitial edema. The proliferation of connective tissue layers. Scale. 10x10, 10x20. Coloring hematoxylin-eosin.

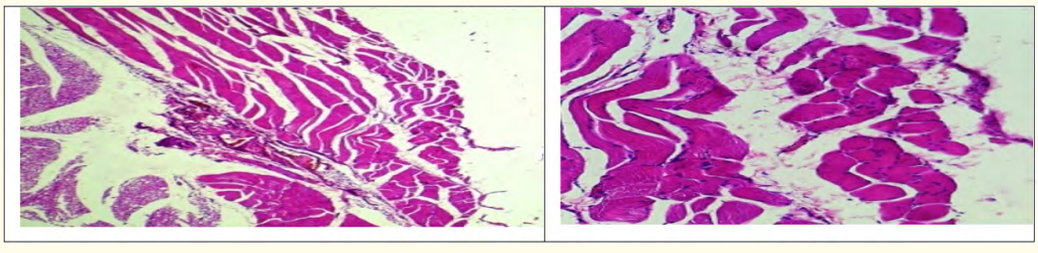

Figure 8: Rat diaphragm with e-CPI. Contractile changes in myocytes. The proliferation of connective tissue layers. Scale. 10x10, 10x40. Coloring hematoxylin-eosin.

2. Morphological changes in animals with e-CPI are characterized by focal infiltration of lymphoid elements, moderate interstitial edema with impaired blood circulation in the muscular part of the wall of the diaphragm.
3. The early elimination of prolonged irritation of the respiratory tract helps prevent the development of purulent inflammation of the lungs and the preservation of the morphological picture of the diaphragm.

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Volume 3 Issue 3 March 2019