Standardized Toolbox of Education for Pediatric Surgery

APSA Committee of Education 2015-2016

Case ##
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

- What other option in neonates?
  - 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 waveform
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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A. Age of patient
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What is a unique option for venous access in neonates?

A. Internal jugular vein
B. Umbilical vein
C. Femoral vein
D. Cephalic vein
E. None of the above
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What is a potential risk of central venous access?

A. Hemothorax
B. Pneumothorax
C. Vascular injury
D. B and C only
E. All of the above
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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
The preceding educational materials were made available through the American Pediatric Surgical Association.

In order to improve our educational materials we welcome your comments/suggestions:

www.eapsa.org