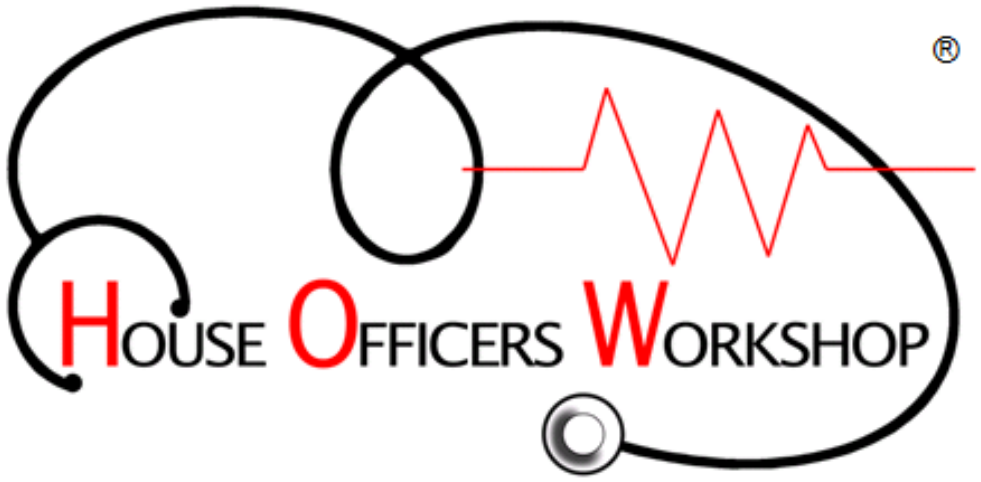

Medicine Practical Workshop

Disclaimer: As we all know, we are all still students and henceforth bound to make mistakes, however, we will try our very best to convey all knowledge based on the Malaysian protocols. By that, we do not hold any responsibilities should our presentations bear mishaps in the future.

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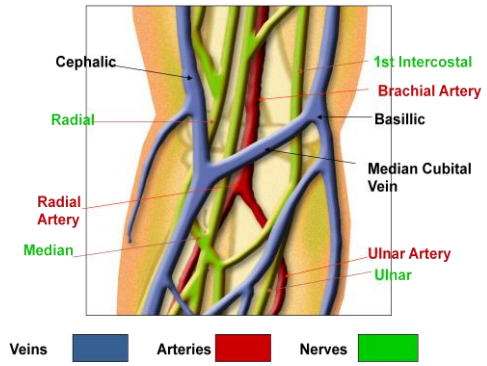
Venepuncture

Antecubital Fossa



VEINS TO BE USED ARE

- METACARPAL VEINS
- CEPHALIC VEIN
- BASILIC VEIN
- MEDIAN CUBITAL VEIN

Attributes of an ideal vein are: -

- Engorged, bouncy & soft
- Refill after it has been depressed
- Visible
- Round
- Well supported by surrounding structures
- Straight & 'free of valves'
-

Veins to be avoided:

- Thrombosed, fibrosed or sclerosed
- Inflamed ,bruised or painful
- Thin or fragile
- Mobile
- Near bony prominences and joints
- Hematoma
- Near sites of infection or oedema
- For **venesection avoid** the arm with an **IV line running**
- Upper extremity on the side of a previous mastectomy - test results may be affected **because of lymphedema.**

EQUIPMENT

- Collection Tubes
- Needles (23G- blue needle or 20 G Green needle)
- Tourniquet
- Alcohol Wipes
- Cotton balls
- Gloves
- Syringes
- Sharp bin

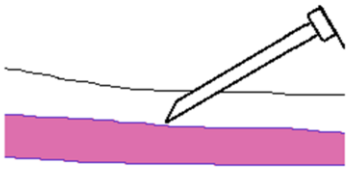
Methods for improving venous access:

- Apply a tourniquet
- Lower the level of the arm below the heart
- Ask the patient to open and close their fist
- Light tapping / rubbing of the veins
- Relax the patient / consider the environment
- Warm up the patient's hands
- **DO NOT re-touch** or **palpate** the **vein once cleaned!!!**
- The needle should form a 15 to 30 degree angle with the surface of the arm.

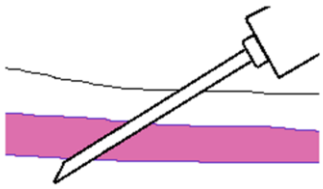
TROUBLESHOOTING

1. IF NO BLOOD IS OBTAINED:

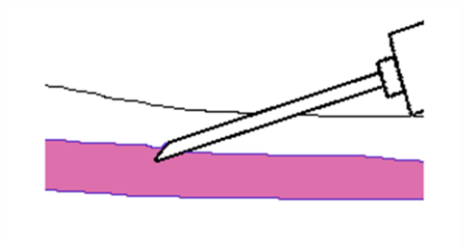
- Change the position of the needle. Move it forward (it may not be in the lumen)



- or move it backward (it may have penetrated too far).



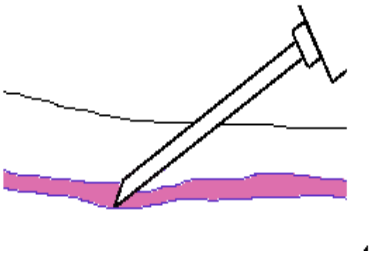
- Adjust the angle (the bevel may be against the vein wall).



- Loosen the tourniquet. It may be obstructing blood flow.
- Re-anchor the vein. Veins sometimes roll away from the point of the needle and puncture site.

