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Case: Cardiac Assessment
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Question:

A previously well 2-year-old male became irritable, restless and refused to eat over the preceding 24 hours. When he began vomiting, he was brought to the hospital.

On exam, there is tachypnea (60/min) without retractions. The liver is enlarged 3.0 cm below the right costal margin. The heart rate is 240 beats per minute. Chest x-ray shows a moderately enlarged heart.

The patient's ECG rhythm strip is displayed to the right in Image 1. Ice was applied to the child's face a few seconds before the abrupt change in rate. What is the diagnosis?



Answer Options:

- A. atrial flutter
- B. supraventricular tachycardia (SVT)
- C. sinus tachycardia
- D. vasovagal syndrome
- E. dilated cardiomyopathy

- **Answer:**
B

Remediation:

Supraventricular tachycardia (SVT), also known as paroxysmal supraventricular tachycardia (PSVT) when occurring paroxysmally, is defined as an abnormal arrhythmia mechanism produced above or within the bundle of His. The most common cause is reentry within the AV node (AV nodal reentrant tachycardia, or AVNRT).

Older children complain of palpitations, dizziness, fatigue, and chest pain. In infants,

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irritability, pale and mottled skin, and tachycardia are the symptoms seen, with progression to heart failure if the arrhythmia is prolonged. Heart rates can be 240-300 beats per minute.

The AV reentrant tachycardias (AVRT) are due to a bypass tract outside the AV node (e.g., Kent bundle). Wolff-Parkinson-White syndrome is the most common type. With antidromic AV reentrant tachycardia, the QRS complexes are wide with an initial delta wave. With orthodromic conduction, the QRSs may be normal width during tachycardia, but a delta wave would probably be seen following conversion to sinus rhythm.

Tachyarrhythmias in children may also be associated with cardiomyopathies, myocarditis, or congenital heart defects such as Ebstein's anomaly.

ECG findings with SVT may include:

- regular rhythm, usually > 150 beats/minute
- normal or wide (aberrant conduction) QRS complex
- inverted P waves in the inferior leads
- P waves often superimposed on the QRS or ST-T

About the Image(s):

Image 1: RS: Supraventricular Tachycardia with Conversion to NSR in a Two-Year-Old

This two-year-old presented with narrow complex SVT with retrograde P waves. Ice was placed on the face three seconds prior to conversion, resulting in brief AV nodal block and conversion to normal sinus rhythm.

Specific findings on this rhythm strip include:

- narrow complex SVT
- retrograde P waves (Note that the T waves are diminished prior to conversion due to superimposition of retrograde P waves.)
- conversion to normal sinus rhythm

Image 2: Typical Normal Child ECG for Comparison

Normal sinus rhythm, rate 74.

Note: the isolated T negativity and low QRS voltage in V4 is unexplained and possibly due to lead misplacement.

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