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Research Article

# CHARACTERISTICS OF PATHOMORPHOLOGICAL CHANGES OF ALCOHOLIC CARDIOMYOPATHY

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## ABSTRACT

Effects of alcohol metabolites, mainly acetaldehyde, on the heart. Disturbances in metabolism and electrolyte imbalance lead to arrhythmias and disturbances in the functional activity of the heart. Acetaldehyde disrupts the synthesis of several compounds and increases the synthesis of inflammatory cytokines and leads to the development of an autoimmune process. The weight of the heart is 500-550 gr. and it is observed that it is filled with fat. When the heart is placed on the operating table, it is diffuse, similar to infectious myocarditis, and the heart is red or purple in color.

## KEYWORDS

Alcohol, cardiomyocyte, heart, ventricle, compartment, dystrophy.

## INTRODUCTION

In recent years, according to WHO data and epidemiological studies, diseases of the cardiovascular system remain dominant in economically developed countries. Cardiomyopathies are an important part of cardiovascular diseases with their severe course and numerous life-threatening complications [3,5]. There are several types of cardiomyopathies, one of which is alcoholic cardiomyopathy. The relevance of alcoholic CMP is determined by its relatively frequent occurrence, development along with other heart diseases, and in most cases it leads to sudden death. It has been confirmed that 15% of patients with chronic alcoholism suffer from alcoholic CMP and 18% of them die accidentally [1,4].

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This type of CMP develops from the specific effects of alcohol on the heart. The main reason is chronic alcohol consumption, drinking 100 ml every day for 10-20 years. Histological examination reveals that the muscle fibers are thickened and there are many connective tissue fibers between the muscles, the typical characteristic of this KMP is that the interstitial tissue is wide, the muscle fibers are stiffened, and there are large thrombi attached to the inner wall of the left ventricle [2,6].

**The purpose of the research:** to clarify the specific macro- and microscopic changes of the heart in alcoholic cardiomyopathy;

## METHODS

We reviewed 5,642 reports from the RPAM autopsy department during 2011-2020, and a total of 64 CMPs were identified during this period, accounting for 1.13% of all autopsies and 4.7% of cardiovascular diseases. 11 of the 64 identified cases were alcoholic cardiomyopathy. After macroscopic examination of the heart, 1.5x1.5x0.5 cm pieces taken from the walls of both ventricles and both compartments were frozen in a 10% solution of formalin in phosphate buffer for 48 hours, then washed in running water for 3-4 hours and placed in a series of alcohol batteries of increasing concentration (80°, 90°, 96°, 96°, 100°) and dehydrated in chloroform, paraffin with added wax was poured, and bricks were prepared. Histological sections 5-6 µm thick were taken from paraffin blocks and stained with hematoxylin-eosin and van Gieson stain to identify connective tissue fibers. Histological preparations were studied in 10, 20, 40 lenses of a light microscope, and pictures were taken from the necessary areas.

## RESULTS

Due to the chronic intoxication of the body under the influence of alcoholic KMP ethanol, in most cases, due to the lack of proteins and thiamine in the heart tissue, all parts of the organ become enlarged almost to the same extent, their cavities expand, often the right ventricle becomes enlarged and dilated. In our material, 14 cases of alcoholic KMP were detected, all of which had a dramatically enlarged heart, with an average weight of 582.7 g. it was observed that the heart was filled with fat in some of them. It was observed that the heart was macroscopically enlarged, reddish in color, softened in consistency, and spread out like dough when placed on the table. From the cavities of the heart, it was often found that the right ventricle was suddenly enlarged, and its wall was dilated.

Microscopic examination of this condition revealed that this type of KMP is a characteristic change, that is, the myocardial interstitial tissue is strongly swollen, as a result of which each of the muscle fibers is shriveled and located separately (Fig. 1). Separated muscle fibers are crooked, some of them are cracked, the transverse extension lines are not well visible, they are sparse. Cardiomyocyte nuclei are few and those that are present are hypertrophied and enlarged. It is determined that the connective fibers in the interstitial tissue are shortened and turned into a sparse network,

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and the cells are suspended. It is observed that the swelling of the interstitium is even stronger in the areas where the blood vessels are located, as a result of which the structural units of the connective tissue are disintegrated, blood is poured around the vessels in a diapedesis manner. It is determined that the wall of the arterial blood vessels is narrowed due to sclerosis, the tissue structures in the wall are dense with each other and form a whole layer. It is observed that the blood vessels of the vein are sharply expanded, the wall is thinned, the cavity is filled with blood, blood is poured around it in a diapedesis method (Fig. 2). It is determined that the murash fibers located in this area are shriveled and fragmented, some of them undergo myolysis, and others undergo vacuolization.

