CONDITION

Sick sinus syndrome

Sick sinus syndrome is a problem with the heart's natural pacemaker that causes an abnormally slow or irregular heartbeat.

WHAT IT IS
Abnormal function of the heart's natural pacemaker

BODY SYSTEM
Heart and circulation

MAIN SYMPTOMS
Fatigue, dizziness, fainting, palpitations

WHAT CAUSES IT
Age-related scarring, medicines, or heart disease

HOW IT IS DIAGNOSED
ECG and longer-term heart rhythm monitoring

MAIN TREATMENT
Pacemaker and management of contributing causes

CAN IT BE CURED?
Sometimes - reversible triggers can resolve

IS IT AN EMERGENCY?
Sometimes - fainting or chest pain

LONG-TERM OUTLOOK
Usually manageable with monitoring and appropriate treatment

Overview

Sick sinus syndrome is a problem with the sinus node, a small group of cells in the heart's upper right chamber. The sinus node acts as the heart's natural pacemaker. It produces electrical signals that tell the heart when to beat.

The preferred medical term is sinus node dysfunction . When the sinus node does not work properly, the heartbeat may be too slow, pause for several seconds, or fail to speed up enough during activity. Some people alternate between slow rhythms and unusually fast rhythms. This is called tachycardia-bradycardia syndrome , or "tachy-brady syndrome."

A slow heart rate is not always abnormal. Healthy young adults, athletes, and people who are asleep may have a low pulse without having sick sinus syndrome. The condition matters when an abnormal rhythm causes symptoms, limits activity, or is linked to another heart rhythm

problem.

Sick sinus syndrome is more common as people get older because the sinus node and nearby heart tissue can develop scarring over time. However, it can occur at other ages, especially after heart surgery or alongside another heart condition.

Symptoms

Some people have no symptoms. Others have symptoms that come and go, which can make the condition difficult to recognise.

Possible symptoms include:

Symptoms happen when the heart does not pump enough blood to the brain and other organs. They may last only a few seconds or occur during particular activities.

In tachy-brady syndrome, you may notice racing or fluttering followed by a very slow pulse or a pause. The fast rhythm is often atrial fibrillation, an irregular rhythm that begins in the heart's upper chambers.

These symptoms can have many causes besides sick sinus syndrome. A pulse reading from a watch or home monitor cannot confirm the condition by itself.

- Unusual tiredness or reduced stamina
- Dizziness or light-headedness
- Fainting or nearly fainting
- Shortness of breath, especially during activity
- Chest discomfort
- Confusion or difficulty concentrating
- Awareness of a slow, pounding, fluttering, or irregular heartbeat
- Difficulty exercising at a level that was previously comfortable

Causes and risk factors

The most common cause is gradual scarring of the sinus node and the electrical pathways around it. This scarring can interfere with the signals that control the heartbeat.

Other possible causes or contributors include:

Medicines that may contribute include some beta blockers like metoprolol or propranolol ,

calcium-channel blockers, digoxin, and drugs used to control abnormal heart rhythms. These medicines are often important for other conditions. Do not stop one suddenly without medical advice.

In some people, no single cause is found. Several factors may also be present at the same time.

- Coronary artery disease or a previous heart attack
- Inflammation or disease affecting heart muscle
- Previous surgery involving the heart's upper chambers
- Certain inherited or structural heart conditions
- Obstructive sleep apnoea, which causes repeated pauses in breathing during sleep
- Low thyroid hormone levels
- Abnormal levels of potassium or other body salts
- Medicines that slow the heart

Diagnosis

Diagnosis begins with your symptoms, medical history, medicines, and pulse. Because symptoms may be brief or occasional, a normal heart tracing at one appointment does not rule out sick sinus syndrome.

An electrocardiogram , usually called an ECG or EKG, records the heart's electrical activity. It can show a slow sinus rhythm, pauses, or another rhythm problem. When an ECG captures a rhythm abnormality at the same time as symptoms, this provides especially useful evidence.

If episodes come and go, you may be asked to use a portable rhythm monitor. Options include:

An exercise test may be used if symptoms happen with activity. It can show whether the heart rate rises enough during exercise. Failure to increase appropriately is called chronotropic incompetence .

Blood tests may look for thyroid problems, electrolyte abnormalities, or other reversible causes. An ultrasound scan of the heart, called an echocardiogram, may be used to check its structure and pumping function.

There is no single heart-rate number or pause length that confirms the condition in every person. Diagnosis usually depends on the rhythm pattern, symptoms, contributing factors, and whether the two occur together.

- A Holter monitor, usually worn continuously for a short period

- A patch monitor, often worn for longer
- An event monitor that records during symptoms
- An implantable loop recorder for infrequent, unexplained episodes

Treatment and management

Treatment is based on whether the rhythm is causing symptoms and whether there is a reversible cause. People without symptoms may only need observation and follow-up.

A medication review is important. If a medicine is slowing the heart, its dose or use may be reconsidered. The right approach depends on why the medicine was prescribed, so changes should be medically supervised.

Treatable contributors, such as low thyroid hormone, electrolyte problems, or sleep apnoea, may also be addressed. Correcting one of these problems can improve the rhythm in some people.

For ongoing symptoms caused by a slow heartbeat, the main treatment is a permanent pacemaker. This is a small device placed under the skin, usually in the upper chest. It sends electrical impulses when the heart beats too slowly or pauses.

