

Narrative Review on the Effect of Atherosclerosis-Heart and Blood Vessel Complications and Prevention

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Introduction

Atherosclerosis means hardening and narrowing of the arteries. The blockage of arteries which carries blood to different organs, may lead to several health complications. It is also termed as atherosclerotic cardiovascular disease or arteriosclerosis. It is the primary cause of heart attacks, strokes, and peripheral vascular disease which all together considered as cardiovascular diseases (Figure 1).

Brain stroke

The accumulation of plaque within the blood vessels ruptures and become fragile. It results in the formation of blood clots within the blood vessels and obstructs the blood flow while travelling to the other parts of the body. If a clot blocks a blood vessel in the brain, it causes a brain stroke.

There are two types of ischemic stroke caused by blood clots; one is narrowing of blood vessels to the brain caused by atherosclerosis or by other particles and blocks blood flow to that part of the brain. A cerebral embolism happens when clot or some other particle, called an embolus, is carried by the bloodstream [1]. It lodges in an arteries of the brain and blocks the flow of blood. The embolism could be due to plaque or a piece of clot that broke off from an atherosclerotic plaque. However, this condition is seen in people with atrial fibrillation.

TIA (Transient Ischemic Attacks)

Transient Ischemic Attacks (TIA) signs and symptoms usually last for few minutes or an hour; rarely symptoms may last for 24 hours. The signs and symptoms of a TIA is stroke and may include sudden onset of symptoms like weakness, numbness or paralysis in face, arm or leg, typically on one side of the body, slurred speech or difficulty in understanding others, blindness in one or both eyes or double vision, loss of balance or coordination. There may be more than one Transient Ischemic Attacks (TIA), and the recurrent signs and symptoms may be similar or different depending on which area of the brain is involved [2].

Heart angina

Angina is chest pain or discomfort caused when heart muscle doesn't get enough oxygen supply through blood. Due to lack of oxygen demand, it may experience symptoms like pressure or squeezing in the chest. The discomfort may also occur in shoulders, arms, neck, jaw, or back. Angina pain may even feel like indigestion. Angina is not a disease, it is a symptom of an heart disease, usually Coronary Heart Disease (CHD). There are many types of angina, including Prinzmetal's angina, microvascular angina, stable angina, variant angina and unstable angina. This condition is seen when one or more of the coronary arteries are narrowed, also called ischemia. Angina can also be a symptom of Coronary Microvascular Disease (MVD) [3].

Heart attack

A heart attack occurs when the flow of blood to the heart is blocked by the accumulation of fat, cholesterol and other substances, which form a plaque in the arteries of the heart (coronary arteries). Sometimes, a plaque can rupture and form a clot that obstructs the blood flow. The interrupted blood flow can destroy part of the heart muscle. Myocardial infarction also called as heart attack.

The development of atherosclerosis is complicated, but the primary event seems to be repeated, subtle injury to the artery's inner lining (endothelium), through various mechanisms. These mechanisms include physical stresses from turbulent blood flow (such as occurs where arteries branch, particularly in people who have high blood pressure). Inflammatory stresses involving the immune system (such as when people smoke cigarettes), Chemical abnormalities in the bloodstream (such as high cholesterol or high blood sugar as occurs in diabetes mellitus)

Infections with a few types of bacteria or viruses (such as *Helicobacter pylori* or cytomegalovirus) may also increase inflammation in the artery's inner lining (endothelium) and lead to atherosclerosis [4-6].

- Fatty Deposits in a Coronary Artery
- Plaque formation
- Atherosclerotic Plaque

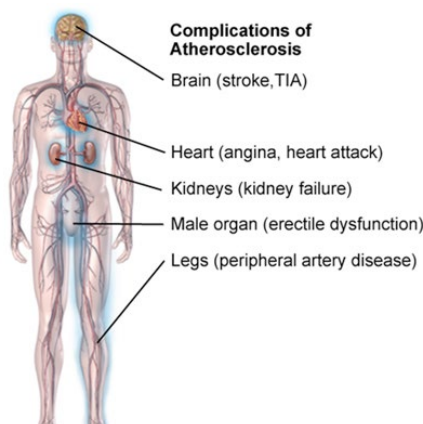


Figure 1: Complications of atherosclerosis.

