“You have a what, inside you?”

Less than mainstream medical devices encountered in the ED.

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Objectives
- Review short, medium and long term vascular access devices
- Understand common complications associated with vascular access devices
- Understand how to appropriately utilize a vascular access device in an emergency
- Review the function of Pacemakers and AICD devices
- Understand common complications associated with pacemakers and AICD devices

Deciphering Medical Devices
- What does it do?
  - Basic description
  - Typical use
  - Basic description of function
- What does it look like?
- What can go wrong?
- How do I fix it?

Vascular Access Devices
- Short Term
  - Peripheral IV
  - Percutaneous Multihole Central Catheters
- Medium Term
  - Midline Catheters
  - PICC Lines
- Long Term
  - Tunneled RA Catheters
  - Implantable Ports

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Percutaneous Multilumen Central Catheters

- **Short Term Use (< week)**
  - IV medications
  - Blood products
  - CVP monitoring
  - Hyperalimentation

- **Description**
  - Silicone or polyurethane
  - Over the wire insertion
  - 1 to 5 lumens
  - 15 to 30 cm in length

- **Complications**
  - Overall = 3.5%
  - Infection/Bleeding
  - Neurologic

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Emergency Access

- Swab catheter/cap junction with povidone iodine
- Clamp catheter
- Open clamp
- Aspirate 5cc and discard then flush with 5cc of normal saline
- Administer medication
- Flush with 5cc of normal saline after every use
- Close clamp
- Notify ED staff that catheter was accessed and type of flush used

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Catheter Dislodgement

- Stop on-going infusions
- Clamp all lumens
- Do not remove catheter if still in place
- Cover insertion site with sterile gauze
- Apply direct pressure at site for 10 minutes if bleeding
- Transport to ED

Catheter Sheared / Cut

- Apply clamp proximal to the cut
- Cover insertion site with sterile gauze
- Apply direct pressure at site for 10 minutes if bleeding
- Transport to ED

Infection at Catheter Site

- Do not remove catheter
- Provide supportive care
- Transport to ED
Midline IV Catheters
- Medium Term (2 to 4 weeks)
- Limited IV medications
- Not used for:
  - Chemotherapy
  - Hyperalimentation
  - High-osmolality medications
- Description
  - Silicone or polyurethane
  - Open tip or Groshong
  - Introduced with a stylet via introducer sheath
  - Tip rests in proximal arm veins
  - 1 to 2 lumens
  - 20 cm in length
- Complications
  - Infection/Bleeding
  - Infectious

Midline IV Catheters & PICC Lines
- Emergency Access
  - Swab catheter/cap junction with povidone-iodine
  - Clamp catheter (open tip only)
  - Replace cap if needed using aseptic technique
  - Attach 10 cc syringe with saline flush
  - Open clamp (if present)
  - Aspirate 5 cc and discard
  - Flush with 5 cc of normal saline
  - Close clamp
  - Replace cap if catheter was accessed and open in hospital

Tunneled Central Venous Catheters
- Broviac
  - Single lumen
  - 1.0 mm ID
- Hickman
  - 1 or 2 lumens
  - 1.6 mm ID
- Hemocath/Permacath
  - 2 lumens
  - 2.2 mm ID
- Long Term (1 year)
- IV medications
- Blood products
- Chemotherapy
- Dialysis
- Hyperalimentation
- Description
  - silicone
  - Over-the-wire insertion
  - 1 to 2 lumens
  - Open ended or Groshong
- Complications
  - Pulmonary
  - Vascular/Bleeding
  - Infectious
  - Neurologic

Peripherally Inserted Central Catheters (PICC Lines)
- Medium Term (2 to 4 weeks)
- IV medications
- Chemotherapy
- Hyperalimentation
- Description
  - Silicone or polyurethane
  - Open tip or Groshong
  - Introduced via guide wire
  - Tip rests in SVC
  - 1 to 3 lumens
  - 50 to 60 cm in length
- Complications
  - Vascular/Bleeding
  - Infectious

Groshong Tip Catheters
- No clamping
- No Heparin
- Use 10 cc syringe and normal saline flush
- Aspirate & flush 20 cc of normal saline
**Tunneled Central Venous Catheters**