A pacemaker does not remove sinus node scarring. It prevents the heart rate from becoming too slow and can reduce related dizziness, fainting, and exercise limitation. The device needs regular checks, and its battery and function are monitored over time.

A pacemaker does not directly prevent fast rhythms such as atrial fibrillation. If fast rhythms are also present, treatment may include medicines or procedures to control the rate or rhythm. Some people with atrial fibrillation need medicine to reduce the risk of blood clots and stroke. That decision is based on individual stroke and bleeding risks, not on sick sinus syndrome alone.

Complications

When the heart beats too slowly, the brain may briefly receive too little blood. This can lead to fainting, falls, or injury.

An inadequate heart rate can also reduce exercise capacity and make everyday activities more tiring. In people with other heart problems, persistent slow rhythms may contribute to worsening heart failure symptoms.

Sick sinus syndrome is often linked with atrial fibrillation or atrial flutter. These fast rhythms

can cause palpitations and shortness of breath. Atrial fibrillation can also increase the risk of a blood clot travelling to the brain and causing a stroke.

Complications are not inevitable. Monitoring and treatment are intended to control symptoms and reduce risks linked to slow or fast rhythms.

Prevention

Age-related scarring of the sinus node usually cannot be prevented. Inherited causes also cannot currently be prevented.

Some contributing problems can be identified and managed. This may include treating sleep apnoea, thyroid disease, or abnormal electrolyte levels. Reviewing medicines can help identify drugs that may be slowing the heart, but prescribed treatment should not be stopped without guidance.

General care for heart health-such as avoiding smoking and managing blood pressure, cholesterol, and diabetes-may lower the risk of other heart conditions. It does not guarantee that sick sinus syndrome will be prevented.

Living with it and what to expect

The course differs according to the cause and whether other heart conditions are present. Age-related sinus node dysfunction often develops gradually over months or years. Symptoms may remain occasional at first, then become more noticeable. Some reversible forms improve when the underlying trigger is corrected.

If you do not have symptoms, regular follow-up may be all that is needed. New fatigue, fainting, reduced exercise ability, or palpitations should be reported because the rhythm may have changed.

After pacemaker placement, many people can return to their usual daily activities once the implant site has healed. Follow-up checks make sure the pacemaker is working correctly and help track its battery. You may receive specific advice about wound care, driving, physical activity, and devices that produce strong magnetic or electrical fields.

A pacemaker controls slow rhythms but does not prevent every heart problem. Ongoing care may still be needed for atrial fibrillation, coronary artery disease, heart failure, or other conditions.

The long-term outlook is often good when symptoms are recognised and treated. It is

influenced more by age and other heart or medical conditions than by the slow rhythm alone.

When to get medical help

Seek emergency help now if you have:

Do not drive yourself if you feel faint or severely unwell.

Arrange prompt medical assessment for new fainting, repeated near-fainting, worsening shortness of breath, or a new slow or irregular pulse with symptoms.

A routine appointment is appropriate for ongoing tiredness, reduced exercise capacity, occasional palpitations, or repeated low pulse readings without severe symptoms. Bring a list of medicines and, if available, records from a home monitor or wearable device. These records can be helpful, but they do not replace a medical ECG.

If you already have a pacemaker, follow the monitoring plan provided for your device. Seek advice if the implant area becomes increasingly red, swollen, painful, or starts draining fluid, especially soon after placement.

- Fainted and have not recovered normally
- Chest pain or pressure
- Severe difficulty breathing
- A very slow or irregular heartbeat with severe weakness or confusion
- Sudden facial drooping, arm weakness, speech trouble, or other stroke symptoms

Common questions

Is sick sinus syndrome the same as having a low heart rate?

No. A naturally low resting heart rate can be normal, especially during sleep or in physically fit people. Sick sinus syndrome involves abnormal sinus node function, usually with symptoms or an inability to adjust the heart rate when needed.

Can sick sinus syndrome come and go?

Yes. Pauses or slow rhythms may occur only occasionally. That is why a longer-term rhythm monitor is sometimes needed when a standard ECG does not capture an episode.

Will I definitely need a pacemaker?

No. A pacemaker is generally considered when slow rhythms cause symptoms and are not due

to a reversible problem. People without symptoms may only need monitoring.

Does a pacemaker cure sick sinus syndrome?

A pacemaker does not repair the sinus node. It takes over when the natural heart rate becomes too slow. This can control symptoms, but other rhythm problems may still need treatment.

Can I exercise with sick sinus syndrome?

Exercise may be possible, but the safe level depends on your symptoms, heart rhythm, other heart conditions, and whether you have recently received a pacemaker. Stop and seek assessment if activity causes faintness, chest pain, or unusual shortness of breath.

Can sick sinus syndrome cause atrial fibrillation?

The two conditions commonly occur together because both can result from changes in the heart's upper chambers. Atrial fibrillation may need separate treatment, including an assessment of stroke risk.

Sources

- Kusumoto FM, Schoenfeld MH, Barrett C, et al. 2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay . Circulation . 2019;140:e382-e482.
- Glikson M, Nielsen JC, Kronborg MB, et al. 2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy . European Heart Journal . 2021;42:3427-3520.
- Hawks MK, Paul MLB, Malu OO. Sinus Node Dysfunction . American Family Physician . 2021;104(2):179-185.
- MedlinePlus Medical Encyclopedia. Sick sinus syndrome . U.S. National Library of Medicine.