



Examination of myocardium and adrenal glands structure in patients with COVID-19

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Motivation and Aim: The new coronavirus, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has caused numerous deaths worldwide. However, little is known about the causes of death. Along with the development of viral pneumonia in COVID-19, extrapulmonary lesions, in particular the heart, are observed. The contractile activity of the heart is coordinated by the hypothalamic-pituitary-adrenal axis. In the terminal period with COVID-19, cardiac function is supported by adrenomimetics.

The aim of this study was to analyze the structure of the myocardium and adrenal glands in patients who died from COVID-19.



Materials and methods

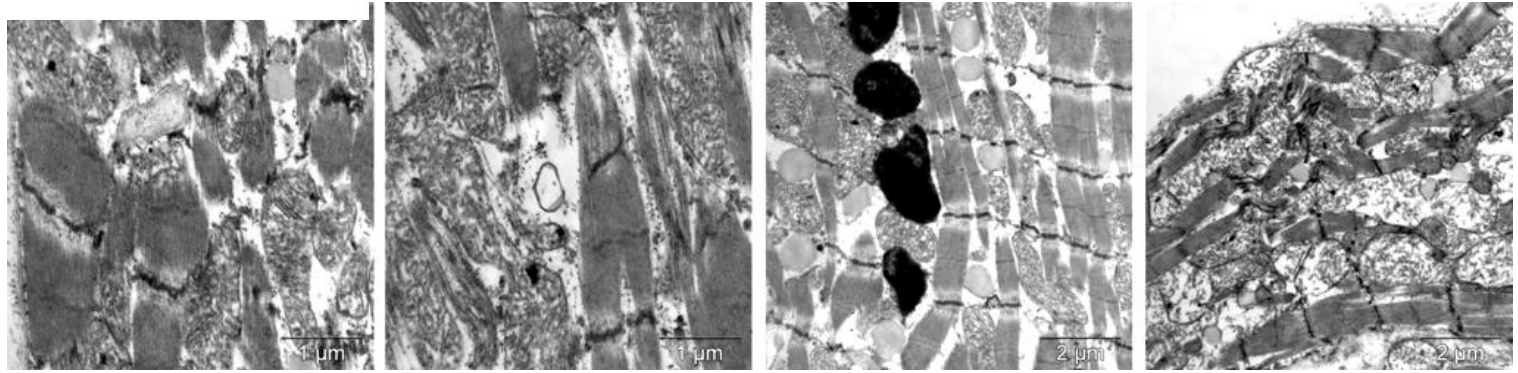
A histological study was carried out on autopsy material from patients (n=8) died from Covid-19. As a control, autopsy material was used from "blunt trauma of the body" patients (n=3). Tissue samples were fixed in a 4 % paraformaldehyde solution. The formalized samples were subjected to a standard procedure in the histological tissue processor STP 120. Paraffin slices were stained with hematoxylin and eosin and examined under a Leica DME microscope. Transmission electron microscopy was used to examine the cells ultrastructural organization. Ultrathin sections thick 70–100 nm were studied using an electron microscope JEM 1400 (Japan) of the Center for Microscopy of Biological Objects of the Siberian Branch of the Russian Academy of Sciences.

