



## ORIGINAL RESEARCH PAPER

## Paediatrics

### PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA(PSVT)

**KEY WORDS:** Paroxysmal; Supraventricular; Tachycardia; Ventricles; Palpitations; Episodes; Arrhythmia.

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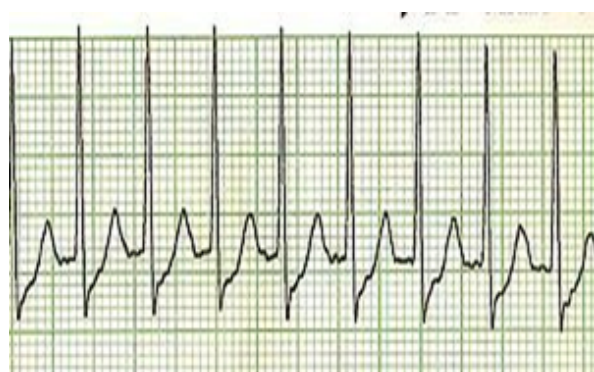
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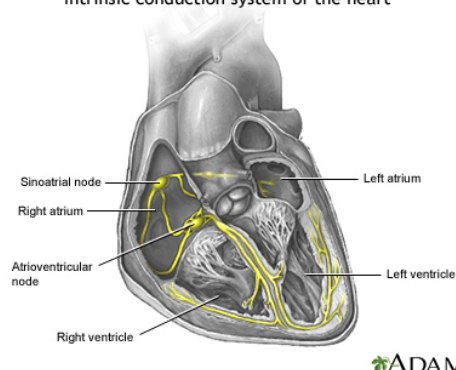
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#### ABSTRACT

Paroxysmal supraventricular tachycardia (PSVT) is episodes of rapid heart rate that start in a part of the heart above the ventricles. "Paroxysmal" means from time to time. Paroxysmal supraventricular tachycardia (PSVT) is a type of supraventricular tachycardia. Often people have no symptoms. Otherwise symptoms may include palpitations, feeling lightheaded, sweating, shortness of breath, and chest pain. Episodes start and end suddenly. It can occur at any age and in people who don't have other heart conditions. The heart's sinus node typically sends electrical signals to tell the heart muscle when to contract. In PSVT, an abnormal electrical pathway causes the heart to beat faster than normal. Episodes of rapid heart rate can last from a few minutes to several hours. A person with PSVT can have a heart rate as high as 250 beats per minute (bpm). A normal rate is between 60 and 100 bpm. It is another type of "short-circuit" arrhythmia. It may result either from atrio-ventricular nodal re-entrant tachycardia (AVNRT) or from an accessory pathway, which may occur as part of the Wolff-Parkinson-White (WPW) syndrome.



Intrinsic conduction system of the heart



ADAM

#### Incidence

PSVT affects about 1 in every 2,500 children. It is the most frequent abnormal heart rhythm in newborns and infants. Wolff-Parkinson-White syndrome (WPW) is the most common type of PSVT in children and infants. PSVT is more common in adults under age 65. Adults over age 65 are more likely to have atrial fibrillation.

#### Causes and risk factors

The cause is not known. Risk factors include alcohol, caffeine, nicotine, psychological stress, and White syndrome which often is inherited from a person's parents. The underlying mechanism typically involves an pathway that results in re-entry. There are certain medications that make PSVT more likely. For example, when taken in large doses, the heart medication digitalis (digoxin) can lead to episodes of PSVT. The following actions can also increase your risk of having an episode of PSVT:

- ingesting caffeine
- ingesting alcohol
- smoking
- using illegal drugs
- taking certain allergy and cough medications

#### Path physiology

The main pumping chamber, the ventricle, is protected (to a certain extent) against excessively high rates arising from the supraventricular areas by a "gating mechanism" at the atrioventricular node, which allows only a proportion of the fast impulses to pass through to the ventricles. In Wolff-Parkinson-White syndrome, a "bypass tract" avoids this node and its protection and the fast rate may be directly transmitted to the ventricles. This situation has characteristic findings on ECG.

#### Symptoms

Symptoms most often start and stop suddenly. They can last for a few minutes or several hours. Symptoms may include:

- Anxiety
- Chest tightness
- Palpitations (a sensation of feeling the heartbeat), often with an irregular or fast rate (racing)
- Rapid pulse
- Shortness of breath
- Other symptoms that can occur with this condition:
- Dizziness
- Fainting

In more serious cases, PSVT can cause dizziness and even fainting due to poor blood flow to the brain.

