Myocarditis and cardiomyopathy

Cardiomyopathy UK
the heart muscle charity

An introduction to myocarditis

- Myocarditis is an inflammation of the heart muscle wall.
- It can affect the function of the heart, and the normal electrical signalling of the heart.
- Myocarditis can cause dilated cardiomyopathy in some people.

What is myocarditis?

The heart wall has three layers:

- pericardium – the 'sac' that surrounds the heart;
- endocardium – the inner lining of the heart; and
- myocardium – this is the middle layer, the heart muscle.

Myocarditis is an inflammation of the heart's muscle wall. It can affect how well the heart works: it means that the heart can't pump properly and doesn't work as well as normal. It also affects the normal electrical signalling of the heart (the heart's beat and rhythm). This can cause arrhythmias (irregular heart rhythms).

Who gets myocarditis?

Myocarditis can affect anyone, at any age, and can happen in people with no history of illness.

What causes myocarditis?

There are many possible causes of myocarditis (see below), but the most common cause is a viral infection.

- Viral infections – such as the viruses that cause the common cold, flu, chickenpox, glandular fever, German measles, gastrointestinal ('stomach') infections and adenovirus (lung infections).
- Bacterial infections – such as staphylococcus (sometimes called 'staph infections'), streptococcus (sometimes called 'strep infections') and the bacteria that causes Lyme disease (transmitted by ticks).
- Parasitic infections – such as toxoplasma (which causes toxoplasmosis and is found in cat faeces (poo)) and Trypanosoma cruzi (in tropical countries this can cause a condition known as Chagas disease and is transmitted by insect bites).
- Fungal infections – such as molds, yeasts and fungi.
- Allergic reactions – to medication (such as some antibiotics and anti-epileptic drugs) or recreational drugs (such as cocaine).
- Reactions to chemicals radiation or radiotherapy (such as some cancer treatments).
- Immune conditions – such as Giant cell myocarditis (a very rare condition where some cells in the heart grow abnormally big). This can be associated with autoimmune conditions (where the immune system is overactive and attacks healthy cells and organs) such as lupus.

It may not be possible to confirm the exact cause of myocarditis. When a cause can't be found, this might be referred to as 'idiopathic' (or unknown) myocarditis.

Does myocarditis get better?

Most people with myocarditis recover completely, either with or without treatment, and have no lasting symptoms or complications. For example, if it is caused by a viral infection, the myocarditis may get better as the person's immune system fights the infection and they recover from the virus. Doctors may suggest avoiding strenuous activity and exercise for some months to avoid strain on the heart and help it to recover.

However, some people will have ongoing symptoms, which can vary in how severe they are.

What are the symptoms of myocarditis?

Not everyone with myocarditis will have symptoms. Some people feel generally ill or under the weather, and have 'viral infection' symptoms such as feeling tired, achy, a sore throat and a headache. However, other people have more severe symptoms, which are usually the following.

- **Chest pain** - which can feel very similar to the pain of a heart attack.
- **Palpitations** (feeling your heart beating too fast or too hard like it is 'fluttering') – this is caused by abnormal heart rhythms ('arrhythmias') where the heart is beating too fast or erratically because the electrical messages which control the heart's rhythm are disrupted.

Complications

Severe myocarditis can cause permanent damage to the heart muscle, and the following complication.

Increased risk of stroke – this is because when the heart is not able to pump effectively, blood can pool in the chambers of the heart and form blood clots. These clots can get trapped in blood vessels and could cause a heart attack or stroke. This could also be caused by arrhythmias.

Arrhythmias

In **atrial fibrillation** (AF) the electrical messages that normally cause the heart muscle to contract are disrupted. This means that the atria (the top chambers of the heart) beat very quickly and are uncoordinated, making the flow of blood around the atrium 'turbulent', and the heart less efficient at pumping out blood. These uncoordinated messages can also become transferred to the lower chambers of the heart (the ventricles). This can cause a fast and irregular heart rhythm. The turbulent flow of blood can increase the risk of blood clots forming, which can increase the risk of a stroke.

In **ventricular fibrillation** (VF) the contraction of the ventricles (the lower chambers of the heart) is uncoordinated, and they 'quiver' rather than contract normally. This means that blood is not pumped out of the heart effectively. This is life-threatening as the heart suddenly stops beating (a cardiac arrest), and needs urgent medical attention.

Myocarditis and cardiomyopathy

Myocarditis, particularly when it is caused by a viral infection, can cause dilated cardiomyopathy. When this happens, the person usually experiences symptoms of heart failure.

Heart failure is when the heart isn't pumping well enough, and needs support to meet the needs of the body. It can cause the following symptoms.

