

Symptoms & Diagnosis

Although mostly arrhythmias are symptomatic, sometimes they may not produce any symptoms. Some serious arrhythmias like atrial fibrillation can be asymptomatic and present with stroke (AF increases chance of stroke by 500%), while not so harmful arrhythmias like premature beats can be very symptomatic. So when we are deciding about severity of any arrhythmias, asymptomatic status may not imply severity of disease process. The presenting signs can be -

1. Palpitations or feeling of your own heartbeat, people can feel this as if heart is skipping a beat, fluttering, or beating too hard or fast.
2. Skipped beats- usually indicate extra beats from upper chambers of the heart (premature atrial complexes) or from lower chambers of the heart (Premature ventricular complexes). Premature beats are common in healthy people of all ages. Caffeine, alcohol, stress, and fatigue may cause PACs or PVCs to occur more frequently. If the symptoms caused by premature beats are bothersome, they can be treated with medications or catheter ablation.
3. A slow heartbeat, which can be felt as slow pulses- Slow heartbeat is called bradycardia. Slow heart beats less than 60 bpm can be harmless like in athletes or during sleep. But if it causes symptoms like dizziness and fainting, breathlessness and fatigue on exertion- then it needs to be addressed. Cause of bradycardia is either a disease in the sinus node or the AV node and conduction system below it. If an offending medication is responsible for bradycardia, it should be stopped. If no reversible causes are found, symptomatic bradycardia often needs to be treated by a pacemaker.

Some of the symptoms may be more serious and life threatening like,

1. Weakness, dizziness, and light-headedness
2. Fainting or nearly fainting- Fainting is a common symptom and can occur on prolonged standing, dehydration and fear. Cardiac cause of fainting is due to sudden stoppage of blood supply to the brain due to momentary stoppage of the heart or a fast heart rate. It indicates a disease of the structure of the heart or its electrical system. Cardiac cause is indicated by a sudden onset and short duration with quick recovery of fainting. Also fainting on exertion, or in presence of associated cardiac symptoms like shortness of breath or chest pain indicates a serious cardiac cause.
3. Sudden cardiac arrest- Occurs suddenly when the heart malfunctions and stops beating unexpectedly. Seconds later, the person becomes unresponsive, is not breathing or only gasping. Death occurs within minutes unless the victim receives treatment. It differs from syncope, as its not reversed automatically. Most common cause of SCA is a chaotic ventricular rhythm like Ventricular fibrillation. SCA can be reversible in some victims if CPR is started immediately and the rhythm shocked by a defibrillator. If 2 people are present at the incident, one should begin CPR immediately and the other should call for help and find an AED (Automatic external defibrillator).

The risk factors of SCA are:

1. A previous heart attack: The majority of people who die of SCA show signs of a previous heart attack
2. A family history of sudden death, heart failure, or massive heart attack
3. An abnormal heart rate or rhythm of unknown cause
4. An unusually rapid heart rate that comes and goes

5. Episodes of fainting of unknown cause
6. Some congenital heart defect before and after surgical repair
7. A low ejection fraction (EF): The ejection fraction is a measurement of how much blood is pumped by the ventricles with each heartbeat. A healthy heart pumps 55 percent or more of its blood with each beat; less than 35 percent indicates an elevated risk of SCA

How to Diagnose Cardiac Arrhythmias?

Diagnosing cardiac arrhythmias can be difficult, because of the infrequent episodes, and by the time patient reaches the doctor, arrhythmia may subside, making it difficult to identify exact nature of arrhythmia. So, if the patient doesn't have documented arrhythmia, then history, physical examination and when required various investigations may be required to diagnose the arrhythmia.

History Taking:

In history taking the exact nature of arrhythmia is assessed by asking the patient to describe the exact mode of onset of symptoms, ask them to explain how they feel the palpitations, any precipitating or relieving factors. Some arrhythmias come with sudden onset of neck pulsations. Some patients may develop arrhythmias during particular time of the day, sometimes during the exercise, which may help in diagnose the exact nature of arrhythmia. There are arrhythmias which are relieved by pressure over the neck, applying cold water to face, these may help the doctor to clinch the diagnosis. Presence of other health problems, such as a history of heart disease, high blood pressure, diabetes, or thyroid problems, History of lung diseases including tuberculosis. may also be important to know to diagnose and to decide on further management. It is also important to know about the family's medical history, including whether anyone in the family has:

1. History of arrhythmias
2. Any history of heart disease or high blood pressure
3. History of sudden death

History previous medications and current medications are also important. History of smoking, physical exercise and intake of drugs like cocaine or amphetamine will also be enquired.

Examination:

The following things will be assessed during the physical examination

1. To assess the rate and rhythm of the heartbeat
2. To the heart for any extra or unusual sound heard during the heartbeat
3. To assess the pulse for counting the heartbeat
4. To look for swelling in the legs or feet, which could be a sign of an enlarged heart or heart failure
5. To Look for signs of other diseases, such as thyroid disease, that could be causing the problem
6. To look for lung findings and also findings of glands in the neck.

Diagnostic Tests and Procedures

Electrocardiogram

An arrhythmia is considered documented if it can be recorded on an electrocardiogram (ECG). This is the standard clinical tool for diagnosing arrhythmias. To do an ECG, the healthcare

professional places small patches or stickers called electrodes on different parts of the body. One is put on each arm and leg and several across the chest. They do not hurt. With various combinations of these electrodes, different tracings of the heart's electrical activity can be made and permanently recorded on paper or in a computer. It records the relative timing of atrial and ventricular electrical events. It can be used to measure how long it takes for impulses to travel through the atria (the heart's upper chambers), the atrioventricular (AV) conduction system and the ventricles (the heart's two lower, pumping chambers). Because of the fleeting nature of arrhythmias, a person who complains of symptoms that suggest arrhythmia may often have an ECG that appears normal. Hence it is advisable to do an ECG when symptoms occur. Also it is very important to preserve all ECGs, keeping photocopied or electronically stored to avoid fading, and bringing them to the electrophysiologist during evaluation.

