

CARDIAC EXTRASYSTOLE

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Abstract: Extrasystole is an often-benign alteration of the heart rhythm. This is an early pulsation contraction of the heart, which the affected individual can clearly perceive as an abnormal contraction of the organ, an “added” or “irregular” heartbeat compared to the normal heartbeat, but which only instrumental examinations are able to detect and typify accurately.

Keywords: sino-atrial node, atria, ventricles, AV junction, Purkinje, “flapping wings”, Atrial extrasystoles, Ventricular extrasystoles, ECG, Holter monitoring.

Physiologically, the heartbeat originates from the sino-atrial node, present in the upper part of the right atrium, one of the four chambers of the heart, and close to the upper hollow vein. This is the “electrical control unit” from which starts the electrical impulse that, first through the atria and then through the ventricles, makes the heart contract, allowing the blood to be pumped into the body (systole indicates the contraction of the heart, while diastole is its relaxation). Extrasystoles are essentially extra beats, or contractions, which interrupt the normal regular rhythm of the heart. They occur when there is electrical discharge from somewhere in the heart other than the sino-atrial node. They are classified as atrial or ventricular extrasystoles according to their site of origin. The normal heart rate and rhythm are determined by the sino-atrial node in the right atrium, which acts as the pacemaker for the heart. This node discharges electric current through the atria causing them to contract. The electric current then passes through the atrioventricular (AV) node which lies within the lower interatrial septum. Electrical impulses pass from here into the Purkinje's network, along the right and left bundles of His, and excite the ventricular muscles, causing their contraction. The conduction system and myocardium have a nerve supply and are hormone sensitive (to catecholamines), which allows regulation of the heartbeat according to different activities, stress and excitement. Both atrial and ventricular extrasystoles are common at all ages.

In the case of extrasystoles, the stimulus to contraction does not come from the sino-atrial node but is localized elsewhere (atria, ventricles, AV junction), interfering with the normal conduction of the electrical impulse: the ectopic impulse breaks in at any stage of the cardiac cycle and often modifies the duration of the ventricular diastole (depending on whether the extrasystole is inserted in an early or late phase of the diastole), with consequent possible reduction of the cardiac output, especially if the extrasystoles are frequent or repetitive. According to the origin of the stimulus that causes the extrasystolic beat, an atrial extrasystole is distinguished, in which the stimulus comes from the atrial musculature; a ventricular extrasystole, when it comes from the ventricular musculature; an

atrioventricular extrasystole or nodal junctional, with the stimulus coming from the atrioventricular node. The altered pulsations can be extemporaneous (so-called “blanks”) or frequent, with a manifestation that follows certain regularity or not. Not always, however, does the individual with extrasystole feel these abnormal contractions, being that the condition is many times asymptomatic. Otherwise, it may feel a sort of “flapping wings” in the chest at the heart level or a sort of “emptiness”, a stop to the heartbeat, a plunge of the heart. The patient does not feel most extrasystoles, especially if they are isolated and occasional. Symptomatic patients may instead have the sensation of a “missing heartbeat” or a “more intense heartbeat”, or they feel a sort of “flapping wings”, a “flicker in the middle of the chest” or a sort of “thorax thud” in correspondence of the heart, a “void”, a “plunge” of the heart. If, on the other hand, the extrasystoles are repetitive (and occur in pairs/triplets, or alternate with the normal rhythm determining a bi/tri/quadruple rhythm) or are frequent and last longer, the heart rhythm changes and is often felt by the patient with episodes of palpitations that have an accelerated or irregular heart rhythm. In some cases, however, the symptoms become more important, especially if associated with prolonged tachycardia: shortness of breath (dyspnea), increased fatigue (asthenia) and dizziness may appear.