2. **IF BLOOD STOPS FLOWING INTO THE TUBE:**

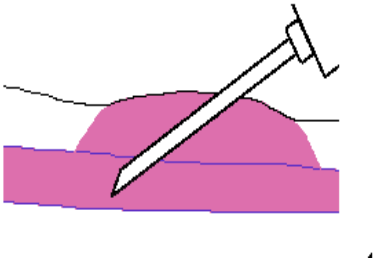
- The vein may have collapsed
- The needle may have pulled out of the vein



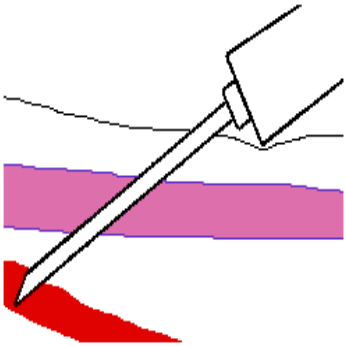
✓ Hold equipment firmly and place fingers against patient's arm

3. **PROBLEMS OTHER THAN AN INCOMPLETE COLLECTION:**

- Hematoma forms under the skin adjacent to the puncture site - release the tourniquet immediately and withdraw the needle. Apply firm pressure.



- The blood is bright red (arterial) rather than venous. Apply firm pressure for more than 5 minutes.



•

<u>Haematoma/Bruising</u>

- Tourniquet too tight / left on too long / use of RUBBER GLOVE!
- Arterial puncture
- Repeated insertion sites

<u>If you stick yourself with a contaminated needle:</u>

- Remove your gloves and dispose of them properly.
- Squeeze puncture site to promote bleeding.
- Wash the area well with soap and water.
- Record the patient's name and ID number.
- Follow your hospital protocol regarding treatment and follow-up.

ORDER OF DRAW

- NO ADDITIVES (Red, Dark Blue)
- COAGULATION (Light Blue)
- OTHER ADDITIVES (Green, Purple & Grey)

**EXCEPTION to this is when Blood Cultures have been requested, these MUST BE filled first anaerobic (Pink/Orange) followed by aerobic (Blue)

Plain
GXM
AB Levels

E.D.T.A.
FBC

Buffered Sodium Citrate
PT
APTT

Fluoride/oxalate
Glucose

Lithium Heparin,
BUSE,RP, LFT, P, Ca, Cardiac enzymes,electorlytes

Hemolysis Causes:

- Drawing through vascular access device
- Improper needle placement
- Excessive pulling pressure on the plunger of the syringe
- Vigorous specimen mixing
- Small needle size
- Under filling of the specimen tube

REMEMBER!!!

- YOU CAN ONLY POKE YOUR PATIENT TWICE (2 times) IF YOU ARE UNABLE TO GET THE BLOOD, GET YOUR COLLEGUE HELP
- NEVER FORCEFULLY EJECT THE COLLECTED BLOOD FROM THE SYRINGE INTO THE VACUUM TUBE.

Culture & Sensitivity

Why It Is Done?

- Find bacteria infection
- Type of bacteria infection
- Find a fungal infection, such as yeast
- Antibiotic sensitivity test
- **Find the cause of :**
    - an unexplained fever or
    - shock or
    - person becoming extremely ill
- Suspect Systemic inflammatory response syndrome (SIRS)
- **What do we need?**
- 1 sterile dressing set
- 2% chlorhexidine gluconate in 70% isopropyl alcohol swab
- 2 needles
- 1 syringe
- 1 sterile gloves
- 2 blood culture bottles (anaerobic and aerobic)

Set Contents:

-1pc Plastic tray with 3 compartments
-6pc Cotton ball (0.5 gm each)
-5pc Gauze swabs(7.5 cm × 7.5 cm - 8 ply)
-2pc Dissecting forceps
-1pc Hand towel
-1pc Waterproof drape
-1pc Yellow limpet bag
-1pc Outer wrap(blue)- Sterile field

Don't forget to:

- Check bottles for damage
- Check expiry date on bottles
- Explain and gain consent..
- Ask the patient if he took antibiotic recently
- Check patient is comfortable

Procedure

- Apply tourniquet and select vein..
- Cleanse the skin area for 30+ seconds with 2% chlorhexidine gluconate in 70% isopropyl alcohol and allow to dry
- Put on the sterile dressing cloth to the site of selected vein..
- Hand antisepsis and proper aseptic technique non touch technique (ANTT) is required for taking samples i.e. sterile gloves
- Remove bottle cap and decontaminate septum using a 2% chlorhexidine in 70% isopropyl alcohol swab. Leave to dry for 1 minute.
- Without retouching the site withdraw 20 ml of blood from the patient..
- Remove the syringe from the needle, and fix on new needle to the previous syringe..
- Inject 10ml of blood into anaerobic bottle first then 10 ml to aerobic bottle..

PRECAUTION

- *Blood culture bottles must always be filled first (i.e. before tubes for other investigations.)
- Do not remove bar codes from the bottles.
- Bottles and forms should be labeled appropriately with patient details, date, time

and most importantly site of culture (e.g. central or peripheral)

- Rotate the blood cultures bottles to mix – **DO NOT SHAKE!!!**
- Apply dressing to site and apply pressure for 2+ minutes

What Affects the Test

- Recent Antibiotics
- Contaminated by bacteria or fungus on the skin.
- If the blood test is not done correctly or the blood sample is not processed properly. In these cases, a false-positive or false-negative result could occur.

Branula (Venous Cannulation)

Cannula selection

In determining cannula size and site consideration must be given to the purpose of cannulation and the likely duration of IV therapy. As a general rule you should the smallest gauge and shortest length cannula that will meet the patient's needs.