- **Emergency Access**
  - Swab catheter/cap junction with povidone-iodine
  - Clamp catheter
  - Replace cap if needed using aseptic technique
  - Attach 10 cc syringe
  - Open clamp
  - Aspirate 5 cc and discard then flush with 5 cc of normal saline
  - Administer medication
  - Flush with 5 cc of normal saline after every use
  - After use heparin flush if available
  - Notify ED staff that catheter was accessed and type of flush used

**Implantable Vascular Access Devices**

- **Emergency Access**
  - Clean skin with providone-iodine solution
  - Attach 19 or 22 gauge Huber (non-coring) needle to extension tube with clamp and 10 cc syringe
  - Access port at 90 degree angle
  - Open clamp
  - Aspirate 5 cc and discard then flush with 5 cc of normal saline
  - Apply antibiotic ointment to puncture site and stabilize Huber needle with gauze dressing
  - Administer medication
  - Flush with 5 cc of normal saline after every use
  - After use heparin flush if available
  - Notify ED staff that catheter was accessed and type of flush used

**Flushing Vascular Access Devices**

- Always use a 10 cc syringe to flush
- Flush gently
- Notify ED staff immediately of VAD use, type and quantity of flush

**Cardiac Pacemakers**

- **Function**
  - Provide an electrical stimulus to initiate mechanical contraction
- **Description**
  - Implanted in the chest wall
  - Weigh < 30 gm
  - Components:
    - Pulse Generator
    - Battery
    - Leads
  - Life span = 4 to 10 years
  - Leads may go to the atrium, ventricle, or both chambers
  - Rate is usually set between 60 and 80 beats per minute
Normal VVI Pacemaker
- Pacemaker is set at 75 beats/min
- Pacemaker spike precedes QRS
- Note intrinsic QRS complexes

Normal DDD Pacemaker
- Note each QRS is preceded by 2 pacar spikes
- Pacing of the RV produces QRS with left bundle branch morphology

Pacemaker Complications
- Failure to Pace
- Failure to Sense
- Failure to Capture
- Inappropriate Pacemaker Rate
- Other

Failure to Pace
- No pacemaker spikes despite an intrinsic rate below threshold
- Common Causes
  - Lead disconnection or fracture
  - Battery depletion
  - Component failure
  - Oversensing

Magnet Use to Evaluate Failure to Pace
- Magnet is used to turn on asynchronous mode
- Ring magnet triggers reed switch
- May also use magnet to reset runaway pacer

A 68-year-old male with ventricular pacing after placement of a DDD pacemaker. Note the paced spikes that precede the wide QRS complex. The pacing spikes are best seen in lead V3-V6.
Failure to Sense
- Constant pacemaker spikes despite intrinsic cardiac activity
- Common Causes
  - Lead dislodgement or fracture
  - Fibrosis at the lead tip
  - Battery depletion
  - External interference
  - Low amplitude cardiac signal

Failure to Capture
- Appropriate pacemaker spikes without subsequent cardiac activity
- Common Causes
  - Lead dislodgement or fracture
  - Fibrosis at the lead tip
  - Battery depletion
  - Metabolic abnormalities
  - Antiarrhythmic medications

Inappropriate Pacemaker Rate
- Extremely rare event with modern devices
- Usually in DDD type pacers
- Endless loop reentry tachycardia

Other Complications
- Infections
  - 1 to 15%
  - S. aureus
- Cardiac perforation
- Pericarditis
- Vessel injury
- Venous thrombosis

Automatic Implantable Cardiac Defibrillator
- Function
  - Automatic defibrillation of malignant ventricular arrhythmias
- Description
  - Implanted in the chest wall
  - Design 20-70 gm
  - Components
    - Pulse Generator
    - Battery
    - Leads
  - Life span = 4 to 10 years
  - Leads go to the ventricle and in some cases into the atrium
AICD Complication

- Inappropriate Shock
  - 33%
  - Misinterpretation
- Pacemaker Interference
- Lead Dislodgement / fracture
- Infection
- Inadvertent Inactivation

AICD Skin Erosion

- Site Infection
- Pressure Necrosis

Questions?