In the case of benign extrasystole, the symptoms tend to worsen at rest, sometimes especially after meals or at night, and may disappear with physical exercise; in the case that they increase with physical activity, they are often indicative of a more important pathology and require pharmacological therapies or interventions aimed at treating the underlying disease. For this reason, a detailed description of the symptoms will be essential during the cardiological examination to define the contours of this arrhythmia. However, beyond the description of the symptomatology, instrumental examinations are necessary.

Extrasystole can occur at any age, therefore also in pediatric age. But in general the probability of appearance increases with age. In a healthy heart, in a young individual who has no pathology, extrasystole often correlates with a functional disorder and can be associated with stress (physical and mental), excessive consumption of smoke, caffeine, alcoholic or carbonated drinks, substances of abuse (cocaine and other drugs) or some medicines (digoxin, aminophylline, tricyclic antidepressants). Fever, excessive anxiety or excessive sports can also become triggers. At other times, extrasystolic beats can result from a lack of calcium, magnesium and especially potassium in the blood or from an excess of calcium. Rest, the correction of these behaviors or these alterations causes the disappearance of extrasystole. Even during pregnancy, extrasystoles are very frequent, but are related, as in the case of gastro-esophageal reflux or an excess of abdominal fat, to vagal or sympathetic reflex stimulations coming from the abdominal organs. Such premature systoles must not, therefore, create concern and are not related to heart disease. The extrasystole form of arrhythmia can also occur as a sign of other conditions or diseases that do not affect the heart, such as thyroid disorders (especially hyperthyroidism, but also hypothyroidism), anemia, untreated arterial hypertension, gastro-esophageal reflux or other digestive and intestinal disorders such as gallstones, constipation, meteorism.

Therefore, an appropriate lifestyle, corrections of cardiovascular risk factors, annual monitoring of standard blood tests and not excessively intense sporting activity are ideal prerequisites for a healthy heart and body. The majority of patients suffering from extrasystole, but otherwise healthy, will not need any therapy, because they are benign and related to non-pathological conditions (anxiety, digestive difficulties, stress, sleep deprivation) – explained the specialist. Reducing the most frequent triggering factors (caffeine, nicotine, drinks, drugs or excessive sports) can certainly be useful and sometimes essential to decrease the frequency or solve the problem, regardless of the symptoms. Many patients benefit greatly from lifestyle interventions, a healthy and light diet, regular physical activity

that is not excessively intense, and recovery and maintenance of weight and shape.

“In most cases, occasional extrasystoles in non-cardiopathic individuals are not a health problem, but it is essential to check their benign nature with your doctor to exclude heart disease or other causes. Once the diagnosis has been made, and above all the reduction of working arrhythmias has been verified, it has now been demonstrated that the practice of regular physical activity has positive effects on the reduction of extrasystole and on the improvement of both the physical and psychological condition of the non-cardiopathic individual suffering from extrasystole. The presence of heart disease, on the other hand, will limit the intensity of physical activity in relation to the type of pathology underlying it and its prognosis. However, even the cardiac patient is recommended a mild regular physical activity, while respecting his overall health, and only in limited, more serious cases we recommend absolute rest, regardless of the presence of extrasystoles,” concluded the specialist.

Atrial extrasystoles

These are common in healthy people with normal hearts. They are often seen on 24-hour Holter monitoring in over 60% of healthy adults. They can also occur when there is increased pressure on the atria such as in cardiac failure or mitral valve disease and may occur prior to the development of [atrial fibrillation](#). They are exacerbated by alcohol and caffeine.

Ventricular extrasystoles

These are common and can occur at any age.

Premature ventricular contractions (PVC) have been described in 1% of clinically normal people as detected by a standard ECG and 40-75% of apparently healthy persons as detected by 24- to 48-hour ambulatory ECG recording.

They are more common in those with structural heart disease. Ventricular extrasystoles are the most common type of arrhythmia that occurs after [myocardial infarction](#). They may also occur in severe left ventricular (LV) hypertrophy, [hypertrophic cardiomyopathy](#) and [congestive cardiac failure](#). There are various classification systems for ventricular ectopics, in terms of their clinical risk, frequency or focus of origin.