Gauge	Flow rate (ml/min @ 1m)	Intended purpose
14G	350	Trauma patients Large volume replacement
16G	198	Trauma patients Major surgery Intra or post-partum GIT bleeding
18G	106	Blood products Delivery of irritant medications
20G	63.6	General use IV maintenance IV antibiotics IV anaelgesia
22G	36	Paediatrics Fragile veins
24G	23	Paediatrics/neonates

Factors to consider

Selection of site

- In most circumstances cannulation should be attempted on the most distal part of the patients arm
- Palpating a vein is important to determine its condition. Press lightly over the vein then release to assess elasticity and rebound filling. The vein should not feel hard and knotty.
- Ideally the cannula should be in the patients non-dominant arm
- Always consider the purpose of the cannula

Sites to avoid

- Veins distal to a previous IV site
- Joints or bony prominences
- Veins of the lower extremity
- Sclerosed or thrombosed veins
- The patients dominant hand (where possible)

- Veins with overlying cellulitis or skin breakdown
- An arm with an AV fistula or shunt – this is an absolute C/I except in the case of extreme emergency

Cannulation Process

- Ensure all equipment is prepared
    - Chlorhexidine and alcohol swab stick
    - Appropriate size IV cannula
    - Adhesive dressing
    - Gauze
    - Adhesive tape
    - Primed extension tubing and 3-way tap if required
    - Sharps container
    - Splint and bandage if required (particularly children)
    - IV infusion set or bung
    - Syringe and blood tubes if required

- Wash hands
- Introduce yourself to the patient
- Confirm correct patient identification and obtain consent for cannulation
- Explain the procedure and it's purpose
- Check for allergies to eg local anaesthetic or tapes
- Ensure use of standard precautions
- Apply tourniquet to the extremity proximal to the chosen site and tighten to less than arterial pressure
- If veins not obvious dilation may be improved by
    - Having the patient clench and relax their fist
    - Tapping the vein lightly with your fingers
    - Allowing the arm to hang dependant for a short period of time
    - Applying a warm pack over the area selected

- Choose a suitable vein
- Cleanse the skin with antiseptic solution and allow to dry
- Ensure no obvious defects of the cannula by inspection. Gently rotate the cannula on the stylet 360 degrees to release it
- Anchor the vein and pull skin taut
- Hold cannula in dominant hand by flash chamber bevel up
- Insert needle at 5-30 degree angle in a single fluid movement
- Observe for flashback and then advance the device slightly to ensure that the tapered tip of the cannula is in the vein
- Lower the cannula until it is almost flush with the skin and gradually advance the cannula until it has entered the vein to the hub
- Release the tourniquet
- Apply fingertip pressure at the distal end of the cannula tip to prevent backflow
- Retract the stylet and dispose of in the sharps container
- Attach injection port/extension tubing/IV giving set
- Cover the cannula with occlusive transparent dressing
- Flush with 5ml Normal Saline to ensure patency
- Secure further as required

Complications of IV Cannulation

- Thrombophlebitis
  Inflammation of the vein associated with thrombosis
- Infiltration
  Extravasation of fluid into the tissues either because of damage to the vein or dislodgement of the cannula
- Haematoma formation
- Nerve, tendon or ligament damage
- Infection
  Local cellulitis or septicaemia

Extras

Risks - During Insertion

- Infection
- Haemorrhage
- Haematoma
- Vaso-vagal episode
- Needle phobias
- Catheter embolism (**cannulation**)
- Transfixation
- Pain
- Nerve damage
- Arterial puncture
- Allergies
- Needlestick injury

Colour	Size	Flow Ml/min	Uses
Brown	14	275	Rapid transfusions of whole blood. Emergency situations.
Green	16	173	Rapid transfusions of whole blood. Emergency situations
Grey	18	100	Blood transfusions
Pink	20	60	IV infusions. Bolus'
Blue	22	25	Bolus'. Maintenance infusions
Yellow	24	13	Bolus medications. Short term infusions. Neonates
Purple	26		Neonates

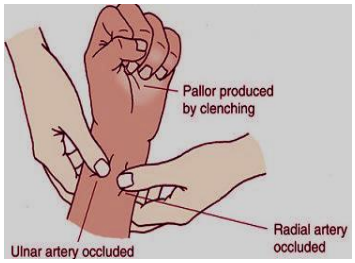
Patients Condition	Cannula Size
All obstetric patients	Grey or Green
Active gastrointestinal (GI bleed)	Brown or Grey
At risk of GI bleed	Grey
At risk of epileptic fit	Green
At risk of cardiac event	Green
At risk of neurological event	Green

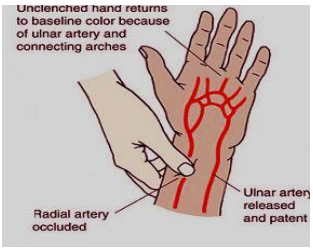
Arterial Blood Gases

Indications

- To determine:
    - PH and partial pressure of respiratory gases
    - Response to therapeutic interventions and disease state
- Sampling of blood in emergencies when venous blood cannot be obtained
- **Contraindications**
- Coagulopathy, anticoagulant medications, and thrombolysis
- Abnormalities of the overlying skin
- AV shunt (e.g. Dialysis patient), AV fistula
- Severe peripheral vascular disease, absence of peripheral pulse
- Negative results of a modified Allen test (collateral circulation test)
- **Why an ABG instead of Pulse oximetry?**
- Pulse oximetry determine **hemoglobin saturation.**
- Pulse oximetry does not assess **ventilation (pCO_2,PO_2)** or **acid base status**.
- Pulse oximetry becomes unreliable when saturations fall below 70-80%.
- Pulse oximetry cannot interpret methemoglobin or carboxyhemoglobin.
- **Which Artery to choose?**
- **RADIAL ARTERY**
    - Superficial,
    - Has collaterals
    - Easily compressed
- Other arteries (femoral, dorsalis pedis, brachial) can be used in emergencies.

