Extrasystoles

Synonyms: ectopic beats, premature beats, premature atrial or ventricular complexes

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.

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.

Epidemiology[^1]

Both atrial and ventricular extrasystoles are common at all ages.

**Atrial extrasystoles**
- These are common in healthy people with normal hearts. There 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.
- 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.

**Children[^2]**
- 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.
- Both are usually abolished by exercise.

Significance of extrasystoles

Extrasystoles can occur frequently in people with completely normal hearts and often do not cause any problems. However, they can also be a feature of certain cardiac diseases.

**Significance of atrial extrasystoles**
- Usually, atrial extrasystoles do not cause problems.
- In some cases, runs of atrial ectopy can lead to paroxysms of atrial fibrillation.[^3]
Significance of ventricular extrasystoles[4]

Patients without cardiac disease
Ventricular extrasystoles are often found in clinical practice. In the absence of heart disease, they are usually benign and the prognosis is good. Previous research found that in normal hearts, there were no excess cardiovascular events or mortality in patients with ventricular extrasystoles.[1] However, more recent research has revealed possible adverse affects of ventricular extrasystoles, even in those without known cardiac disease:

- There is conflicting evidence regarding the effect of ventricular extrasystoles on mortality.[5]
- Extrasystoles induced during exercise testing, particularly those arising during the recovery phase, may indicate an increased mortality risk.[6, 7, 8]
- In patients with frequent ventricular ectopics (>1,000 per 24 hours), there may be an adverse affect on ventricular function.[4]
  - There may be subtle impairment of LV function, despite a normal LV ejection fraction.
  - Frequent ventricular extrasystoles may be linked to a slow decline in ventricular function in the long term (over several years or decades). However, it was rare for overt LV dysfunction to develop - most patients had ejection fractions in the normal range.

Patients with cardiac disease
In the presence of significant structural heart disease, frequent ventricular extrasystoles indicate an increased risk of sudden cardiac death, and specialist advice should be sought.

Risk factors for extrasystoles[1]
- Can occur in normal hearts, where the prevalence of extrasystoles increases with age.
- Hypertension.
- Heart disease, including acute myocardial infarction, valvular heart disease, cardiomyopathy, ventricular hypertrophy and cardiac failure.
- Electrolyte disturbances, including hypokalaemia, hypomagnesemia, hypercalcaemia.
- Drugs, including digoxin, aminophylline, tricyclic antidepressants, cocaine, amphetamines.
- Alcohol excess.
- Infection.
- Stress.
- Surgery.
- Hyperthyroidism.
- Possibly, central sleep apnoea is linked to ventricular ectopics.[9]
- Stimulants such as caffeine may have a role, although this has not been proven for ventricular extrasystoles.[1]

Presentation
May be a coincidental finding on a routine ECG.

Possible symptoms
- Palpitations are the main reported symptom (see also separate article on Palpitations):
  - There is an awareness of a change in the force, rate or rhythm of the heartbeat.
  - 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 are:
  - Syncope or near syncope (dizziness)
  - Atypical chest pain
  - Fatigue
  - There are case reports in which chronic cough cough ± syncope were the presenting symptoms of extrasystoles.[10, 11]

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 atroventricular synchrony.

Assessment[12]

History
• 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.[13]
  • Rapid recovery after the syncopal event, without confusion or drowsiness, is characteristic of cardiac syncope.[13]
• Family history - for early cardiac disease or sudden death.
• Previous cardiac disease or coronary heart disease (CHD) risk factors.

**Examination**

• Cardiovascular system including blood pressure, heart murmurs and any signs of cardiac failure.

**Investigations**

In patients presenting with palpitations, initial investigations are:[14]

• 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.[15]
ECG findings

**Atrial extrasystoles**
These are premature P waves which look different from a normal P wave. They may be hidden in the ST segment or T wave of the preceding sinus beat. They may be followed either by a normal QRS complex, or the PR interval may be prolonged, or the impulse may not be conducted at all.

**Ventricular extrasystoles**
These are wide, abnormally shaped QRS complexes. Extrasystoles occurring at every second or third beat are called bigeminy or trigeminy respectively.