In most cases of alcoholic KMP, it is determined that the interstitial swelling spread in the myocardial tissue simultaneously spreads to the interstitial tissue and the cytoplasm of parenchymatous cells, that is, cardiomyocytes. This condition is called myocardosis, the reason for which is a metabolic disorder in alcoholism, that is, due to a violation of the protein synthesizing function of the liver, there is less protein in the myocardium, instead of it, thiamine substance increases, and the swelling process develops in both interstitial tissue and cardiomyocytes. Microscopically, small vacuoles appeared in the sarcoplasm of some cardiomyocytes, while in others, a tumor center appeared under the outer cytolemma (Fig. 3), around myofibrils. In this case, it is determined that the nucleus and myofibrils of cardiomyocytes are pushed to the edge of the cell.

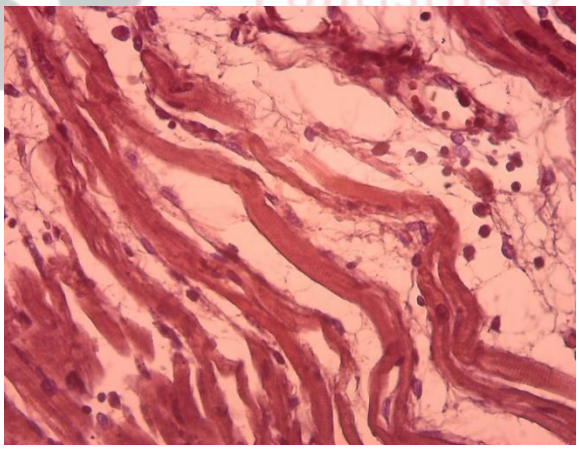

**Figure 1. Alcoholic KMP. Myocardial interstitial tissue is severely swollen and muscle fibers are separated from each other. Paint: G-E. Floor: 10x40.**

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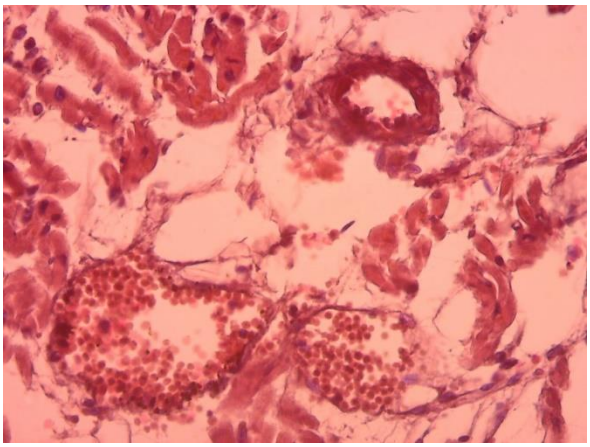

**Figure 2. Alcoholic KMP. Myocardial artery wall is narrowed due to thickening, veins are widened and full. Paint: G-E. Floor: 10x40.**

