

## Dizziness, Blackouts, Syncope

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There are many different causes of blackouts and dizziness and these may relate to problems with the blood pressure, the brain, the inner ear, disorders of blood components and the heart. I will focus on cardiac causes of dizziness and blackouts and in particular disorders of heart rhythm. The medical term for a sudden blackout is called syncope

**Dizziness and blackouts** due to disorders of heart rhythm are usually characterised by a sudden on/offset of symptoms. Differentiating between the various causes of a blackout can be difficult and may require investigation from other specialists such as a neurologist, ENT surgeon or haematologist.

### Normal Heart Rhythm

The Sinus node is the heart's pacemaker. It is located at the top of the right atrium. The electrical impulse travels across the atria towards the Atrio-Ventricular node. The AV node then delays it a little bit before passing the impulse through to the ventricles. This delay allows the blood to travel from the atrium into the ventricle. The impulse travels along specialised fibres called HIS-Purkinje system including the left and right bundle.

This means that in a normal heartbeat, each impulse originates in the sinus node and travels to the ventricles causing the atria and then the ventricles to contract sequentially.

### Bradycardia

Bradycardia means slow heartbeat and can occur due to problems in the sinus node, the AV node or the His-Purkinje system. Cells in the heart, like the rest of the body, tend to deteriorate with increasing age. This can cause a slow pulse, tiredness, dizzy spells and even blackouts if the slowing is severe or there is a pause in impulses of a few seconds or more.

Disease of the AV node and His-Purkinje system leads to slowing of electrical conduction between the atria and ventricles. This can result in only one ventricular contraction for every 2 atrial contractions (known as 2 to 1 heart block), complete heart block (in which no electricity gets through the AV node at all and the chambers beat independently of each other) and any combination in between e.g. 3 to 1, 3 to 2, 4 to 3, 5 to 1 heart block etc

### Diagnosis of Bradycardia

Bradycardia can be easily diagnosed from measuring a slow pulse, recording an ECG or from wearing a cardiac monitor. If symptoms of dizziness or blackouts are rare, a small ECG recording device can be inserted under the skin for longer term monitoring

(implantable loop recorder). These devices automatically record heart rhythm but a patient can also activate the device to tell it when they have had symptoms. Placing an antenna over the skin interrogates the device and collects the recorded information. This can be performed in a pacemaker clinic, or via a special remote monitoring device that can be installed at a person's home using a wireless 3G cellular phone network.

### **Treatment of Bradycardia**

Symptomatic bradycardias are usually treated by implanting a pacemaker. Pacemakers prevent the heart from going slower than their programmed rate. They usually do not prevent or treat fast heart rhythms. Occasionally, patients who require a drug that causes slowing of your heart rate e.g. a beta-blocker e.g. for Atrial Fibrillation may need a pacemaker to allow them to take this drug safely. Similarly, if you have episodes of a very slow heart beat or your heart stops for long periods but doesn't cause symptoms, you may still be offered a pacemaker for safety reasons.

### **Tachycardia**

Syncope can also happen when the heart races – a tachycardia. There are several different types of tachycardia, but the most important type which causes syncope are those from the the ventricles, called ventricular tachycardia (VT), and ventricular fibrillation (VF).

### **Diagnosis of Ventricular Arrhythmias**

This is essentially performed in the same way as for diagnosing bradycardia or other types of tachycardia, using ECGs, cardiac monitors you wear for days or weeks and occasionally by implanting a small monitor under the skin.

### **Ventricular Arrhythmias**

Its are most commonly seen in patients with previous heart attacks where a scar acts as a focus point for the VT. A VT can deteriorate into VF. VF can also happen spontaneously. The difference between VT and VF is that VF is a totally chaotic rhythm and always results in cardiac arrest.

VT can also result in cardiac arrest if it is fast enough, but when it is slower it results in palpitations and feeling unwell. If it is very slow, which is more common if you take anti-arrhythmic drugs, it may cause mild or no symptoms.