For examples see the ECG library (link provided under 'Further reading & references', below).

Which patients need referral from primary care?[12]

In the context of palpitations or suspected arrhythmia, referral is required for:

- Urgent symptoms (eg, chest pain, breathlessness or loss of consciousness) usually merit admission for assessment.
- Syncope or near syncope (especially exertional syncope, which is a serious symptom[13]).
- Symptoms suggesting a pathological tachycardia - eg, if there is an accurate description of very rapid heartbeat with sudden onset and offset.
- Significant ECG abnormality.
- Significant cardiac disease.
- Heart murmur.
- Significant underlying problem - eg, endocrine or metabolic disorder, infection.
- Family history of sudden death or heart disease at a young age:
  - Unexplained sudden death at age >30, and all sudden deaths at age <30, should trigger cardiovascular evaluation of first-degree relatives (for heritable arrhythmias or cardiomyopathies).
  - A family history of early cardiac disease (age <40) suggests possible increased cardiac risk and further assessment may be warranted.
- Also refer if symptoms are troublesome, so that treatment options can be considered.

The urgency of referral depends on clinical judgement, taking into account the frequency and duration of symptoms and other medical conditions. Discussion with a specialist may be helpful if there is uncertainty about the urgency or usefulness of referral. Usually, refer to an arrhythmia clinic, if available.

Management[12]

As an overview:

- Low-risk patients with no other cardiac problems and no symptoms (or minor symptoms only) can be reassured.
- Other patients (those with cardiac disease, cardiac risk or significant symptoms) will usually need further assessment, treatment or follow-up.
- Treatment options are:
  - Drugs - beta-blockers (eg, atenolol, metoprolol).
  - Radiofrequency catheter ablation of the ectopic focus (in suitable cases).
  - Patients with a high intake of caffeine or other stimulants may be advised to try reducing their intake, to see whether or not this improves their symptoms or the extrasystoles.[1]

Management of atrial extrasystoles

- If symptoms are troublesome, try beta-blockers (atenolol or metoprolol).[12]
- Atrial extrasystoles arising from the pulmonary veins may be treatable by the procedure of pulmonary vein isolation.[16]
- Catheter ablation may be a feasible option for some atrial ectopics in future, using specialised techniques.[3,16]

Management of ventricular extrasystoles[1]

Management depends on:

- Whether there is underlying heart disease.
- The frequency of the extrasystoles and whether ventricular tachycardia has been documented.
- The frequency and severity of symptoms.

The following strategy for management of ventricular extrasystoles is suggested in a 2006 cardiology review:[1]

- **Patients with no symptoms/minor symptoms only** - no heart disease (including normal LV function), infrequent ventricular extrasystoles, ventricular extrasystoles which reduce in frequency on exercise testing, and no documented ventricular tachycardia:
• These patients can be reassured.
• Reducing caffeine intake (if high) can be tried to see if this reduces symptoms.
• If treatment is desired, consider beta-blockers.

• **Patients with no heart disease, but with frequent ventricular extrasystoles (>1,000 per 24 hours).**[^4]
  - No treatment is required, but these patients may merit long-term follow-up, with periodic reassessment of LV function, particularly for those with very high-frequency extrasystoles.

• **Patients with no heart disease, with frequent unifocal ventricular extrasystoles and particularly if ventricular tachycardia or salvos is induced on exercise:**
  - Consider catheter ablation - this may be curative and results are often good.

• **Patients with cardiac disease:**
  - Ventricular extrasystoles may indicate either an arrhythmia risk or the severity of the underlying disease; therefore, consider the level of risk for sudden cardiac death.
  - Beta-blockers may be indicated either for the underlying cardiac disease, or because they may reduce the frequency or symptoms of ventricular extrasystoles.
  - Consider implantable cardiac defibrillators if at high risk of serious ventricular arrhythmia.
  - Consider catheter ablation as adjunctive treatment.

Also treat any underlying cardiac disease and contributing factors - eg, hypertension, electrolyte abnormalities, ischaemia or cardiac failure.

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**Further reading & references**

- ECG Library
  12. Palpitations; NICE CKS, March 2009 (UK access only)

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