New Insights Into the Comorbidity of Coronary Heart Disease and Depression

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ABSTRACT

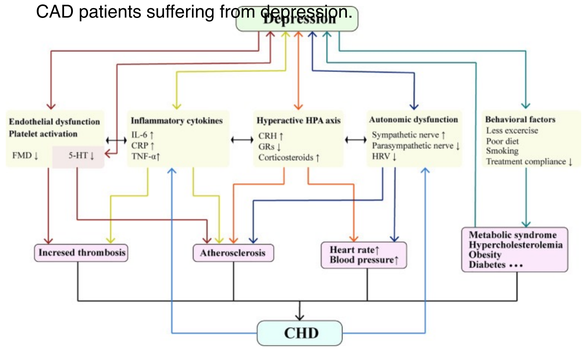
Coronary artery disease (CHD) and depression are common conditions that significantly reduce quality of life and place a significant financial burden on society. They also often co-exist, worsening the patient's condition and worsening the prognosis. This comorbidity strongly suggests a common pathological mechanism. This review focuses on the development of depression in CAD patients, the adverse effects of depression on CAD symptoms, and the underlying mechanisms of comorbidity. In addition to the general mechanisms known for decades, this review summarizes the interesting and original potential mechanisms underlying comorbidities such as: B. Endocrine substances, gut. Endocrine flora and microRNA. Finally, there are several treatment strategies for the comorbidity, involving drugs and psychotherapy, which may provide a theoretical basis for further basic research and clinical investigations on improved therapeutic interventions.

Autonomic dysfunction

- Autonomic dysfunction develops when the nerves of the autonomic nervous system (ANS) are damaged and contribute to the association between depression and CHD.
- patients with a history of CHD or congestive heart failure always show decreased parasympathetic activity and increased sympathetic activity.
- This leads to reduced heart rate variability (the amount of time between your heartbeats fluctuates slightly) (HVR), lower baroreflex sensitivity, and an independent risk factor for cardiac death.
- Autonomic dysfunction increases mortality in patients with acute myocardial infarction (AMI) and a higher risk of complications after cardiac surgery..
- There is a relationship between HRV reduction and depression severity, that is as the HRVfalls the symptoms of depression are aggravated.

Behavioral factors

- Patients with CAD depression are more likely to have unhealthy behaviors and lifestyles, such as poor eating habits, lack of exercise, smoking, and poor adherence to treatment.
- Poor diets, such as low fruit and vegetable intake, contribute to the link between depression and cardiovascular disease (Wu et al., 2021). A sedentary lifestyle can be observed in CAD patients with major depression.
- A study conducted in 1017 CHD patients showed a link between depressive symptoms and cardiovascular events associated with lack of exercise in patients (Wu et al., 2021).
- Poor adherence to treatment has been shown to be associated with CAD patients suffering from depression.

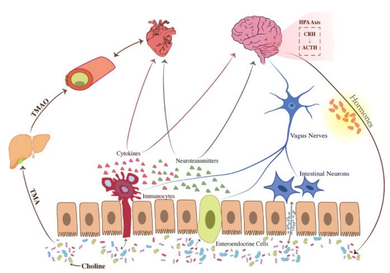


Depression is an independent risk factor of CHD

- Not only is depression associated with CHD, but it also increases the Framingham risk score for CHD.
- Framingham risk score utilizes gender, age, cholesterol profile, blood pressure, and smoking to predict the chances of an individual having a cardiac event in 10 years
- Many potential factors have been found to explain this association. These include inflammation, endothelial dysfunction, endothelial dysfunction, platelet activation, hypothalamic-pituitary-adrenal (HPA) axis hyperactivity, autonomic dysfunction, and various behavioral factors.

Gut microbiota

- Gut microbiota help regulate immune responses, fight illness, adjust metabolism, and maintain the stability of the intestinal environment.
- The gut microbiota make up 90% of the total number of cells in the human body and there are about 3.3 million different unique microbial genes in the human gut
- Intestinal bacteria can transform internal choline phosphatidylcholine, and L-carnitine into trimethylamine (TMA) which oxidized with trimethylamino oxide (TMAO) in the liver.
- High levels of TMAO causes platelet activity and thrombosis, in turn causes heart disease.



Endocrine signaling

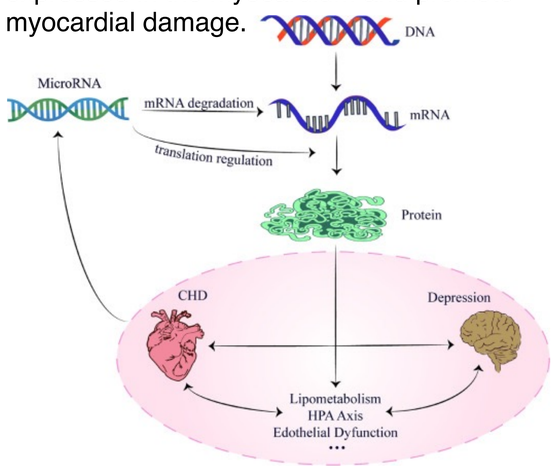
Homeostasis can be maintained in the body by the interactions between the nerve, endocrine, and immune systems of which CHD and depression result from the imbalances among these hemostatic systems.

The endocrine system includes the liver (insulin-like growth factor (IGF), secretes hepatokines-like fetuin-A, and others), the heart, and skeletal muscle

IGF-1 is a single-chain polypeptide that has a similar molecular structure like insulin. It is synthesized by the kidney, skeletal muscle, and liver which is then secreted into the circulation

MicroRNAs

- MicroRNAs (miRNAs) are part of the eukaryotic small noncoding RNAs with a length of 22 nucleotides which regulate gene expression at the post transcriptional level.
- One of the most important independent risk factors for CHD is abnormal lipid metabolism.
- MicroRNAs help regulate lipid metabolism-related gene expression, which have been known to affect the development of lipid metabolism-related diseases.
- These miRNAs can be released into the peripheral blood circulation during AMI when expressed in the myocardium and promote myocardial damage.



Future Directions

- Some suggestions for therapeutic strategies include pharmacologic and psychotherapy strategies.
- The risk of antidepressant (AD) prescription has been shown to be much lower in patients with cardiovascular diseases than in the general population.
- ADs are both relatively safe and effective creating mild or rare side effects.
- All commonly prescribed ADs target either one or more monoamines (serotonin, dopamine, and norepinephrine), which are phylogenetically conserved molecules that are regulated by complex systems with multiple components.

References

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