Modified Allen Test





Equipment

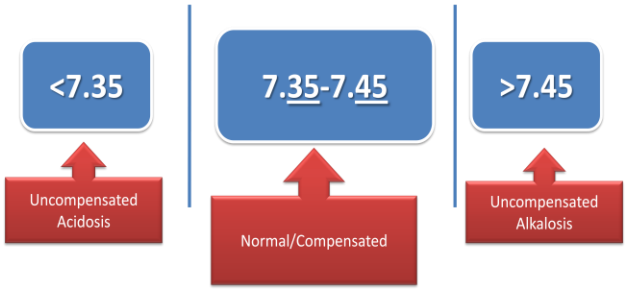
- 20G needle (Green needle)
- 23G needle (Blue needle)
- Heparin 1000U
- 2cc syringe
- Biohazard bag
- Ice
- Gauze or cotton balls
- Alcohol swab

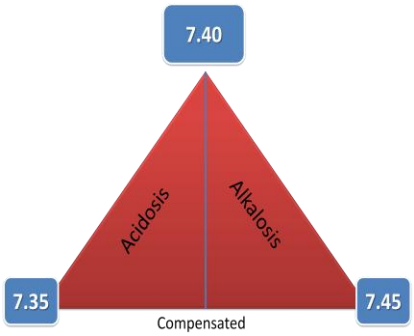
Complications

- Hematoma
- Distal ischemia
- Arteriovenous fistula formation
- Infection (soft-tissue and bone)

ABG Interpretation

- Step 1: PH- Acidosis/ Alkalosis





- Step 2: Metabolic/ Respiratory
  - pCO2-- acid
    - Respiratory component
  - HCO3-- base
    - Metabolic component

	pH	PaCO2	HCO3
Respiratory Acidosis	↓	↑	normal
Respiratory Alkalosis	↑	↓	normal
Metabolic Acidosis	↓	normal	↓
Metabolic Alkalosis	↑	normal	↑

Summary

Values		
	pH	
Uncompensated acidosis	7.35-7.45	Uncompensated alkalosis
	$PaCO_2$	
Respiratory alkalosis	35-45 mmHg	Respiratory acidosis
	HCO_3	
Metabolic acidosis	22-28 mmol/L	Metabolic alkalosis
	PaO2	
	80-100mmhg	
	SaO2	
	95-100%	

B.E

- Indicates the amount of excess or insufficient level of bicarbonate in the system.
- The normal range is –2 to +2 mEq/liter.
- A negative base excess indicates a base deficit in the blood.

Anion gap

Anion gap = $[(Na^{+}) + (K^{+})] - [(HCO_3) + (Cl^{-})]$
normal value – 8-12 mEq/L

- Used for DD of metabolic acidosis
- **Metabolic acidosis - Causes**

1) Normal anion gap
Therapeutic infusion/poisoning
Of HCL/NH4CL
Diarrhea (excessive loss of HCO3)
Renal tubular acidosis

2) High anion gap
MUDPILES
Methanol
Uremia
Diabetic ketoacidosis
Paraldehyde
Iron, isoniazid (INH)
Lactic acid
Ethanol, ethylene glycol
Salicylates

Compensatory response : Hyperventilation (CO_2 wash out)

Metabolic alkalosis - causes

Prolonged vomiting
Diuretic therapy (except K+ sparing)
Cushing's syndrome
Hyperaldosteronism ->
Primary/Secondary

Compensatory response : Hypoventilation (reduces CO_2 wash out)

Respiratory acidosis - causes
(ANY HYPOVENTILATION)
COPD, asthma
Neuromuscular disease -> Myasthenia gravis, Guillian-Barre's syndrome

Respiratory alkalosis - causes
CHAMPS
CNS disease
Hypoxia
Anxiety
Mech Ventilators
Progesterone
Salicylates/Sepsis

Central venous catheterization

INDICATIONS:

1)When i.v. catheter is not sufficient for the intended clinical therapy

2)When it is necessary to have access to a large volume blood vessel for:

-quick administration of large volume substitution and /or drugs

-administration of i.v. solutions of drugs in the event of the collapse of peripheral vessels(shock)

-administration of irritating or toxic drugs (eg. catecholamine, chemotherapeutic agents)

-Administration of high-osmolarity solutions(>800mosm/l),drug for parenteral nutrition

-Therapies lasting several days or weeks which require a venous access

-Vein-venous hemofiltration (dialysis)

-Measurement of central venous pressure during or after an operation

--central venous catheter should only be used when other access routes or procedures are not appropriate

--the catheter should be removed promptly as soon as it is no longer required.

SIX MOST FREQUENTLY USED ACCESS ROUTES :

-Internal jugular vein

-Subclavian vein

-Basilic vein

-External jugular vein

-Brachiocephalic vein

-Femoral vein

TYPES OF CENTRAL VENOUS LINE

-long line- From basilica vein, brachiocephalic vein.

-short line- from subclavian vein, internal jugular vein, external jugular vein.

PREPARATION FOR CATHETERIZATION

-Anamnesis/Reviewing medical records

- Medication intake, in particular anti-coagulant therapy
- Previous infectious, pulmonary or cardiac illnesses(which will eventually lead to right heart failure)
- Known allergic reactions

-Clotting status

-length measurement

-necessary catheter length is determined by use of a measurement tape.

-when puncturing the right subclavian or jugular vein the correct catheter position immediately before the right atrium is reached 13-16cm.

-The approach from the left side of the body requires 15-20cm.

-Positioning of the patient

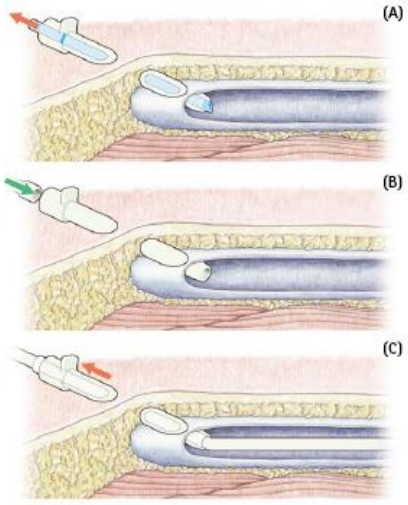
-When puncturing the internal or external jugular veins, subclavian, or brachiocephalic veins→Trendelenburg position.

-No special positioning of the patient is necessary for puncture in the region of the arm.