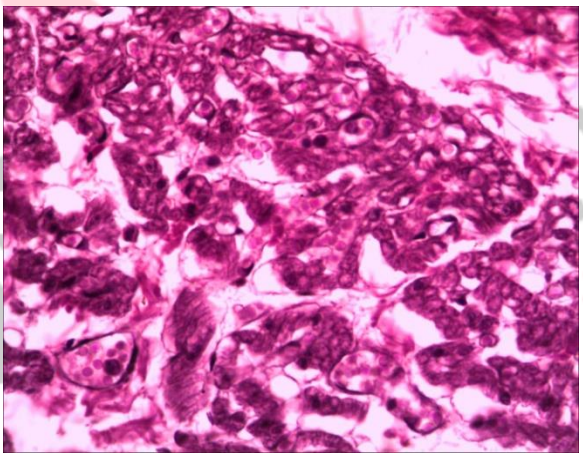

**Figure 3. Alcoholic KMP. Intracellular and extracellular edema in the myocardium. Paint: G-E. Floor: 10x40.**

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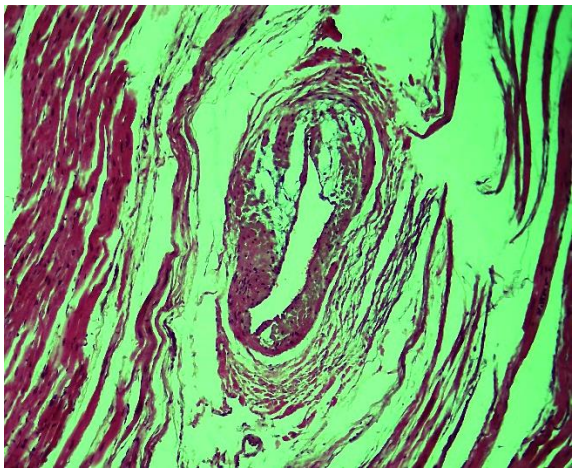

**Figure 4. Alcoholic KMP. Interstitial tissue tumor, sclerosis in and around the artery wall, development of destruction in the wall. Paint: G-E. Floor: 10x10.**

As characteristic changes of alcoholic KMP, a strong swelling of the interstitial tissue and the wall of blood vessels and around it, as well as the growth of connective tissue, were noted. In this photomicrograph, it is clearly seen that due to the development of a very strong swelling in the interstitial tissue of the myocardium, muscle fibers are separated and torn. If we pay attention to the wall of the artery, it is determined that the connective tissue has a different thickness due to growth and destruction. In one part of the arterial wall, it is determined that the tissue structures have hardened, fatty substances have accumulated between them, and even spread to the endothelium layer, bulging it (Fig. 4).

Another reason for myocardium swelling and dilatation in alcoholic KMP is that the process of extracellular and intracellular swelling in some areas of the myocardium eventually destroys the sarcoplasm and myofibrils of cardiomyocytes and leads to myolysis (Fig. 5). In this area, accumulation of lymphohistiocytic cells in the interstitial tissue and around blood vessels, their activation and hypertrophy and hyperchromasia are determined. As another pathological change in the composition of cardiomyocyte cells, foci of lipofuscinosis and calcinosis are observed.

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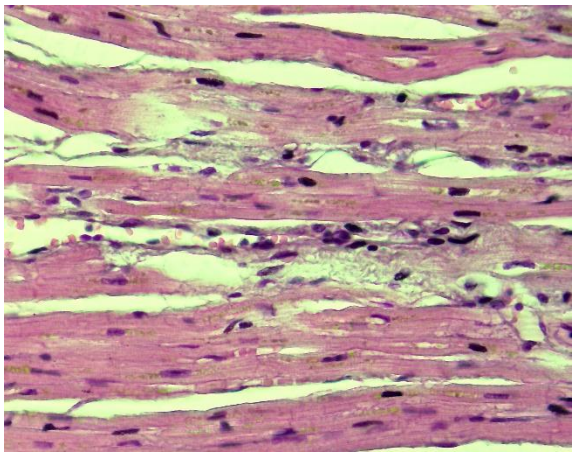

**Figure 5. Alcoholic KMP. Due to extracellular and intracellular swelling, sarcoplasm and myofibrils of cardiomyocytes were shriveled and subjected to myolysis. Paint: G-E. Floor: 10x40.**

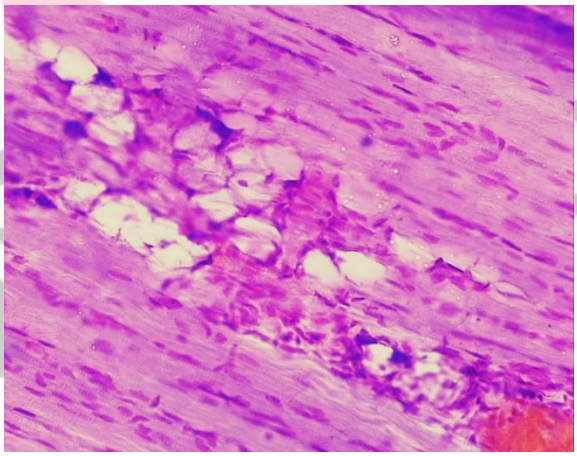

**Figure 6. Alcoholic KMP. The appearance and proliferation of fat cells and histiocytic cells in the interstitial tissue of the myocardium. Paint: G-E. Floor: 10x40.**

