Hypotension and Vagal Maneuvers for tachycardia

Hypotension may be a result of decreased cardiac output or decreased systemic vascular resistance.

Shock = physiological state of insufficient oxygen (not enough blood flow) to tissues (and cells) of body.

1. Circulatory shock
   a. **Vasogenic or Distributive shock** – improper delivery of blood to cells.
      i. **Septic shock** = leading cause of death in hospitals
         1. Caused by infection
            a. Gram negative bacteria
               i. Staphylococcal sp.
               ii. Streptococcal sp.
               iii. E. coli sp. (UTIs)
            iv. Some respiratory tract infections
         b. Fungi
         c. Protozoans
            i. Amebiasis
   2. Caused by Invasive procedures
      a. Urinary catheters
      b. Other indwelling lines and catheters
   3. Treatment includes identifying and treating the underlying cause of the infection (using antimicrobials), and fluid replacement.

ii. **Anaphylaxis** – allergic reaction leading to overwhelming systemic vasodilation, vascular leakiness and relative hypovolemia
   1. Contrast media
   2. Drug-induced (especially antimicrobials)
   3. Insect bite-induced
   4. Anesthetic agents
   5. Foods/food additives
   6. Vaccines
      a. Human Papilloma Virus (HPV)
      b. Japanese Encephalitis virus vaccine
   7. Environmental agents
      a. Pet dander
      b. Mold
      c. Pollen
      d. Other allergens
   8. Treatment usually includes a sympathomimetic, especially EPI.

iii. **Acute adrenal insufficiency**

iv. **Neurogenic shock**
   1. Spinal cord injury – autonomic neuropathy
      a. Disease
      b. Trauma
   2. Impaired baroreceptors
   3. Spinal anesthesia
   4. Depression of vasomotor centers in brain
      a. Severe pain
      b. Drugs
      c. Hypoglycemia
   5. Treatment usually includes sympathomimetic vasopressors (dopamine, DA, EPI, NE and/or phenylephrine); may include fluids.

b. **Cardiogenic** – pumping ability of heart is impaired.
   i. **Arrhythmia**
      1. Ventricular tachycardia
      2. Ventricular fibrillation
      3. AV nodal block
      4. Sinus bradycardia
   ii. MI, HF
   iii. Dysfunctional heart valves
   iv. Pulmonary embolism

c. **Hypovolemic** – reduction in the volume of blood (may be relative as when severe relaxation of the vasculature, or vasodilation, occurs)
   i. **Absolute hypovolemia**
      1. Hemorrhage = loss of whole blood
         a. Internal
            i. Long bone fracture
            ii. Hemotherax
            iii. Severe kidney disease
            iv. Severe pancreatic disease
            v. Surgery-related
         b. External
      2. Loss of Plasma
         a. Burns
      3. Loss of other body fluids
         a. Vomiting/diarrhea
         b. Dehydration
            i. Excess sweating
            ii. Not enough water consumption
            iii. Severe kidney disease
            iv. Diabetes
            v. Drug-induced (e.g., diuretics)
            vi. Parasitic or bacterial disease
               1. Amebiasis-induced diarrhea
               2. Cholera-induced diarrhea
               3. Giardia-induced diarrhea
               4. Cryptosporidiosis-induced diarrhea
   ii. **Relative hypovolemia**
      1. Pooling of blood
      2. Massive vasodilation
         a. See distributive shock
         b. Severe head injury
         c. Drug-induced
         d. Liver failure
         e. Poisoning
         f. Anaphylaxis
VAGAL MANEUVERS

This handout is for information only and is not intended as a training module.

I. BACKGROUND:

Vagal maneuvers are non-pharmacologic interventions used to terminate and diagnose tachy-dysrhythmias.

Vagal maneuvers increase parasympathetic tone and slow conduction through the AV node. The most common methods for stimulating the vagus nerve are Valsalva’s maneuver and Carotid Sinus Massage (CSM). A safer variant of carotid sinus massage is Carotid Sinus Pressure (CSP).