-Sterile catheter placement technique

TECHNIQUE OF INSERTION

1) *Catheter-through-cannula technique*



-blood vessel is prepunctured with an iv catheter(the iv catheter consists of a needle surrounded by a plastic cannula)

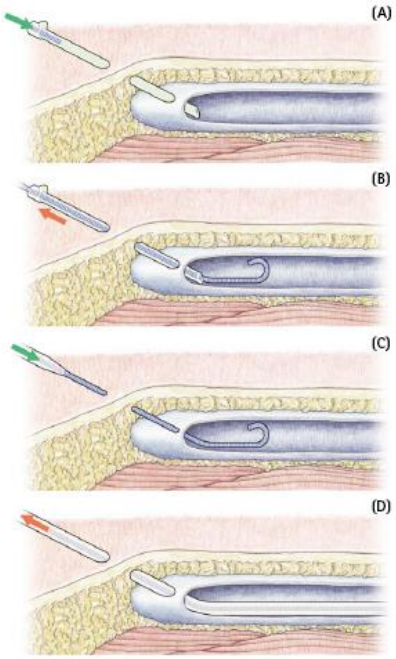
-after puncture of the vessel, the needle is withdrawn(A) and the cannula remains in the blood stream.

-the central venous catheter, which usually is contained in a protective sheath, is connected to the cannula by a airtight coupling(B).

-the catheter is then advanced through the cannula into the blood vessel. Positioning is facilitated by means of a mandrin inside the catheter.

-the cannula is removed distally after the correct catheter position has been reached(C)

2) *Guidewire technique = Seldinger technique*



When puncturing the blood vessel, the user may choose between a steel needle or an i.v. catheter. For safety reasons, the i.v.catheter is preferred.

-When using the i.v. catheter, the steel needle is removed so that the plastic cannula remains in the vein.

-Through this cannula or alternatively a steel needle, a flexible guidewire is advanced into the vein (A). ---Then the needle or cannula is removed (B).

- The diameter of the puncture needle is always smaller than the central venous catheter.

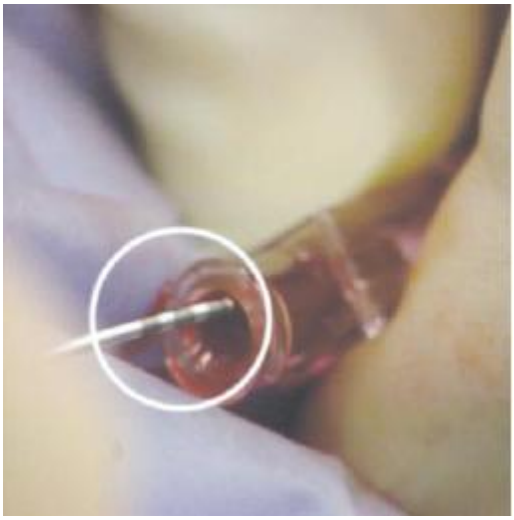
-To facilitate the entry of the catheter through the tissue, a dilator made of plastic is put over the guidewire and advanced into the tissue.

- Then the central venous catheter is threaded over the wire and advanced into the vein (C).

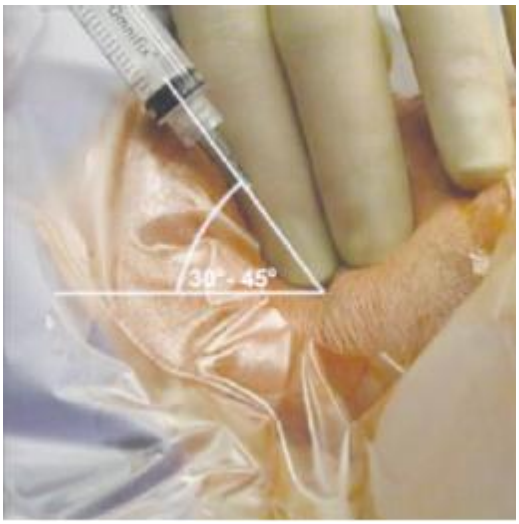
-The guidewire stabilizes the plastic catheter and facilitates its positioning. After the placement of the catheter has been checked, the wire is removed (D).

CATHETER PLACEMENT

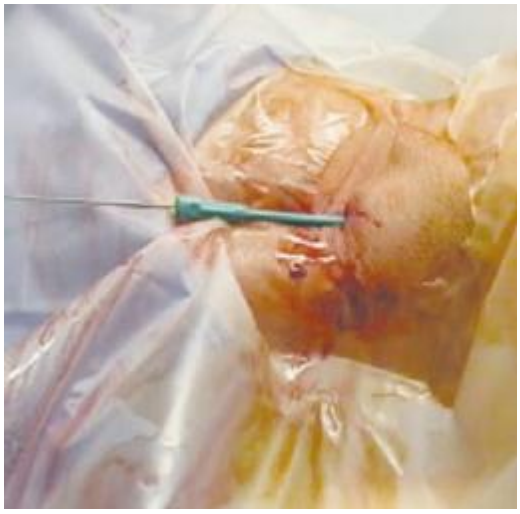
1
The patient is disinfected in the puncture area and amply covered with sterile drapes. The head is turned to the opposite side and slightly extended dorsally. The puncture site is located lateral to the easily felt carotid artery and between the two heads of the sternocleidomastoid muscle.



3
If the blood flowing back into the syringe is mostly dark red and not flowing with a pulsing rhythm (indicative of arterial blood), then the guidewire can be advanced via the puncture needle. Be sure that there is a secure connection between the needle and the dispenser



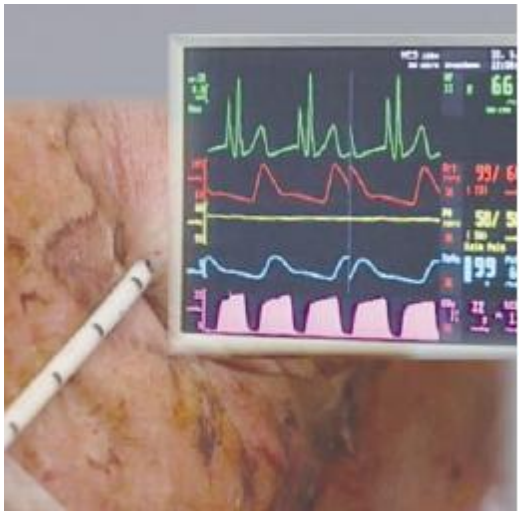
2
5 ml of a local anesthetic is injected into the puncture area. With an attached syringe the puncture needle is inserted in a caudal direction at an angle of 30° to the skin between the two bellies of the sternocleidomastoid muscle toward the ipsilateral nipple. The vein is reached at a depth of 2.5–4.5 cm.