Holter and Event Monitors

Suspected arrhythmias sometimes may be documented by using a small, portable ECG recorder, called a Holter monitor (or continuous ambulatory electrocardiographic monitor). This can record 24 hours of continuous electrocardiographic signals. While an ECG is sort of a 12-second "snapshot" of the heart's electrical activity, the Holter monitor is more like a "movie."

As with an ECG, electrodes are taped to the chest. The wires are connected to a portable, battery-operated recorder that can run for 24 to 48 hours. The patient can do most normal activities while being tested. The patient may need to keep a diary or log of your activities and symptoms.

At the end of the measurement period, the recorder's tape or memory is analyzed on a computer that rapidly identifies rhythm disturbances that occurred while you were wearing the monitor. The diary helps the healthcare professional see how the activities or symptoms correspond to recorded events in the heart. For suspected arrhythmias that occur less frequently than every day, an External Loop recorder or ELR is helpful. An event monitor is similar to a Holter monitor. The patient must wear an event monitor while doing the normal activities. An event monitor records the heart's electrical activity when the patient will push a button to start the monitor on feeling symptoms. Otherwise they record automatically when they sense abnormal heart rhythms. Patient can wear an event monitor for weeks up to a month.

If the symptoms of palpitation or syncope is rare to occur once in few months, those patients are monitored by an Implantable loop recorder. This device detects abnormal heart rhythms. Small nick in skin is used to place this device under the skin in the chest area. An implantable loop recorder helps doctors figure out why a person may be having palpitations or fainting spells, or to rule out significant cardiac events associated with the symptoms. The device can be used for as long as 36 months.

Blood tests. Blood tests check the level of substances in the blood, such as potassium and thyroid hormone. Abnormal levels of these substances can increase your chances of having arrhythmia.

Genetic testing- is important to detect gene defects that cause primary electrical problems of the heart as a result of defect of ion channels (channelopathies), or to detect genetic cardiac muscle diseases. These help to know the familial gene defects, which helps in prognostication and family planning.

Chest x ray. A chest x ray is a painless test that creates pictures of the structures in your chest, such as your heart and lungs. This test can show whether your heart is enlarged.

Cardiac Imaging:

1. **Echocardiography.** This test uses sound waves to create a moving picture of the heart. Echocardiography (echo) provides information about the size and shape of the heart and how well the heart chambers and valves are working. The test also can identify areas of poor blood flow to the heart, areas of heart muscle that aren't contracting normally, and previous injury to the heart muscle caused by poor blood flow. A transoesophageal echo, or TEE, is a special type of echo that takes pictures of the heart through the food tube or oesophagus. This test is very useful particularly in patients with AF to rule out clots in the heart as a clot increases the chance of stroke and is a contraindication for cardioversion (reversal of AF to normal rhythm by a shock).
2. **Cardiac Magnetic resonance imaging(MRI)**is an very important test for evaluation of disease of heart muscle (after heart attack or from infiltrative disorders like sarcoidosis and tuberculosis) which otherwise may not be visible on echocardiography. The diagnosis of It shows the damaged and dead tissues of the heart which can result in life threatening arrhythmias like ventricular tachycardia and fibrillation, thereby helps to plan treatment. It also helps in planning ablation of these arrhythmias.
3. **Cardiac PET and chest CT imaging-** important to find inflammations in the heart in diseases like tuberculosis and sarcoidosis and helps in planning management. PET is a nuclear imaging protocol, which needs some preparations in the form of avoiding carbohydrates for few days before it.

Stress test. This is an option that provokes arrhythmias and makes their diagnosis (and thus their proper treatment) easier. A treadmill test may be used for people whose suspected arrhythmias are clearly exercise-related. It is important to know if exercise makes an arrhythmia worse. To test this, the patient will walk and run on a treadmill — or ride a stationary bicycle — while the heart rate and rhythm are monitored. Treadmill test also is important to see types and severity of genetic cardiac diseases involving mutations in the cell membrane channels(long QT syndrome).

Tilt table testing. A tilt test may be advised for some people who have had recurrent fainting spells and a vasovagal syncope is suspected. (one that is seen on prolonged standing, in uncomfortable conditions and out of fear and anxiety) . This syncope is often benign and needs only lifestyle modifications include adequate fluid intake and avoid stressors like prolonged standing. This test shows how the heart rate and blood pressure respond to a change in position from lying down to standing up.

Electrophysiology study (EPS). This test is used to assess serious arrhythmias. During an EPS, a

thin, flexible wires are passed through veins in the groin (upper thigh) or arm to the heart. The wire records the heart's electrical signals. An electrophysiologist (EP), a heart rhythm specialist, then studies the character and speed of those signals to find out areas of heart's muscle that caused the rhythm problem. This is important to diagnose cause of potentially life-threatening slow and fast heart rates and plan management.

Coronary angiography. Coronary angiography uses dye and special x rays to show the inside of the blood vessels of the heart. To get the dye into your coronary arteries, the doctor will use a procedure called cardiac catheterization.

A thin, flexible tube called a catheter is put into a blood vessel in the arm, groin (upper thigh), or neck. The tube is threaded into the coronary arteries, and the dye is released into the bloodstream. Special x rays are taken while the dye is flowing through the blood vessels. This helps the doctor find blockages that can cause a heart attack.