

American Pediatric Surgical Association

Standardized Toolbox of Education for Pediatric Surgery

APSA Committee of Education
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Case ##
Central Venous Access



Central Venous Access

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Objectives

- Know the variety of indications for long-term venous access in children.
- Understand potential anatomic options for central venous access.
- Recognize pitfalls of different locations and types of catheters.

Central venous access

- **Common procedure performed at bedside or operating room by radiologists and surgeons**
 - In pediatrics, more often involve surgery
- **Wide variety of indications**
- **Rare, but serious, complications can occur with procedure or catheter.**

Case Study

- **14-year old male with cystic fibrosis in need of venous access.**
 - Several prior hospitalizations
 - Unable to gain peripheral access due to multiple previous attempts
 - On exam, sitting in bed, texting on cellphone
 - Heart: regular rate
 - Chest: coarse BS bilaterally, no wheezes

Additional history?

- **What other points of the history do you want to know?**
 - Any respiratory symptoms
 - Previous long-term access attempted?
 - Any history of previous venous thrombosis?
 - Any bleeding tendencies?

Additional history?

- **What other points of the history do you want to know?**
 - Any respiratory symptoms
 - Previous long-term access attempted?
 - Any history of previous venous thrombosis?
 - Any bleeding tendencies?
 - Relevant Family Hx
 - Relevant Social Hx
 - ROS

Physical Exam

- **What specifically would you look for?**
 - **Vital Signs:**
 - **Relevant Exam findings for a problem focused assessment:**

Physical Exam

- **What specifically would you look for?**
 - **Vital Signs:**
 - **Hemodynamically stable? Any recent fevers?**
 - **Relevant Exam findings for a problem focused assessment:**

Physical Exam

- **What specifically would you look for?**
 - **Vital Signs:**
 - **Relevant Exam findings for a problem focused assessment:**
 - **Signs of venous congestion? Venous collaterals?**

Studies (Labs, Imaging)

- **What labs needed?**
- **What Imaging Needed**

Studies (Labs, Imaging)

- What labs needed?
 - Coagulation studies
- What Imaging Needed

Studies (Labs, Imaging)

- **What labs needed?**
- **What Imaging Needed**
 - **Consider duplex venous ultrasound to evaluate patency of targeted veins**

Indications for central venous catheter

- Parenteral nutrition
- Chemotherapy
- Use of antibiotics
- Use of analgesics
- Transfusion of blood & blood products
- Collection of blood
- Hemodialysis
- Intensive monitoring & therapy
- Administration of clotting factors
- Long-term treatment of chronically-ill patients

Case Discussion

- **Diagnosis – need for venous access**
 - Options:
 - Central venous catheter (direct access to central vein)
 - Tunneled vs. non-tunneled
 - Implantable vs. non-implantable port
 - Peripherally-inserted central catheter (PICC)
 - Peripheral intravenous catheter

Types of Tunneled Catheters

- **Non-implantable — exits skin**
 - Broviac – 2.7 – 6.6Fr
 - Hickman – 7-12 Fr
 - Dual Lumen Hickman 7-10 Fr
- **Injection ports outside of skin, more easily removed**
 - Benefit – multiple lumens
 - No need for needle stick to access port



Pitfalls of implantable vs. non-implantable

- **Implantable — “port” under skin**
 - **Port-a-cath or Mediport**
 - **Single lumen – 4.5 – 10Fr**
 - **Dual Lumen – 10Fr**
- **With port under skin, more difficult to remove**
 - **Benefit – able to swim & bathe and do not need to flush daily**



Options of anatomic locations

- **Internal jugular veins**
- **External jugular or facial veins**
- **Subclavian veins**
- **Femoral veins**
- **Peripheral upper extremity veins draining into central veins (e.g. cephalic vein)**

Options of anatomic locations

- **What other option in neonates?**

Options of anatomic locations

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 - **Umbilical vein (prior to day of life 7)**

Case Discussion – pre-op planning

- **Consent – what are the *immediate* risks of central venous access?**

Case Discussion – pre-op planning

- **Consent – what are the *immediate* risks of central venous access?**
 - **Bleeding from superficial insertion site**
 - **Vascular injury from needle insertion**
 - **Pneumothorax or hemothorax if approaching internal jugular or subclavian vein**
 - **Range of arrhythmias due to catheter tip**
 - **Air or thrombotic pulmonary embolism**

Case Discussion – pre-op planning

- **Consent – what are the *long-term* risks of central venous access?**

Case Discussion – pre-op planning

- **Consent – what are the *long-term* risks of central venous access?**
 - **Central line-associated bloodstream infections (CLABSI)**
 - **Venous thrombosis and ensuing risk of pulmonary embolism**
 - **Possible need to remove and/or re-place if catheter damaged**

Interval steps before / instead of surgery

- **Before placement of implantable device – confirm patient without active infectious process**
- **If needed – know integrity of venous options**
 - Duplex ultrasound of veins planned to be accessed
- **Consider temporary percutaneous options (e.g. PICC)**

Operation

- **Observe aseptic techniques**
- **Use ultrasound when possible to reduce risk of vascular injury & confirm placement**
 - Internal jugular
 - Femoral
 - Subclavian-ultrasound not helpful or indicated.

Operation

- **Considerations for catheter selection:**
 - How many ports are needed?
 - Anatomic size of pediatric vessels & appropriate lumen size
 - How long will catheter be needed?

Options for confirming correct placement

- **Aspirating with syringe for blood return**
- **Radiologic imaging**
- **Blood samples (e.g. blood gas to distinguish venous vs. arterial source)**
- **Transmit wave form**

Post-operative Management

- **Confirm placement and rule out complications with adjunct studies**
- **Maintain aseptic technique**
- **Heplock to prevent thrombosis**
- **Remove as soon as not necessary**

Case Study

- **In pediatric patient requiring long-term vascular access for repeat hospitalizations & home therapy**
 - Consider implantable, tunneled catheter
 - Benefit – hidden under skin, able to swim in summer

What if:

- **Infant?** –
 - think smaller catheters (e.g. Broviac)
- **Positive blood cultures?**
 - consider temporary PICC
- **DVT?**
 - consider contralateral side (IJ vs. subclavian vs. femoral), rule out SVC thrombosis

What is an important consideration to make pre-operatively when choosing appropriate catheter for long-term use?

- A. Age of patient**
- B. Resolution of infectious process**
- C. Size of vessels**
- D. Patency of central veins**
- E. All of the above**

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- B. Umbilical vein**
- C. Femoral vein**
- D. Cephalic vein**
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What is a potential risk of central venous access?

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- B. Pneumothorax**
- C. Vascular injury**
- D. B and C only**
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Final Discussion/Review

- **Variety of indications and anatomic options for central venous access**
- **Although fatal risks are rare – need to properly consent family & recognize immediate complications**
- **Alternatives exist for temporary intravenous access**

Acknowledgement Slide

**The preceding educational materials were
made available through the
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we welcome your comments/ suggestions:**

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