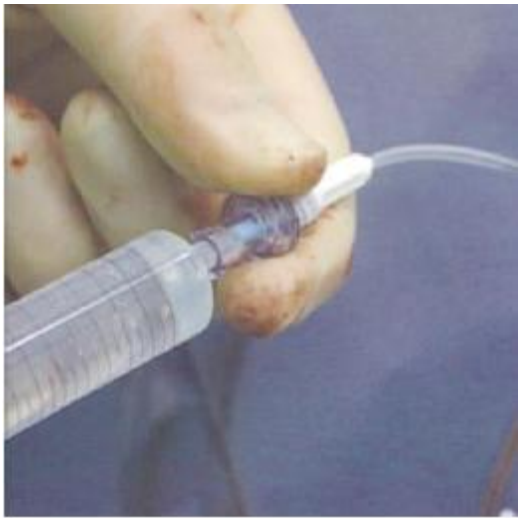
4
The guidewire is at first inserted only 5–6 cm. The puncture needle is removed; the venous position of the guidewire must not be altered during this procedure. The skin directly at the puncture site can be widened with a scalpel (caution: do not damage the guidewire).
A dilator that can be threaded over the guidewire and advanced downward to the vein is a safer way of facilitating the subsequent introduction of the catheter. The dilator is then removed.

6
A universal adapter for conducting an electrical signal from the guidewire is attached to the distal end of the guidewire. The ECG signal is switched over to the guidewire lead. The advancement of the catheter (with the guidewire inside) is continually monitored on the ECG screen.

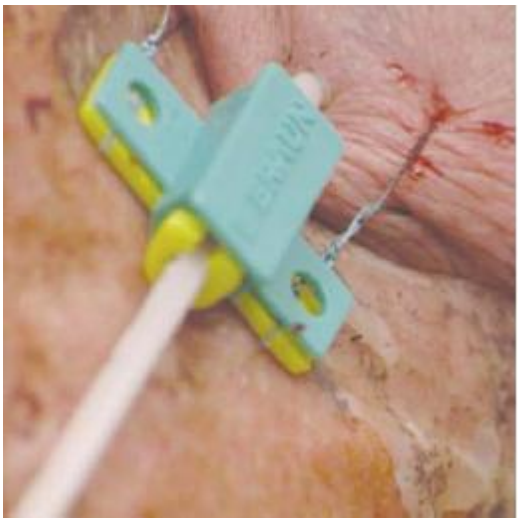
5
The central venous catheter is advanced into the vein over the guidewire. A length marking on the guidewire indicate when the catheter tip has almost reached the tip of the wire but the flexible J-tip remains outside of the catheter. When this point has been reached, the catheter and the guidewire are then advanced together further into the vein.



7
When the catheter is advanced into the right atrium, a pronounced elevation of the P-wave occurs in the electrocardiogram. It must be retracted approximately 2 cm and is now positioned correctly in the superior vena cava.



8
All catheter lumens are checked for possible obstructions using physiological saline solution.



9
The sliding fixation wing is brought into position and the clip for catheter fixation is attached. Unintended slippage of the catheter out of the vena cava is ruled out as far as possible by this arrangement. The fixation wing is attached to the skin with purse-string suture.

10
Blood on the skin at the puncture site is cleaned away and the site is covered with a transparent dressing. The type of catheter and any complications that may have occurred are noted in the patient's file.

CHECKING THE POSITION OF THE CENTRAL VENOUS CATHETER

Correct position of the catheter –in the vena cava directly before the right atrium.

To check- make a chest radiograph directly after placement of the catheter

-conducting an ECG during the placement procedure.

--> The catheter is initially advanced to the point where an elevated P-wave is visible in the ECG; then it is retracted 2cm. The ECG reading return to normal.(signal f the catheter's position before the right atrium.)

Testing catheter function

To test that all the catheter lumens are free of obstructions.

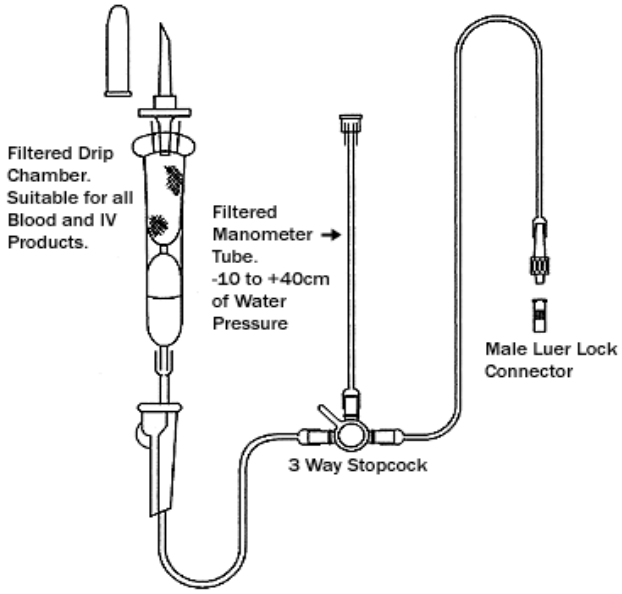
-A syringe filled with physiological saline solution is connected t each of the lumens and blood is briefly aspirated. Then reinject aspirated solution.

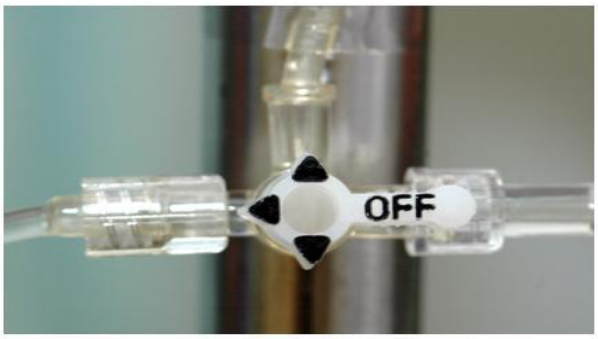
-If aspiration of injection is obstructed—verify position of catheter by chest X-ray and correct it if necessary.