Loss of consciousness (in only the most serious cases)

For infants and toddlers, symptoms of heart arrhythmias such as SVT are more difficult to assess because of limited ability to communicate. Caregivers should watch for lack of interest in feeding, shallow breathing, and lethargy. These symptoms may be subtle and may be accompanied by vomiting and/or a decrease in responsiveness

#### Diagnosis

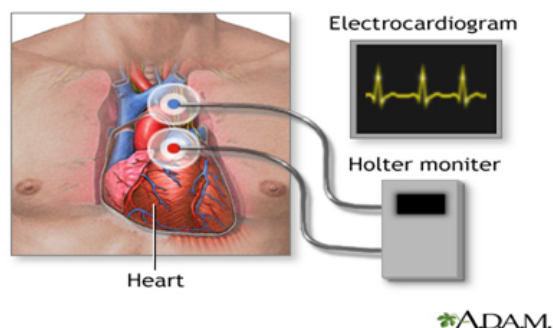
A physical exam during a PSVT episode will show a rapid heart rate. It may also show forceful pulses in the neck.

The heart rate may be over 100, and even more than 250 beats per

minute (bpm). In children, the heart rate tends to be very high. There may be signs of poor blood circulation such as lightheadedness. Between episodes of PSVT, the heart rate is normal (60 to 100 bpm).

An ECG during symptoms shows PSVT. An electrophysiology study (EPS) may be needed for an accurate diagnosis and to find the best treatment.

Because PSVT comes and goes, to diagnose it people may need to wear a 24-hour Holter monitor. For longer periods of time, another type of the rhythm recording device may be used.



### Treatment

AV nodal blocking can be achieved in at least three ways:

#### Physical maneuvers

**A number of physical maneuvers increase the resistance of the AV node to transmit impulses (AV nodal block), principally through activation of the parasympathetic nervous system, conducted to the heart by the vagus nerve. These manipulations are collectively referred to as vagal maneuvers.**

The valsalva maneuver should be the first vagal maneuver tried and works by increasing intra-thoracic pressure and affecting baroreceptors (pressure sensors) within the arch of the aorta. It is carried out by asking the patient to hold his/her breath while trying to exhale forcibly as if straining during a bowel movement. Holding the nose and exhaling against the obstruction has a similar effect.

There are other vagal maneuvers including: holding one's breath for a few seconds, coughing, plunging the face into cold water, drinking a glass of ice cold water, and standing on one's head. Carotid sinus massage, carried out by firmly pressing the bulb at the top of one of the carotid arteries in the neck, is effective but is often not recommended in the elderly due to the potential risk of stroke in those with atherosclerotic plaque in the carotid arteries.

Pressing down gently on the top of closed eyes may also bring heartbeat back to normal rhythm for some people with atrial or supraventricular tachycardia (SVT).

#### Medications

Termination of PSVT following adenosine administration  
Adenosine, an ultra-short-acting AV nodal blocking agent, is indicated if vagal maneuvers are not effective. If unsuccessful or the PSVT recurs diltiazem or verapamil are recommended. Adenosine may be safely used during pregnancy. SVT that does not involve the AV node may respond to other anti-arrhythmic drugs such as sotalol or amiodarone.

#### Cardio version

If the person is hemodynamically unstable or other treatments have not been effective, synchronized electrical cardioversion may

be used. In children this is often done with a dose of 0.5 to 1 J/Kg. Cryoablation is a newer treatment for SVT involving the AV node directly. SVT involving the AV node is often a contraindication for using radiofrequency ablation due to the small (1%) incidence of injuring the AV node, requiring a permanent pacemaker. Cryoablation uses a catheter supercooled by nitrous oxide gas freezing the tissue to  $-10^{\circ}\text{C}$ . This provides the same result as radiofrequency ablation but does not carry the same risk. If you freeze the tissue and then realize you are in a dangerous spot, you can halt freezing the tissue and allow the tissue to spontaneously rewarm and the tissue is the same as if you never touched it. If after freezing the tissue to  $-10^{\circ}\text{C}$  you get the desired result, then you freeze the tissue down to a temperature of  $-73^{\circ}\text{C}$  and you permanently ablate the tissue.

This therapy has further improved the treatment options for people with AVNRT (and other SVTs with pathways close to the AV node), widening the application of curative ablation to young patients with relatively mild but still troublesome symptoms who would not have accepted the risk of requiring a pacemaker.

You should avoid smoking, caffeine, alcohol, and illicit drugs.

#### Prevention

Once an acute arrhythmia has been terminated, ongoing treatment may be indicated to prevent recurrence. However, those that have an isolated episode, or infrequent and minimally symptomatic episodes, usually do not warrant any treatment other than observation.

In general, patients with more frequent or disabling symptoms warrant some form of prevention. A variety of drugs including simple AV nodal blocking agents such as beta-blockers and verapamil, as well as anti-arrhythmics may be used, usually with good effect, although the risks of these therapies need to be weighed against potential benefits.

#### Outlook (Prognosis)

PSVT is generally not life threatening. If other heart disorders are present, it can lead to congestive heart failure or angina.

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