- **Breathlessness** – fluid builds-up on the lungs, making it harder to breathe. This might happen when doing activities, but in more severe cases it can happen even when resting.
- **Tiredness** – as the heart function is reduced, less energy is delivered to the tissues, causing tiredness.
- **Swollen ankles and tummy** – a build up of fluid in the tissues, because the heart isn't pumping effectively to remove excess fluid, can cause swelling (oedema).

It can also cause palpitations, dizziness and fainting.

See our factsheet 'about heart failure' or contact us for more information about dilated cardiomyopathy.

How does myocarditis cause dilated cardiomyopathy?

It is not clear why myocarditis causes cardiomyopathy in some people, but it may be that the same immune response that protects the body from infection can, in some cases, cause damage to the heart muscle. And the viral infection itself can cause damage. This can involve the following.

The role of different stages in the immune system response

- Initially, 'natural killer' (or NK) cells fight infection by stopping the virus from replicating. This protects the heart muscle from damage.
- Some cytokines (proteins produced during immune responses to infection) protect the heart and others can cause damage to the heart.
- Other cells, called 'NK-like' cells can cause damage to the heart muscle cells.
- T-cells (or T lymphocytes – a type of white blood cell that is important in the immune response) help to kill off the viral infection. However, these cells can also cause damage to the heart muscle.

The role of the virus itself

Viral infections can cause the death of muscle cells (called 'necrosis') as the virus replicates. This can happen if the body's immune response is not able to clear the viral infection, and the myocarditis gets worse.

How is it diagnosed?

There are several tests to diagnose myocarditis, which may include the following.

- **Physical exam and medical history** – to see what physical symptoms are happening and what may be possible causes of these symptoms.
- **Blood tests** – these look for evidence of inflammation, infection and for damage to the heart muscle.
- **ECG** (electrocardiogram) – this looks at the electrical activity of the heart and how the spread of electrical messages pass through the heart muscle. It is also used to see whether arrhythmias are happening.
- **Chest X-ray** – this looks at the size and structure of the heart (to see if it is enlarged), and whether there is fluid on the lungs (a symptom of heart failure).
- **Echo** (echocardiogram) – this is a type of ultrasound scan, which uses sound waves to create echos when they hit different parts of the body. Echos look at the structure of the heart and how it is working (how well it is pumping). It can be used to see if the heart is enlarged, or has fluid around it.
- **MRI** (magnetic resonance imaging) scan – this scan produces high quality images and is used to look at the shape and structure of the heart. It is used to see if the heart muscle is inflamed.
- **PET** (positron emission tomography) scan – this scan uses radioactive dyes to create images of the body, and is used to see how the heart is working. This is usually combined with a CT or MRI scan.
- In some cases, an **endomyocardial biopsy** is done. This is where a small piece of heart muscle is removed to look for signs of infection. This is usually only done if the other tests are not able to identify the cause of your symptoms.

How is it treated?

As myocarditis can get better in some cases, not everyone will need treatment. However, what treatment might be used depends on what symptoms the person has, and the cause of the myocarditis.

Treating the cause

If the cause of myocarditis is known, treatment may be given for this. For example, drugs that affect the immune system.

Treating non-heart related symptoms

Symptoms such as a high temperature may be treated with over-the-counter painkillers.

Treating the symptoms affecting the heart

Treating the symptoms affecting the heart often involves treatment for heart failure. Depending on these symptoms, treatment might include the following.

- ACE inhibitors (angiotensin-converting enzyme inhibitors) – relax and open up blood vessels, which makes pumping blood easier and takes strain off the heart. They can control blood pressure, and control and prevent worsening of heart failure symptoms.
- ARBs (angiotensin II receptor blockers) – similar to ACE inhibitors, these relax the blood vessels and lower blood pressure. They may be used when ACE inhibitors are not suitable due to side effects.
- Beta blockers – slow down the heart rate, and control arrhythmias.
- Diuretics (water tablets) – help to reduce water retention (which causes swelling in the ankles and around the lungs) by encouraging the kidneys to produce more urine. They may not be needed once the ACE inhibitors and beta blockers begin to work.
- Anticoagulants may be used to prevent blood clots forming. This may be used in people with atrial fibrillation – as the uneven flow of blood through the heart could cause a clot to form.

In some cases where the heart is unable to work without support, a ventricular assist device (VAD) might be used. VADs are artificial pumps that assist the heart to pump blood from the lower chambers (ventricles) of the heart around the body. This may be a temporary measure while the heart recovers.

In very severe cases, a heart transplant may be needed if the heart failure is so severe that it can't be treated with medication or devices. This involves removing the failing heart and replacing it with the heart from a donor.

We are here for you

At Cardiomyopathy UK we offer help and support for you and your family. We have information about each type of cardiomyopathy as well as diagnosis, treatment and lifestyle issues. Look on our website or call us for more information. Call our helpline to talk to our cardiomyopathy support nurses. We can put you in contact with other people affected by cardiomyopathy through our support groups, support volunteers and social media. Contact us for more about our services, or look online.

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