Facial immersion in ice water is an acceptable alternative for pediatric patients.

II. INDICATIONS:

Treatment of symptomatic supraventricular tachycardia (decreased level of consciousness, angina, hypotension, congestive heart failure).

Treatment of tachycardia of unknown etiology (supraventricular vs. ventricular) with hypoperfusion.

To differentiate supraventricular tachycardia from ventricular tachycardia in the symptomatic/decompensated patient. (Use of vagal maneuvers in this setting shall not delay synchronized cardioversion)

The Valsalva maneuver and CSM shall only be attempted when the patient’s EKG is being monitored and venous access has been established. Generally, CSM shall only be attempted after the patient has failed to respond to pharmacological intervention.

III. COMPLICATIONS & SPECIAL NOTES:

Dysrhythmias are common after conversion by vagal maneuvers. Note: Treatment is indicated only if persistent (greater than 3-5 minutes).

Other potential complications include:

- Asystole.
- Stroke from dislodged carotid artery thrombus in persons with atherosclerotic disease.
- Brain ischemia from occlusion of carotid artery or compromise of marginally perfused areas of brain.
Hypotension and Vagal Maneuvers for tachycardia

- It is difficult to differentiate congestive heart failure caused by tachycardia from a tachycardia caused by CHF. The symptoms of a patient with a pulse under 160 are usually not the result of a rate related problem.

- Pediatric patients may respond better to facial immersion in ice water. The diving reflex causes peripheral vasoconstriction and a vagus-induced decrease in heart rate.

- Sometimes Vagal Maneuvers can be used to diagnose tachy-dysrhythmias.

IV. PROCEDURE:

Patients should have continuous EKG monitoring and IV access. A 12-lead EKG is preferred prior to initiation.

Valsalva maneuver:

Performed by the patient (patient must be conscious and cooperative)

- Document the dysrhythmia before treating - Explain the procedure to the patient
- Instruct the patient to inhale and hold their breath and:
  ▪ Bear down as if to have a bowel movement, and to hold this position for 20-30 seconds.
  ▪ OR - Blow forcefully through a straw (or IV catheter/similar device) for as long as possible (at least 20 seconds)
- Monitor rhythm continuously.
- Stop maneuver immediately if:
  ▪ Patient becomes confused
  ▪ HR drops below 100 BPM
  ▪ Asystole occurs

Carotid sinus pressure (CSP) and Carotid Sinus Massage (CSM)

Patients with high cholesterol, previous strokes, or other significant risk factors for thrombus should not have CSM performed. Document the dysrhythmia before treating.

- Explain the procedure to the patient
  ▪ Place the patient in supine position (laying down, face up)
  ▪ Expose the neck and hyperextending slightly.
  ▪ Gently palpate for carotid pulses on one side, then the other. Proceed only if bilateral carotid pulses are palpable.
  ▪ Auscultate for bruits over both carotid arteries.
    ▪ Do not perform the procedure if a bruit is heard on either side. Bruits are a systolic sound, a “murmur,” due to a variety of things (carotid stenosis...)
  ▪ Turn the patient’s head to the left side.
  ▪ Turn the paper recorder on and leave on until the procedure is completed.
  ▪ Apply procedure:
    ▪ (CSP) Gentle and steady pressure over the right carotid sinus and hold for 5-10 seconds.
    ▪ OR (CSM) Gentle and steady messaging motion over the right carotid sinus for 5-10 seconds
    ▪ Pressure should be firm but should not totally occlude blood flow.
    ▪ Monitor rhythm constantly throughout procedure.
    ▪ Release pressure immediately if:
      ▪ Patient becomes confused or shows signs of brain ischemia
      ▪ HR drops below 100 BPM
      ▪ Asystole occurs
        ▪ If asystole occurs and persists for longer than 15 sec: Begin CPR
      ▪ If no response to the right side carotid sinus pressure, wait 2-4 minutes and repeat the procedure on the left side.