COMPLICATIONS

1) Incorrect Puncture
   - -into tissue
   - -with perforation of the vessel
   - -with arterial damage
   - -with puncture of pleural cavity
   - -with nerve damage
2) Incorrect catheter position
   - -in another vein
   - -single lumen openings outside the vein
   - -too deeply inserted in the right atrium
   - -with puncture of the cardiac muscle
3) Embolism
   - -Catheter embolism
   - -Guidewire embolism
   - -Air embolism
4) Other Disorders
   - -Dysrhythmia
   - -Thrombosis
5) Infection
   - -Local infection
   - -Catheter associated infection to the point of sepsis

MEASUREMENT OF CENTRAL VENOUS PRESSURE





1) Preparaton of set

-Put measuring tube in measuring scale, connect infusion set to infusion container, adjust level in chamber and fill slowly infusion tube as well as measuring tube. Avoid air from entering. Close roller clamp.

-Turn three way stopcock clockwise by 90', open roller clamp and fill connecting tube. Close roller clamp. Attach connecting tube to cava catheter. Adjust infusion rate.

2) Measurement of venous pressure

-close roller clamp and turn three-way stop-cock clockwise by 90'. Level of liquid adjusts to value of central venous pressure. As soon as column has come to rest, read level of liquid.

3) Resumption of infusion

-Turn three-way stopcock clockwise by 180'. Open roller clamp and refill measuring tube. Close roller clamp.

-Turn three-way stopcock clockwise by 90' and adjust infusion rate.

CVP READINGS:

Normal range: 6-8cmH_20

CVP is elevated by:

- Overhydration which increases venous return
- Heart failure or PA stenosis which limit venous outflow and lead to venous congestion
- Positive pressure breathing, straining

CVP decreases with:

- Hypovolemic shock from hemorrhage, fluid shift, dehydration
- Negative pressure breathing which occurs when the patient demonstrates retractions or mechanical negative pressure which is sometimes used for high spinal cord injuries.

The CVP catheter is also an important treatment tool which allows for:

- Rapid infusion
- Infusion of hypertonic solutions and medications that could damage veins
- Serial venous blood assessment

BP measurement

EQUIPMENT

1. Stethoscope

2. Manual blood pressure cuff

Or Electronic blood pressure machine

Or mercury column sphygmomanometer

Automated ambulatory BP devices

CUFF SIZE

Size of cuff should be correct (2/3 of circumference of arm)

- If too small for patient – high BP is measured
- If too big for patient – low BP is measured

IMPORTANT :

- Do not take a blood pressure (BP) on an injured or painful extremity

- Intravenous line (IV) setting limb

GENERAL GUIDELINES

1. Check record – name, age, illness

2. Gather equipment, including paper and pen, for recording vital signs

3. Wash hand

4. Prepare pt in a quiet and non threatening manner (Close curtain)

5. Clean ear pieces and bell/diaphragm of stethoscope with an alcohol wipe

6. Position.

a) Arm: Sitting or recumbent position with forearm supinated and slightly flexed and supported at heart level.

b. Leg: Prone or if unable to lie prone, supine with knee slightly flexed to permit placing stethoscope over popliteal area

7. Remove clothing as necessary to expose extremity

8. Place correct size cuff around the extremity with the center of the bladder cuff over the artery. *Too narrow a cuff will give false high reading; too wide a cuff will give a false low reading.*

A) Arm: Cuff should be placed around upper arm with

the lower edge about 3 cm above the antecubital fossa.

B) Leg: Cuff should be placed around the mid thigh

with the lower edge about 2 cm above the popliteal space.

9. Locate the artery by palpation. *Allows for proper placement of stethoscope to hear BP.*

10. Palpate the radial pulse, then inflate the balloon till radial pulse not palpable, with additional of 20 mmHg

11. Place stethoscope gently over artery

12. On measuring BPslowly decrease by 2 mmHg till you get the BP

→ *Slower or faster deflation yields false readings.*

13. Deflate the cuff rapidly and completely and remove from the arm

NOTE:

-The cuff should be place at the level of the heart

-Pt should not have smoked or ingested caffeine within 30 minutes of measurement

-Do not reinflate cuff without letting cuff totally deflate. Reinflating cuff results in erroneously high readings.

-To obtain a blood pressure reading by palpation, keep fingers on a distal pulse.

- While the diaphragm of the stethoscope is frequently used, the American Heart Association recommends using the bell of the stethoscope

Classification of blood pressure for adults age 18 and older

Category	Systolic (mmHg)	Diastolic (mmHg)	Prevalence in Malaysia
Optimal	<120	<80	32%
Prehpertension	120-139	80-89	37%
Hypertension			
Stage 1	140-159	90-99	20%
Stage 2	160-179	100-109	8%
Stage 3	>180	>110	4%

The classification is based on the average of two or more readings taken at two or more visits to the doctor. When SBP and DBP fall into different categories, the higher category should be selected to classify the individual's BP.

Urinary Catheterization

- Urethral catheterization is a medical procedure that facilitates direct drainage of the urinary bladder

Types of Catheter

1. Foley catheter- consists of 2 ports: balloon port & drainage port. They are commonly made in silicone rubber or natural rubber.
2. Robinson catheter- is a flexible catheter used for short term drainage of urine. Unlike the Foley catheter, it has no balloon on its tip and therefore cannot stay in place unaided.
3. A Coudé catheter- is designed with a curved tip that makes it easier to thread the catheter pass the prostate or obstructions in the urethral canal. A Coudé catheter tip may be provided with a balloon or not.
4. Triple-lumen(3-ways catheter)- additional port called irrigation port to carry irrigation fluid into the bladder. This is useful in the case of gross haematuria.
5. An external Texas or condom catheter- is used for incontinent males and carries a lower risk of infection than an indwelling catheter.

