Central Venous Cannulation

ACLS (Provider Manual) p. 38-39
PALS (Provider Manual)
Key p. 142 - 154

Objectives

Upon completion of this lecture, the learner should be able to:

- understand central venous cannulation:
  - uses and indications
  - anatomic and physiologic principles
  - procedure
  - complications
    - and how to prevent these complications

Initial Treatment of Fluid Loss

- COMEB *I* G
  - 1 LB IV
  - Alternative
    - central vascular access catheter placement

Central Line Advantages

- Predictable locations
  - internal jugular
  - subclavian
  - femoral
- Allows large catheters
  - concentrated solutions
  - rapid volume replacement
    - flow rates affected by:
      - viscosity
      - pressure
      - catheter length
      - catheter r^4

Central Line Disadvantages and Complications

- Most common complications
  - local infection
  - pneumothorax
  - arterial puncture
- Less common / more dangerous complications
  - air embolus
  - catheter embolism or thrombosis
  - noncompressible site hemorrhage *

* thrombolytic contraindication

Central Line Complications, cont.

- Less common and less dangerous complications
  - catheter breaks
    - forceful flushing
  - malfunction of the device
  - bleeding at the insertion site
  - osteomyelitis

Contraindications

Elective central lines contraindicated in :

- thrombolytic therapy candidates

Central Line Uses and Indications

- in addition to the patient in extremis who needs : 1 LB IV (COMEBIG)
- other, sometimes elective, uses are :
  - central venous pressure monitoring
  - medications
  - nutritional substances
  - large veins access, avoiding
    - peripheral vein complications
      - blood clots
      - local tissue damage from toxic drugs

Central Line Uses and Indications , cont.

other, usually elective, uses :

- medications
  - antibiotics
  - pressor agents
- nutritional substances
  - vitamins, minerals, amino acids
  - lipids
- large veins access, avoiding
  - toxic drug tissue damage from CTX

More Central Line Uses and Indications , cont.

other, often elective, uses :

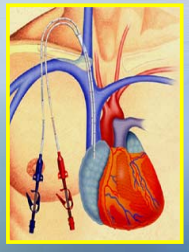
- outpatient
  - does not interfere with daily activities
  - over a prolonged period of time
  - frequent blood draws
  - frequent blood transfusions

and semi-elective, uses :

- emergency hemodialysis
  - double lumen catheter

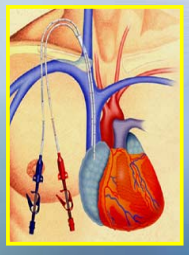
Central Venous Anatomy

- Right internal jugular (here)
- Right subclavian vein
- Left subclavian vein
- Antecubital fossa veins
  - basilic
  - cephalic



Types of Central Venous Access Devices

- Tunneled double lumen catheter
  - Medications and fluids infused by a CV line gain immediate entry to central circulation
  - Emergency hemodialysis
- Other



Types of Vascular Access Devices

- Permanent tunneled catheters:
  - double lumen catheter (previously pictured)
  - Hickman , Broviac, Groshong
  - vascular access device
- Temporary catheters
  - PICC catheters
  - midline catheter

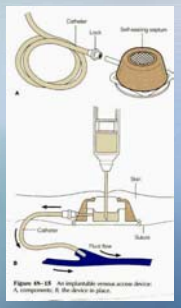
Vascular Access Devices

Tunneled catheters

- permanent vascular access device
  - subcutaneous accessible port
  - implanted beneath the skin
  - the catheter
    - completely internal
    - passes from port
    - into a large central vein
  - silicone covered top of the port
    - to be punctured with a silicone-piercing, non-coring, Huber needle

Permanent Vascular Access Device

- implanted SQ port
- internal catheter
  - passing from port
  - into the central vein
- silicone port top
  - punctured with a silicone - piercing needle
- flush after use



Types of Vascular Access Devices

Temporary catheters
- midline catheter
  - 4 - 6 inches long
- PICC catheter (peripherally inserted central catheter)
  - provides central IV access

Peripheral Vascular Access Device

Temporary vascular access device
- midline catheter

Central Vascular Access Line

Temporary peripheral venous access
- PICC catheter (peripherally inserted central catheter)
- Frequently asked questions about PICC line placement @ http://www.rad.uab.edu/Visions/Spring97/Spring97.htm#anchor698 .

Procedures for Central Vascular Lines

- Permanent central venous access
  - tunneled catheter (surgical)
- Temporary central venous access
  - PICC
  - Seldinger technique
    - R. internal jugular vein
    - Subclavian vein
    - Femoral vein

Central Vascular Line Procedures

Permanent central venous access

- tunneled catheter
  - incisional placement (in the chest wall)
    - of catheter, or
    - of catheter and VAD port (reservoir)
- neither catheter nor a port is truly permanent

Central Vascular Line Procedures

Sites

- Subclavian
- Right internal jugular
  (preferred over the L. pictured here)
- Femoral

Method

- Seldinger technique

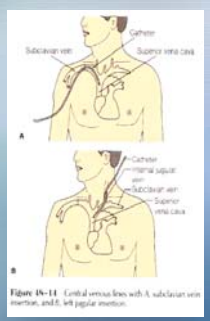


Figure 19–11 Central venous lines with A, subclavian vein insertion, and B, left jugular insertion.

Central Line Procedures - Femoral

Sites

- Femoral

  Right: NAVEL

  Left : LEVAN

Method

- Seldinger technique

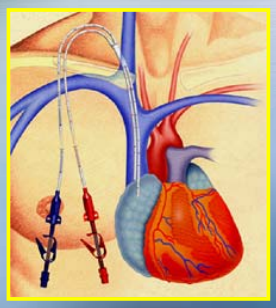
Right Internal Jugular Central Line Procedure

Right internal jugular

- central approach (fig.17-6.B)
- the most direct approach
- less pneumothorax risk
- must avoid carotid

Landmarks

- the "Y" of the sternocleidomastoid
- aim for R. nipple
- away fr. carotid
- blood return at 3 cm



Central Vascular Line Procedures

Seldinger technique (Fig.17-5)

A. starter-needle is inserted

B. into a central vein (3 cm. or 1.12 in.)

B. guidewire passed into SVC

C. starter-needle removed

D. puncture site widened

E. catheter placed over guidewire

F. then the wire is removed

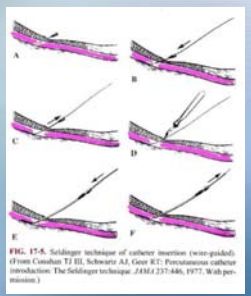


FIG. 17-5. Seldinger technique of catheter insertion (wire-guided). (From Conahan TJ III, Schwartz AJ, Geer RT: Percutaneous catheter introduction: The Seldinger technique. *JAMA* 237:446, 1977. With permission.)

Summary

We have discussed :

- Central venous cannulation
  - indications and benefits
  - anatomic considerations
  - procedures
  - complications
    - and how to prevent some of these complications