PEDIATRIC SVT MANAGEMENT

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INTRODUCTION

Supraventricular tachycardia (SVT) can be defined as an abnormally rapid heart rhythm originating above the ventricles, often (but not always) with a narrow QRS complex.
Diagnostic evaluation

History incompatible with sinus tachycardia

P waves absent or abnormal

Heart rate does not vary with activity

The presence of abrupt changes in heart rate

Heart rate usually >220 beats/min in infants and >180 beats/min in children
Atrial Dysrhythmias

Paroxysmal Atrial Tachycardia

Rate: >180 /Min

R – R: regular

QRS: Narrow
Management of SVT

• Two major issues will be addressed:
  ACUTE MANAGEMENT to terminate the arrhythmia, and
  CHRONIC THERAPY to prevent recurrence.
ACUTE MANAGEMENT

The treatment strategy depends upon the patient's presentation and clinical status (hemodynamically stable or unstable). The approach consists of initiating therapy while continuing to assess the patient's condition.
Hemodynamic assessment and monitoring

- should have an immediate hemodynamic assessment
- 15-lead electrocardiogram (ECG)
- 12 STANDARD LEADS+ Leads V3R and V4R and V7
- Continuous ECG monitoring during therapeutic maneuvers
LABORATORY TESTS

- Electrolyte levels
- Complete blood count (CBC)
- Thyroid studies
- Digoxin level
Electrophysiologic studies have dramatically changed the diagnosis of SVT.

Electrophysiologic studies combination with radiofrequency catheter ablation.

Imaging Studies

Chest radiography (pulmonary edema, cardiomegaly, pneumonia)
Hemodynamic assessment and monitoring

The most important initial clinical determination to make in children presenting with a tachyarrhythmia is whether signs and symptoms related to the rapid heart rate are present. These include hypotension, heart failure, and signs of shock, pallor, or decreased level of consciousness.

Signs in infants may include irritability, tachypnea, and poor feeding.
1-Hemodynamically unstable

Cardioversion

- 0.5 to 2.0 J/kg
- synchronous mode (this will avoid possible precipitation of ventricular fibrillation).
Cardioversion in children

Children electrode paddles (surface area 21 cm$^2$) and adult electrode paddles (surface area 83 cm$^2$) may be preferable in children over 10 kg.

Adequate sedation or general anesthesia (child with too critically ill to delay the procedure for administration of general anesthesia).
Paddle Position

Place the paddles on the upper right side of the chest below the clavicle and the other to the left of the nipple directly over the heart.

Leave about 3 cm between the paddles.

One just to the left of the sternum and the other over the back.
Electrode interface

Use:
- Gel pads
- Electrode cream
- Paste
- Self-adhesive monitoring-defibrillation pads

Do not use
- Saline-soaked pads, ultrasound gel, bare paddles, or alcohol pads
Energy dose

Use a dose of \(0.5 \text{ J/kg}\) for the first attempt and \(2 \text{ J/kg}\) for subsequent attempts.

Additional increases in energy dose are unlikely to increase the efficacy but may increase the myocardial energy.
2-Hemodynamically stable

Evaluate the rhythm

Vagal maneuvers

Adenosine
Vagal maneuvers

These maneuvers should be performed while the ECG is continuously monitored.

The vagal maneuver usually used in infants or young children is application of a bag filled with ice and cold water over the face for 15 to 30 seconds.

This maneuver is successful in 30 to 60 percent of cases.
Vagal maneuvers

Cover only the forehead, eyes and the bridge of the nose with Ice-water mixture to the face
Only for 15 - 30 seconds
Repeat once more
Vagal maneuver (ice bag):

AV reentrant tachycardia breaking to sinus rhythm with Wolff-Parkinson-White syndrome
Another method that may be successful in infants is rectal stimulation using a thermometer. In older children, bearing down (Valsalva maneuver) for 15 to 20 seconds provides vagal stimulation.

Carotid massage and orbital pressure should not be performed in children.
Antiarrhythmic therapy

- **Adenosine**
- **Procainamide** (that is refractory to adenosine)
- **Amiodaron** (that is refractory to adenosine)
Adenosine:

0.1 mg/kg rapid IV injection (if no response is seen within two minutes, the dose is doubled)

5 mL normal saline flush (rapidly metabolized)

Supine

ECG

blood pressure monitoring
0.05 mg/kg initial bolus (maximum dose of 0.25 to 0.35 mg/kg or 12 mg is given)

The average effective dose is approximately 0.13 mg/kg (metabolized by an enzyme on the red cell surface, a higher dose is required when given through a peripheral compared with a central vein)
Pharmacology:

Interacts with A1 receptors on the surface of cardiac cells; the resulting effects include slowing of the sinus rate and an increase in the atrioventricular (AV) nodal conduction delay. This interrupts the reentrant circuit of tachycardia that require the AV node for reentry, which account for the great majority of cases of SVT in children.
Vagal stimulation caused by adenosine is brief and self-limited. The onset of effect is almost immediate, and always within 30 seconds of the infusion. The half-life is less than 5 to 10 seconds. The effects of adenosine are diminished by methylxanthines such as caffeine or theophylline.
Side effects

flushing, nausea, vomiting, vague feeling of discomfort, chest pain, dyspnea

atrial fibrillation, ventricular tachycardia, apnea, one minute of asystole (oxygene, defibrillator)

Bronchospasm (in patients with asthma)
Contraindications

In patients with WPW syndrome

preexisting second- or third-degree heart block or sinus node disease
Procainamide

- Procainamide is a class IA antiarrhythmic drug
- acts by slowing conduction within the myocardium itself, rather than by blocking reentry at the AV node.
- safely in patients with WPW syndrome without the risk of provoking accessory pathway conduction.
- Procainamide has potential for serious adverse effects, and therefore, consultation with a pediatric cardiologist is advised.
• intravenously.
• In neonates, a loading dose of **7 to 10 mg/kg** is given over 30 to 45 minutes.
• In infants and older children, the loading dose is **10 to 15 mg/kg**.
• This is followed by a continuous infusion of procainamide starting at **20 mcg/kg per minute**.
• procainamide can prolong the QT interval
CHRONIC THERAPY:

• Evaluation

• ECG (Wolff-Parkinson-White (WPW) syndrome)

• Echocardiogram (structural heart disease)

• Catheter ablation (21%)

• monitor the child (24 hours)

• teach the parents (heart rate, vagal maneuvers, ice bag to the face, Valsalva maneuver, head-down position, inducing the gag reflex, and other techniques).

• Radiofrequency ablation (RFA) (>5 years old and >15 kg)