

Junctional Ectopic Tachycardia

Junctional Ectopic Tachycardia (JET) is a rare heart rhythm abnormality which occurs more in childhood than adult life. The most frequent time that it happens is immediately after surgery for congenital heart disease. However, it can occur as an isolated congenital phenomenon or after ablation for atrioventricular nodal re-entry tachycardia.

JET is characterised by a very fast heart rate (tachycardia) that originates within or very close to the atrioventricular (AV) node. The AV node is part of the heart's conduction system that usually slows down the naturally faster atrial (top chamber) rate as the impulse travels down to the ventricles. The result is the ventricles contracting at a much higher rate than normal.

JET Following Surgery

JET usually starts in the few hours after surgery as a child warms up after returning from theatre. It is more likely after surgery near to the septal structures of the heart and is well recognised following ventricular septal defect (VSD), tetralogy of Fallot, truncus arteriosus or atrioventricular septal defect surgery. It is diagnosed by an electrocardiogram (ECG) – junctional tachycardia, rate 160-300, and atrioventricular (AV) dissociation. The rhythm arises from the "junction" or His bundle (it is sometimes called His bundle tachycardia) and probably occurs because this area has been irritated or bruised during surgery. The tissue starts to automatically fire off a fast electrical impulse. This results in a tachycardia of the ventricles which may be dissociated from the electrical slower rhythm of the top chambers (atria). Sometimes both chambers are fast. This abnormality of rhythm can significantly reduce cardiac output and make a child seriously unwell.

Treatment

The rate of this rhythm is temperature sensitive and will slow down with cooling and speed up if a child is hot. Therefore, one option is to use cooling blankets to prevent fever. A target body temperature of 35 degrees Celsius is often helpful. It is also important to maximise pain relief and sedation keeping the child as calm and comfortable as possible.

The rhythm can be resistant to medicines, but intravenous amiodarone is often used to slow the heart rate.

The rhythm results in dissociation of the top and bottom chambers of the heart and pacing techniques can be used to restore synchrony again. The temporary pacing wires applied routinely by the surgeon can be used for this. Alternatively surgical ablation of the responsible heart tissue can terminate the arrhythmia.

A child can be very critically unwell whilst this rhythm continues, and supportive measures may be required to maintain adequate pumping action and output of blood from the heart.

Prognosis

The rhythm usually exists for 3-5 days following surgery but then spontaneously resolves. It has been known to continue for up to 10 days. Once it has resolved it will not usually return and long-term medication is not required.

Congenital Junctional Ectopic Tachycardia

This occurs very rarely in an otherwise well child who may be aware of their heart beating fast and may feel tired, dizzy or nauseous. The diagnosis is made by electrocardiogram (ECG). A 24-hour tape of heart rhythm (Holter) may be required because the rhythm often starts and stops continually throughout the day and may

be missed on a single ECG. The heart is usually structurally and functionally normal and the rhythm does not make the child as unwell as when it is seen post surgery. The cause is unknown.

JET post ablation

This looks exactly like the rhythm seen after surgery or occurring spontaneously and symptoms of palpitations, nausea and tiredness are similar. It can be diagnosed by recording an ECG. It may occur due to irritation of the junctional tissue during the attempt at ablation. Again the rhythm in this setting does not cause such severe consequences as when it is seen post surgery but can lead to uncomfortable symptoms and is occasionally persistent.

Treatment of Congenital JET and JET post ablation

This arrhythmia can be quite resistant to usual antiarrhythmic drug therapy. Recently a new drug called ivabradine has been used successfully to control symptoms. Ivabradine blocks the abnormal channels in the heart and preferentially targets fast rhythms coming from the sinus or atrioventricular nodal (junctional) area. If symptoms persist then ablation can be considered. As the area from which the rhythm arises is very close to the atrioventricular node there is a risk that the node can be damaged during any attempt at ablation. Great care needs to be taken to try and avoid damage as this would result in heart block that might require permanent treatment with a pacemaker.

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