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Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/5

IMMUNOHISTOCHEMICAL ASPECTS OF CD 31 (PECAM-1) INTEGRIN ACTIVATION IN VASCULAR ENDOTHELIUM DURING RESTENOSIS AFTER CORONARY ARTERY STENTING

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Abstract

It was found that during the restenosis process occurring in the poststen ting period of coronary arteries, the activation of integrins in the endothelium and the subsequent interaction of activated cell-surface transmembrane heterodimers with the extracellular matrix lead to increased cell adhesion. Consequently, this results in the transendothelial migration of inflammatory elements, including leukocytes, to the affected areas, contributing to the formation of inflammatory signs in the vessel wall. It was determined that these processes specifically lead to the development of focal vasculitis in the vessel wall after coronary stenting, intensification of reparative regeneration in these areas, active proliferation of fibroblasts, and ultimately, vascular restenosis.

Keywords: Immunohistochemical study, CD-31 PECAM-1 integrin, acute coronary syndrome, myocardium, restenosis.

Relevance of the Problem

Worldwide, multifocal atherosclerosis, causing damage to elastic and muscular-elastic type vessels, has been identified in approximately 126 million people. 16-

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18% of global deaths are directly linked to coronary insufficiency. This disease ranks first in terms of mortality rates, leading to severe fatal outcomes such as infarction and stroke in vital organs. The vessels most commonly affected by atherosclerosis are the heart's blood vessels, or coronary arteries. Globally, coronary artery atherosclerosis in individuals aged 45-55 years has been identified in an average of 1.97 billion people (Povzun S.N., 2015). This particular disease is the crucial pathology in the development of coronary artery stenosis and is currently the main problem in endovascular surgery. On average, more than 157 million people undergo coronary artery stenting procedures annually. In the USA, 18.8% of all deaths were caused by coronary artery atherosclerosis, while in the Russian Federation, this figure is 28.4%. In European, Australian, and Canadian countries, this indicator averages 21.2%. Among Asian countries like China, Japan, and Korea, 14.4% of the population dies from IHD, while in Central Asian countries, according to 2022 data, this figure constituted 28.2% of total deaths. This indicates the predominance of IHD in terms of age compared to average age indicators in other countries and its early manifestation. This underscores the urgency and necessity of addressing this problem. Globally, over 10.8 million coronary artery bypass surgeries are performed annually. Regarding mortality rates from coronary artery disease, the USA records 117.1 per 100,000, the Russian Federation 781.4 per 100,000, the European Union 137.5 per 100,000, and Central Asian countries average 816.5 per 100,000.

Materials and Methods

The study utilized clinical-anamnestic, VEGFA-1 immunohistochemical staining, and statistical research methods.

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Aim of the Study

To investigate the specific aspects of immunohistochemical examinations in the diagnosis and planning of treatment for coronary artery stenosis in atherosclerosis and changes in the myocardium, and to develop practical recommendations.

Results and Discussion

CD-31 PECAM-1 participates in leukocyte transendothelial migration, angiogenesis, and integrin activation. In addition to the listed functions, CD-31 or PECAM-1 serves as a cell mechanosensor. The point is that protein molecules are primarily in a homophilic-bound dimeric state, and one cell molecule interacts with a neighboring cell's molecule, ensuring its stable state and forming intercellular contacts. If mechanical stress and cell separation are observed, this protein is synthesized in large quantities to bind them together, thereby ensuring the stability of the state. In immunohistochemical studies, the CD-31 marker is primarily considered a morphological marker presenting endothelial cell damage. One of the noteworthy aspects identified was the occurrence of coronary artery restenosis (De Novo Lesion) and the development of recurrent myocardial infarction in patients across various age groups during the post-coronary stenting period (within 3-20 days) following coronary artery stenosis.

Conclusion

1. It was determined that the CD 31 (PECAM-1) marker, in cases of restenosis (De Novo Lesion) following coronary artery stenting, predominantly occurred in patients who died from myocardial infarction in the 39-44 and 45-59 age groups, with an average incidence of 24.61%, and was more frequently observed in males.
2. A very small proportion (1.46%) of deaths from myocardial infarction with restenosis (De Novo Lesion) after coronary artery stenting, associated with the CD 31 (PECAM-1) marker, comprised individuals aged 60-74. This finding suggests a biological degradation of vessels as a manifestation of biological

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aging, a sharp decrease in integrin activity, and confirms that this age group is the most optimal for stenting procedures.

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