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TEM finding of the agent of lyme-borreliosis in heart biopsy  

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1. INTRODUCTION  

Electron microscopy (EM) laboratory at the Chair of Histology And Embryology of the Faculty of Medicine Novi Sad in association with the Department of Pathology of the Clinical Center extended its activities towards the clinical medical diagnostics in 1991. Most commonly skin, blood and heart biopsies were performed in affected patients.  

Transmission electron microscopy (TEM) offered valuable information on the pathology of chronic myocarditis [1]. Ultrastructural characteristics of myocardial infiltration by inflammatory cells, primarily lymphocytes, revealed morphological features of cardiomyocyte damage. In the period from March 1991 to July 1994 a total of 304 endomyocard biopsies were examined. The samples were taken at the Institute of Cardiovascular Diseases in Sremska Kamenica.  

In one patient with acute myocarditis that was serologically recognized as Lyme disease, heart biopsy revealed presence of the agent morphologically corresponding to the bacteria Borrelia burgdorferi. The aim of this study is to present pathological finding and presence of Borrelia in this patient using TEM.  

2. INVESTIGATION  

Four endomyocardial biopsies were taken from the patient at the Institute of Cardiology in Sremska Kamenica. The biopsies were performed during heart catheterization through the femoral vein by the use of appropriate catheter.  

The samples were fixed in glutaraldehyde, Epon-embedded, sections were made and prepared for TEM in a standard manner. Preparations were examined and photographed in an Opton EM 109 microscope.  

Analysis of bioptic samples revealed strongly marked degeneration of the contractile cardiomyocyte apparatus, extending to necrosis of particular cells (Fig. 1). Series of changes observed in the preparation progressed from the hypercontractility of the myofibrils indicating hypoxia to the myofilament lysis and myofibril destruction to the fine-grain detritus. Mitochondria in such cardiomyocytes were oval, revealing indistinct morphology of inner membrane. Activated macrophages were visible in the surrounding interstices. The most interesting changes were observed in blood capillaries. The lumen was mostly filled with detritus and fibrin filaments, between which multiple horizontal and several vertical bacterial fragments were identified, revealing irregularly coiled appearance and consistent thickness of 0.2 micrometers (Fig. 2).
Reconstruction of the photographs with observed bacterial fragments suggested presence of irregularly spiral bacteria, which correspond to the genus *Borrelia* by their thickness as well as by the irregular curving (Fig. 3).

Such demonstration of capillaries damage with fibrin deposits next to endothelial cells and with fibrin exudation into the extra vascular space of heart interstice through the capillary wall defects indicates serious impairment of blood circulation in the heart. Correlation with clinical findings of the patient with acute myocarditis along with high antibody titer (1 : 320) to *Borrelia burgdorferi* determined in the indirect immuno-
Fig. 2. Heart biopsy of patient, C-capillary wall; N-Nucleus of endothelial cell; F-fibrin deposits; S-spheroplasts of Borrelia; B-Borrelia fragments; >-cleft in the capillary wall with fibrin exudation. TEM, 5000x

Fig. 3. Heart biopsy of patient, photographic enlargement of previous figure. Reconstruction of fragments in capillary lumen represent Borrelia-like bacteria.
fluorescence assay strongly indicated myocarditis in the second-phase Lyme-borreliosis. The patient was subjected to the appropriate antimicrobial therapy, and dismissed from the hospital fully recovered.

Based on observed hypoxia and necrosis of certain cardiomyocytes, activated macrophages in the interstices and capillaries with lumen filled with detritus containing borrelia, we may conclude that microangiopathy presents the pathogenetic mechanism of heart damage in patients with acute dissemination of Lyme-borreliosis.

3. REFERENCES