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Atherosclerosis begins when the injured artery wall creates chemical signals that cause certain types of white blood cells (monocytes and T cells) to attach to the wall of the artery. These cells move into the wall of the artery. There they are transformed into foam cells, which collect cholesterol and other fatty materials and trigger growth of smooth muscle cells in the artery wall. In time, these fat-laden foam cells accumulate [7]. They form patchy deposits (atheromas, also called plaques) covered with a fibrous cap in the lining of the artery wall. With time, calcium accumulates in the plaques. Plaques may be scattered throughout medium-sized and large arteries, but they usually start where the arteries branch.

- Lifestyle changes to reduce risk of complications Sometimes drugs.
- To help prevent atherosclerosis,
- People need to eat a healthy diet
- Exercise
- Lose weight
- Stop tobacco use
- Lower LDL cholesterol levels
- Lower blood pressure
- Lower blood glucose levels
- Sometimes, take drugs such as a statin
- Eating a healthy diet can help decrease the risk of atherosclerosis. A diet low in saturated fats, refined carbohydrates, highly processed foods, and alcohol and high in fruits, vegetables, and fiber decreases the risk of cardiovascular disease. Healthy diet and exercise can promote weight loss if a person is overweight or obese.

People who smoke should stop smoking. People who quit using tobacco have only half the risk of those who continue to use tobacco regardless of how long they smoked before quitting.

People who have high blood pressure should lower their blood pressure with lifestyle changes and drugs. People who have diabetes must maintain strict control of their blood sugar (glucose).

People who are at high risk of atherosclerosis also may benefit from taking certain drugs. Helpful drugs include the statins, which lower cholesterol (even if cholesterol levels are normal or only slightly high), and in some cases, aspirin or other antiplatelet drugs (drugs that keep platelets from sticking together and forming blockages in blood vessels). Aspirin and other antiplatelet drugs can cause bleeding so these drugs should only be taken if patients are at very high risk of atherosclerosis. Some drugs used to treat high blood pressure and some drugs used to treat diabetes also help reduce risk of atherosclerosis [8].

Treatment of Atherosclerosis Complications

When atherosclerosis becomes severe enough to cause complications, the complications themselves must be treated. Complications include;

- Angina
- Heart attack
- Abnormal heart rhythms

- Heart failure
- Chronic kidney disease
- Stroke
- Leg cramps (intermittent claudication)
- Gangrene

Kidney

Kidney failure

Usually in atherosclerosis condition, the arteries become hardening due to accumulation of plaque, which interrupts the blood supply to the kidneys becomes increasingly restricted (stenosis). So that Arrhythmogenic Right Ventricular Dysplasia (ARVD) can cause Chronic Kidney Disease (CKD) and lead to End-Stage Kidney Disease (ESKD), especially as people get older [9].

Male organ

Erectile dysfunction: D (erectile dysfunction), could be a sign of arteries blockage. It's all about blood flow. Plaque in the arteries can make that happen [4].

Legs peripheral artery disease: Peripheral artery disease (also known as peripheral arterial disease) is a common circulatory problem in which arteries get narrow and reduces the blood flow to the limbs. In Peripheral Artery Disease (PAD), legs or arms usually the legs don't receive enough blood supply. This may cause symptoms, such as leg pain while walking. Peripheral artery disease is also likely to be a sign of a buildup of fatty deposits in arteries (atherosclerosis). This condition may narrow arteries and reduce blood flow to the legs and, occasionally, to the arms. Peripheral artery disease can be successfully treated by exercising, eating a healthy diet and quitting tobacco [5,10].

Conclusion

With medication and lifestyle changes, we can slow down or stop the plaques formation. They may even shrink slightly with aggressive treatment like lifestyle changes, medication, angiography and stenting, bypass surgery, and through fibrinolytic therapy.

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