VT or VF can also occur with other types of heart disease, particularly if they cause impairment of heart function or heart failure. These include dilated cardiomyopathy,

hypertrophic cardiomyopathy, myocarditis and sarcoid as well as the channelopathies such as long QT and Brugada Syndromes, in which heart function is usually normal.

There are also several types of VT which are known to occur in people with normal hearts, including in young people. These have a good prognosis and can usually be managed effectively with medication or ablation. These include right ventricular outflow tract VT (RVOT VT) and fascicular VT.

### **Treatment of Ventricular Arrhythmias**

Depending on your situation you will need either a device based therapy with an implantable defibrillator option or/and medications. Occasionally ablation can help in some patients.

### **Fainting & Vasovagal Syncope**

A simple faint is the most common cause of blackouts and affects nearly 1 in 4 people at some point in their life. It does not mean there is an underlying problem with the heart. Faints can occur if your blood pressure is too low or the bodies response to standing upright is insufficient (orthostatic hypotension). This can be seen in some other conditions such as Ehler Danlos Syndrome, adrenal insufficiency or hypothyroidism amongst others. It can also happen to perfectly healthy persons. This is why a common reason for fainting is standing for too long on a hot day e.g. soldiers in on a parade ground.

Some people, however, have a very low threshold for fainting and this can cause major disturbances to their quality of life. This appears to be particularly common in young females, usually in their twenties, and particularly if they are thin. They often have low blood pressure at rest when they feel well, so it doesn't have to fall very much to make them feel ill or faint.

The medical term for fainting is vasovagal syncope, and if you faint often you are said to have vasovagal syndrome.

Essentially, there is a mis-communication between the brain and heart in this condition causing heart rates to fall and blood pressure to drop when they should both do the opposite. The brain communicates with the heart via nerves called the vagus nerve and the sympathetic chain. It is the vagus nerve which slows heart rate and lowers the blood pressure, so if it is dominant over the sympathetic chain, it can cause people to faint.

The good news about fainting is that unless you are unlucky enough to injure yourself severely when you fall, you will not die from this condition. The not so good news is that

the treatments available are not as good as one would like and there is no cure, although many people with this condition do 'grow out of it'.

### **Diagnosis of Vasovagal Syndrome (VVS)**

History is the single most important tool to diagnose VVS.

Sometimes it can be challenging to be sure on the history alone, as it can sometimes be difficult to differentiate it from other causes of blackouts such as problems with the heart's conduction system, types of epilepsy or what is caused psychogenic syncope. Epilepsy is a rare brain condition causing fits affecting less than 1% of the population. Psychogenic syncope is a faint caused by extreme stress or anxiety and is relatively common.

It is very important to know that all types of syncope, whether due to fainting, a heart problem, epilepsy or other conditions can cause a person to have jerky limb movements. This tends to make witnesses, carers and doctors think it is due to an epileptic fit, but this may not be true. It is estimated that up to 30% of adults diagnosed with epilepsy do not have the condition.

Fainting and syncope in elderly people can also occur and because of impaired reflexes, joint problems and weaker muscles, often results in a fall. Sometimes elderly people will not remember blacking out before falling, so it is important elderly people who fall are investigated for heart problems.

### **Tilt-table testing**

Tilt Table Testing is a simple (and very boring) test where you are strapped on a bed which is then tilted upright to 70 degrees. This test tries to reproduce a situation where your circulatory system has to deal with a prolonged standing situation. It is a harmless and completely safe test. It is often combined with a carotid sinus massage to assess special receptors around your neck arteries as these are involved in your heart rate and blood pressure regulation. A tilt table test can be very useful to identify the cause of syncope.

### **Treatments for Vasovagal Syncope**

Unfortunately medications are not very effective but the general strategy is to increase your blood volume so a high salt intake is recommended. This then increases your blood pressure. Another strategy is to prevent your venous blood vessels to dilate too much which would cause your blood pressure to drop when standing upright. Midodrine is often prescribed for this purpose.