Results

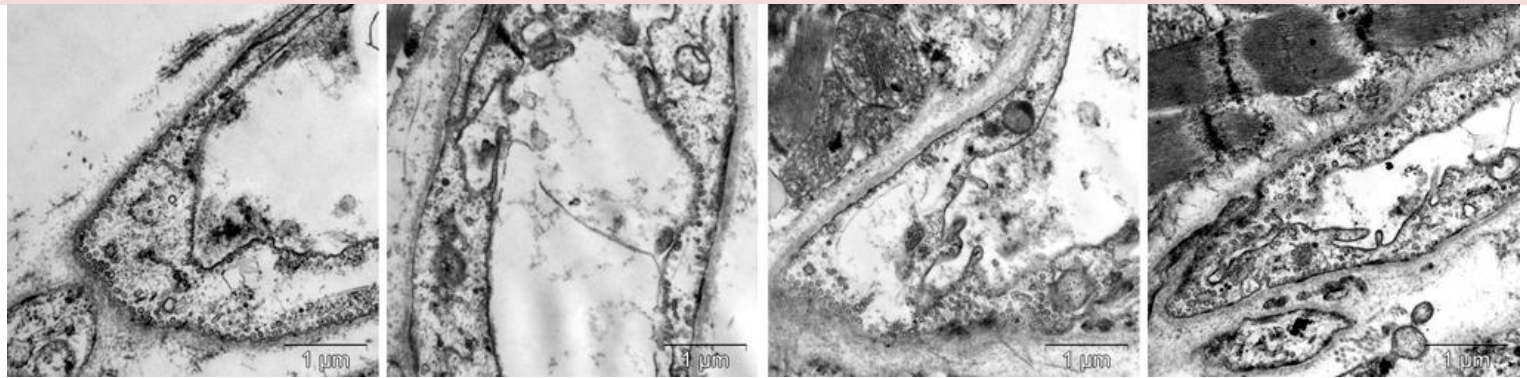
The study of the heart revealed acute circulatory system disorders, dystrophic and necrobiotic changes in cardiomyocytes. Foci of contractures of I-III degrees, myocytolysis of cardiomyocytes and lipid inclusions were detected. Heterogeneity of the endothelium of blood capillaries ultrastructural organization was shown.



Ultrastructure of cardiomyocytes in COVID-19



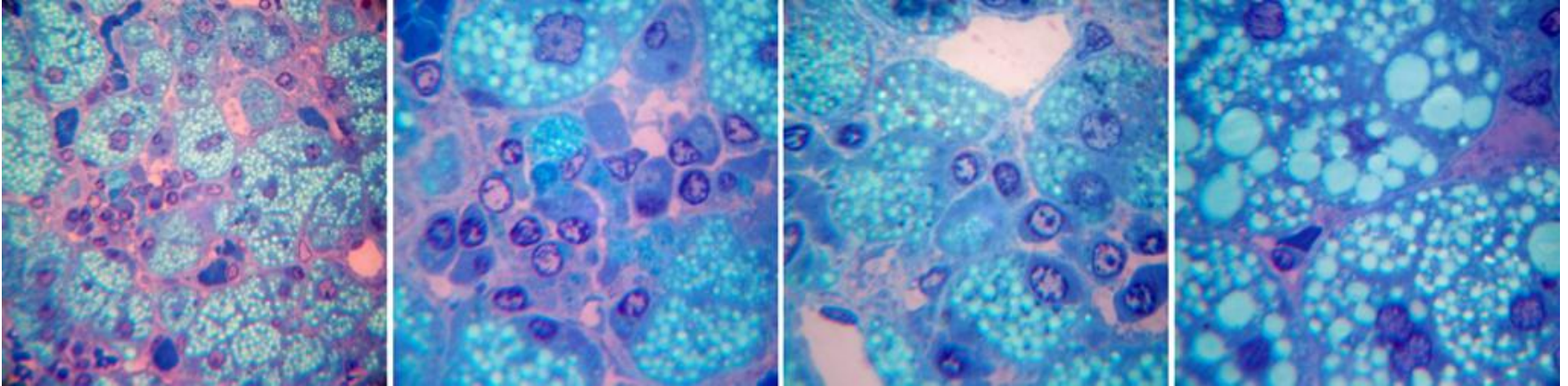
Heterogeneity of the endothelium of blood capillaries ultrastructural organization in COVID-19



Different degree of cytoplasm swelling and vesicular structures content



Structure of the fascicular zone of the adrenal cortex in COVID-19



The presence of an inflammatory infiltrate in the fascicular zone of the adrenal cortex and a different degree of lipid accumulation in the cytoplasm of adrenocorticocytes. Toluidine blue staining.

Conclusions

The data obtained indicate significant changes in the structure of the myocardium and adrenal gland in patients with COVID-19. The revealed structural changes can be informative in the development of cardioprotection to reduce mortality.