The disease is the result of thickening and narrowing of the arteries supplying the heart and surrounding structures with blood carrying oxygen and nutrients.

The heart is supplied by two main coronary arteries which arise directly from the aorta immediately after it leaves the heart. The left coronary artery supplies the left side of the heart (the left atrium and the left ventricle). As the diagram shows it divides into branches supplying the various areas of the left side. The right coronary artery supplies the right side of the heart (right atrium and right ventricle and likewise divides into branches. There is a third artery, the circumflex artery which branches from the first part of the left coronary artery and passes backwards to supply blood to the back and outer aspect of the heart.

Any abnormality of the coronary arteries is therefore very serious because the result is reduction in oxygen and nutrients to the heart. The result may be heart pain (angina), a heart attack (myocardial infarct) and death.

The most common cause of compromise of the coronary arteries is by the accumulation of a fatty deposit called atheroma which builds up around the walls of the arteries. Their build-up results in a narrowing of the bore (lumen) of the
artery which means that the flow diminishes. The result of this build-up, which is called atherosclerosis, is that the reduced blood flow (ischaemia) results in the heart being deprived of oxygen and nutrients and ultimately, when the restriction is too great, heart muscle dies and the patient is experiencing a heart attack.

The causes of coronary heart disease are well-known:

- Smoking
- Excessive alcohol
- Overweight and obesity
- Inactivity
- High blood pressure
- Raised cholesterol
- Diabetes
- Family history of heart disease
- Poor diet rich in saturated fats, salt and sugar
- The risk increases with increasing age

When cholesterol is measured, the doctor may report on two types of cholesterol, low density lipoproteins (called ‘bad’ cholesterol), too much of which is unhealthy, and high density lipoproteins (called ‘good’ cholesterol)

The way to reduce the risk of coronary heart disease is by a healthy lifestyle and it is not surprising that it involves:

- Stopping smoking
- Reducing alcohol intake
- Losing weight

- Increasing exercise
- Controlling blood pressure and diabetes
- Eat a balanced and healthy diet.

The Symptoms of Coronary Heart Disease

It is often the case that the symptoms of coronary heart disease develop slowly over many years. The only symptom may be shortage of breath with exercise. For others, episodes of chest pain (angina), induced by exercise and relieved by rest, may indicate the disease and may be accompanied by breathlessness, tiredness, lethargy, nausea and sometimes by an irregular heartbeat. For yet others, the first sign might be a heart attack (myocardial infarct).

Clues to the presence of CHD are often identified during routine screening checks carried out by GPs in general practice. Raised blood pressure, raised cholesterol or diabetes may be identified. Unfortunately high blood pressure and raised cholesterol are without symptoms and for patients with those conditions, the first sign of the disease might be a heart attack, stroke or kidney failure.

The Diagnosis of Coronary Heart Disease

A variety of investigations can be used to identify the nature and extent of the disease.

1. Blood tests are a first stage to check the cholesterol, blood sugar and a range of other parameters to give initial clues and to assess general health status.
2. Electrocardiogram (ECG). The ECG measures the electrical activity in the heart and variations in the pattern of electrical activity displayed will be an indication of damage to the heart muscle or signs of coronary artery disease. Unfortunately, sometimes an ECG can be normal even with significant coronary artery disease.
3. **Exercise Stress Testing.** This involves exercise on a treadmill whilst an ECG is recorded. Formerly a main stay of cardiac health assessment, it is now much less often used.

4. **Radionuclide test.** In this test a radio-labelled dye in injected by the doctor and it passes into the heart arteries which are therefore outlined by the dye and can be visualised using X-ray techniques. This can therefore assess the flow of blood through the heart vasculature and give a measure of the degree of CHD.

5. **Coronary Angiography.** A technique involving the injection of dye into the coronary arteries to make them stand out clearly. The radiograph above shows such a picture and the arrow points to a narrowing in a coronary artery.

6. **Echocardiogram.** This is an ultrasound investigation (the same technique as a foetal ultrasound) and shows the activity of the heart visually.

7. **Computerised Tomography (CT) and Magnetic Resonance Imaging (MRI) scans.** These scans can provide an accurate 3-D image of the heart by X-rays or the use of electromagnetic waves to produce the images and assess the presence of atheroma in the arteries or other diseases.

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**Treatment of Coronary Artery Disease**

1. **Addressing issues to reduce the risk.** It means addressing all the issues that promote or aggravate CHD; the smoking, weight, exercise, diet and managing blood pressure, raised cholesterol or diabetes. These measures are unlikely to provide any improvement in the existing disease but may slow down the progress.

2. **Medication.** There are variety of ways to treat CHD. Some treatments are to reduce blood pressure, reduce cholesterol or to make the blood less sticky and less liable to coagulate. Other drugs reduce the work that the heart does, control heart failure or dilate the coronary arteries. These drugs include:

   * **“Blood thinners”** reduce coagulation to reduce risk of clots - for example *aspirin, clopidogrel*
   * **Cholesterol-lowering drugs,** e.g. *simvastatin, atorvastatin* and *rosuvastatin* slow the build-up of atheroma in the arteries
   * **Nitrates,** e.g. *GTN, isosorbide mononitrate* relax coronary arteries to improve blood flow.
   * **Nicorandil** works like a nitrate to treat angina
   * **Beta-blockers** e.g. *bisoprolol and metoprolol* reduce heart rate and the work which is required of the heart.
   * **ACE Inhibitors** (e.g. *ramipril, lisinopril*) and *angiotensin receptor blockers* (e.g. *losartan, candesartan* or *valsartan*) lower blood pressure and treat heart failure

3. **Surgery.** If the medical treatment of coronary artery disease does not work or if investigations suggest that obstruction of a coronary artery is likely or imminent, a surgical solution to remove any
actual or potential blockage. This is normally done either by:

a. **Angioplasty** In this technique narrowed areas of coronary artery can be dilated using an inflatable balloon. A **stent** is a stainless steel tube which is inserted into a diseased artery by balloon and is expanded, pushing itself against the inner wall of the coronary artery thereby holding it open.

b. **Coronary Artery Bypass Surgery (CABG)** - pronounced ‘Cabbage’. In this procedure, blocked arteries are replaced by lengths of vein which allow blood to be passed around obstructions.

The control of Coronary Artery Disease still remains a considerable challenge despite the advances in medicine and surgery which have reduced the incidence by over 20% in the last ten years. However, tackling obesity, raised cholesterol and blood pressure still remain major problems. To be overcome before it ceases to be an important killer.

The **British Heart Foundation**, founded in 1999, is the single biggest provider of research funds for Cardio-Vascular Disease.

It provides invaluable support and it has an excellent slogan “**Fighting for Every Heartbeat**”

The organisation is a source of a wealth of information and the contact details are:

- **Telephone**: 0300 330 3322
- **E-mail**: supporterservices@bhf.org.uk
- **Address**:
  
  British Heart Foundation,  
  Lyndon Place,  
  2096 Coventry Road Sheldon, Birmingham B26 3YU

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