Atrial extrasystoles are very common and only rarely associated with any disease. Ventricular extrasystoles are also common. In a structurally normal heart, they are almost always benign.

Risk factors for extrasystoles

Can occur in normal hearts, where the prevalence of extrasystoles increases with age.

Causes of extrasystoly

Heart disease, including [acute myocardial infarction](#), valvular heart disease, [cardiomyopathy](#), ventricular hypertrophy and cardiac failure, electrolyte disturbances, including hypokalaemia, hypomagnesaemia, hypercalcaemia, drugs, including digoxin, aminophylline, tricyclic antidepressants, cocaine, amphetamines, alcohol excess, infection, stress, surgery, [hyperthyroidism](#), possibly, central sleep apnoea is linked to ventricular ectopics.

Extrasystoles usually occur after a normal heartbeat and are followed by a pause until the normal heart rhythm returns. Therefore, they may be felt as 'missed' or 'skipped' beats or 'feeling the heart has stopped'. Alternatively, they can be felt as a thud or strange sensation like a somersault in the chest, or as extra beats. They can be uncomfortable and cause significant anxiety in some people. Symptoms are usually worse at rest and may disappear with exercise. Symptoms which increase on exercise are more worrying and significant. Other possible symptoms: syncope or near syncope (dizziness), atypical chest pain, fatigue.

Possible signs

There may be none.

Variable or decreased intensity of heart sounds; the augmented beat following a dropped beat may be heard.

Variable pulse rhythm.

Visible jugular pulse (cannon a wave) from loss of AV synchrony.

Diagnosing extrasystoles (assessment)

Detailed history of the presenting symptom - including onset, duration, associated symptoms and recovery. Check for other cardiac symptoms including chest pain, breathlessness, syncope or near syncope (eg, dizziness), and arrhythmia symptoms (eg, sustained fast palpitations). If there is history of syncope, note that: exertional syncope should always raise alarm of a sinister cause. Rapid recovery after the syncopal event, without confusion or drowsiness, is characteristic of cardiac syncope. Family history - for early cardiac disease or sudden death. Previous cardiac disease or coronary heart disease (CHD) risk factors.

In patients presenting with palpitations initial investigations are:

Resting 12-lead ECG.

- FBC and TFTs.
- Electrolytes.

Other investigations:

- Serum calcium and magnesium.
- If symptoms have a long duration (many hours), advise the patient to attend their GP surgery or A&E for a 12-lead ECG during the next episode.
- Ambulatory ECG monitoring:

If symptoms are short-lived but frequent (>2-3 times per week), use a 24-hour Holter monitor: If symptoms are short-lived and infrequent (<1 per week), use an event monitor or transtelephonic recorder.

- Echocardiography - to assess LV function and heart structure.
- Exercise stress testing - the relation of extrasystoles to exercise may have prognostic importance.
- Further non-invasive [cardiac imaging](#) may be required.

ECG findings

Atrial extrasystoles

- No P-wave or an abnormally shaped P-wave.
- Early QRS complex of similar morphology to normal sinus beats.

Ventricular extrasystoles

- Early QRS complex.
- No P-wave.
- QRS complex wide (greater than 120 msec) and abnormally shaped.
- Abnormally shaped T-wave.

When these alternate with normal QRS complexes, the rhythm is called bigeminy. When extrasystoles occur with every third beat, the rhythm is called trigeminy.

Finally, there are however numerous heart diseases that are associated with extrasystole, and often arrhythmia is one of the many symptoms that accompany the basic pathology: heart failure, myocardial infarction or coronary heart disease in general, valvular heart disease, infections or inflammation of the heart (myocarditis, endocarditis, pericarditis), hypertrophic obstructive heart disease, dysplasia arrhythmia of the right ventricle or diseases of the cardiac conduction system.

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