Microscopic examination of myocardial tissue in alcoholic KMP revealed another specific pathomorphological change. Since these data are not found in the scientific literature, we will describe the comprehensive histological picture. In some areas of the interstitial tissue of the myocardium, the proliferation of connective tissue cells, i.e. histiocytic cells, among them, metaplasia of histiocytic cells into fat cells was found (Fig. 6). It can be distinguished that in fact it has been confirmed that fat cells grow into the interstitium of the myocardium from the adipose tissue under the epicardium. In our material, it was found that

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fat cells, i.e., lipocytes, arise by metaplasia from interstitial tissue histiocytes. Proliferation and increase of histiocytic cells is observed in the composition and space of muscle fibers around this area. In cases of alcoholic KMP, foci of histiocytic proliferation and lipomatous metaplasia in the interstitial tissue of the myocardium are enlarged due to the increase of adipocytes, fat cells are scattered around. Around such foci, it is determined that there is an increase in fat cells, different morphofunctional conditions, that is, there are cells rich in granules and cells with reduced granules (Fig. 7). In the places where fat cells are located, it is determined that both interstitial tissue and muscle tissues are dystrophied and destroyed.

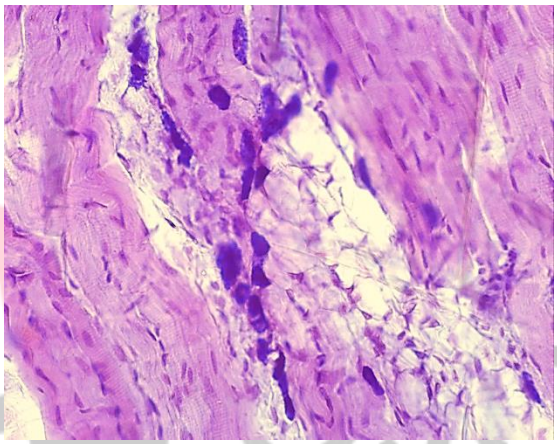

**Figure 7. Alcoholic KMP. The appearance of fat cells in the lipomatous area of the intermediate tissue. Paint: G-E. Floor: 10x40.**

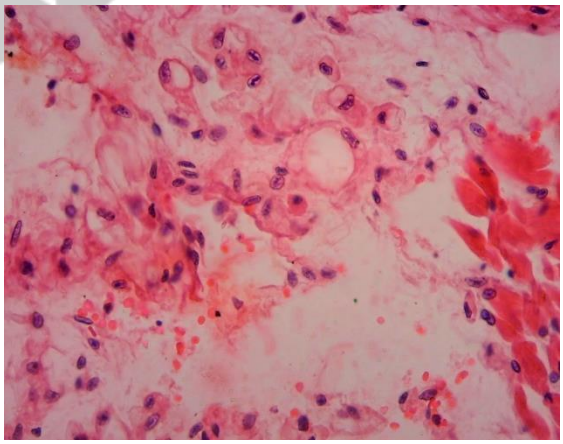

**Figure 8. Alcoholic KMP. Metaplasia of histiocytic cells to lipocytes in the interstitial tissue of the myocardium. Paint: G-E. Floor: 10x40.**

Pathomorphological changes that develop in the myocardium in alcoholic CMP have been confirmed to have a specific morphogenesis, as a result of joint initiation and escalation of alcohol intoxication,

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metabolic disorders, organization and dysregeneration processes. First of all, if there is a strong swelling and destruction of structural structures in the interstitial tissue, in addition, due to dysregeneration of histiocytic cells, their metaplasia into fat cells is determined. In this case, the histiocytic cells have a different structure, the cytoplasm of some of them is strongly eosinophilic, while the cytoplasm of others is swollen due to the appearance of lipids (Fig. 8). The cytoplasm of some of them is completely filled with lipids, so the cytoplasm is wide and the lipid-filled adiposide is determined.

## CONCLUSION

As characteristic changes of alcoholic KMP, a strong swelling of interstitial tissue and the wall of blood vessels and around them, as well as growth of connective tissue are observed. It is determined that the arterial wall has a different thickness due to the growth and destruction of the connective tissue. In some areas of the interstitial tissue of the myocardium, proliferation and increase of connective tissue cells, that is, histiocytic cells, among them, metaplasia of histiocytic cells into fat cells was found. The cytoplasm of some of them is completely filled with lipids, so it is determined that they have completely metaplasticized into the adiposide cells, which have a large cytoplasm and are full of lipids.

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