Sizes of Catheter

- Catheter diameters are sized by the French catheter scale (F).
- The most common sizes are 10 F (3.3mm) to 28 F (9.3mm).
- For Male- 16-18 F
- For Female- 14-16 F

Indication

- Diagnostic
  - Collection of uncontaminated urine specimen
  - Monitoring of urine output
  - Imaging of the urinary tract (retrograde urethrography)
- Therapeutic
  - Acute urinary retention
  - Chronic obstruction
  - Continuous bladder irrigation
  - Hygienic care of bedridden patients
  - Instillation of medication

Contraindications

- Traumatic injury to the lower urinary tract
- Pelvic fracture
- Urethral stricture
- Recent urethral or bladder surgery

Precaution:

- Not to use saline or air to inflate the balloon.

Saline - crystallization or valve malfunction.
Air - balloon floating around in the bladder.

- Never forcefully advance the catheter.
- Unsterile hand (hold genital organ) should not touch the sterile set.
- Prevent retrograde flowing of urine to urinary bladder – can lead to ascending UTI

Complication

- Trauma
- Bleeding
- Mineral deposit due to crystallization
- Catheter associated infection- urethritis & cystitis
- Bladder spasms
- Urethral perforation
- Non-deflation of retention balloon
- Paraphimosis in Male patient

Procedures

- Explain the procedure and benefits to the patient or the patient's representative.
- Patient in supine position, in bed, and uncover the genitalia.

Remember: UC is a STERILE procedure!

Equipments

- **Commercial urinary catheterization kit**
  - 0.9% normal saline/ Providone Iodide/ Chlorhexidine
  - Sterile cotton balls
  - Pincer
  - Lubrication gel (vaseline)
  - Sterile drapes
  - Sterile gloves
  - Urethral catheter
  - 10ml syringe with water for inflation
  - Kidney dish
  - Urine bag
  - Specimen container

Steps

1) Open the catheter tray and place it on the gurney in between the patient's legs, use the sterile package as an extended sterile field. Place the drape under patient's buttock before wearing the sterile gloves.

2) Wear sterile gloves and open the 0.9% normal saline and pour it onto the sterile cotton balls. Place the lubricant gel on the sterile field.

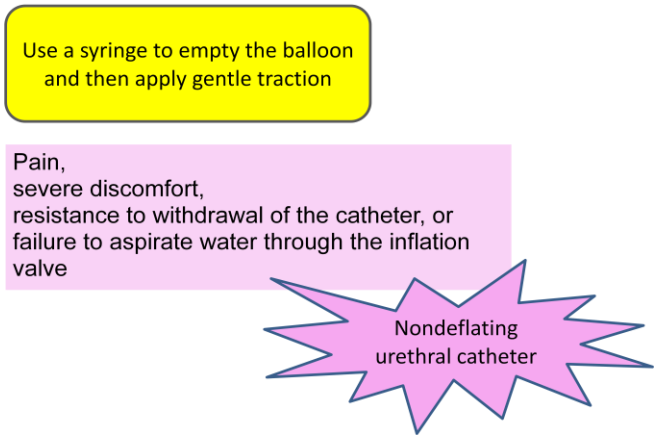
For male:

1. Use the sterile fenestrated drape to create a sterile field around the penis and use the nondominant hand to hold the penis and retract the foreskin (if present).
2. This hand is the nonsterile hand and holds the penis throughout the procedure.
3. Use the sterile hand and sterile pincers to clean the urethra and glans in circular motions with at least 3 different cotton balls.
4. Hold the catheter with the sterile hand and apply a generous amount of the lubricant to the catheter.
5. To hold the penis at 90 º and stretching it upward to straighten out the penile urethra, slowly and gently introduce the catheter into the urethra. Continue to advance the catheter until the urine return.
6. The lubricant may delay urine return. If no spontaneous return of urine occurs, try attaching a 60-ml syringe to aspirate urine. If urine return is still not visible, withdraw the catheter and use a new sterile catheter to reattempt the procedure.
7. After visualization of urine return, inflate the distal balloon by injecting 10 ml of water through the balloon inflation port.
8. Gently withdraw the catheter from the bladder until resistance is met. Then, connect the catheter to the urine bag. If the patient is uncircumcised, make sure to reduce the foreskin, as failure to do so can cause paraphimosis

For Female

1. Patient should lie supine in a lithotomy or frog-like position.
2. Wear sterile gloves and take the sterile fenestrated drape to create a sterile field around the vulva. Use the nondominant hand to separate the labia majora and minora to identify the urethral with the thumb and index finger.
3. Clean the urethral and surrounding vulva in a circular motion with at least 3 different cotton balls.
4. Because the female urethra is shorter, the urine may begin to flow before the balloon has completely enter the bladder. But, still we continuous to advance the catheter for another 3-5cm to ensure the balloon is inserted into the bladder.

Urethral catheter removal



- The most common cause of a non-deflating urethral catheter is obstruction of the inflation canal or due to the crystallization of the inflation fluid inside the balloon.
- Call MO.

Urine dipstick

- Explain procedure to patient.
- Check to make certain that quality controls have been run and are acceptable.
- Following proper patient identification, collect fresh urine specimen in a clean dry container.
- Wear gloves and use universal precautions.
- Remove one strip from bottle and replace cap. Completely immerse reagent areas of the strip in fresh mixed urine and remove immediately to avoid dissolving out reagents.
- While removing, run the edge of the entire length of the strip against the rim of the urine container to remove excess urine. Hold the strip in a horizontal position to prevent possible mixing of chemicals from adjacent reagent areas and/or contaminating the hands with urine.
- Compare reagent areas to the corresponding color chart on the bottle label.
    - Read glucose test at 30 seconds.
    - Read ketones at 40 seconds,
    - Read blood, Ph, protein, and nitrite at 60 seconds.
    - Read leukocytes at 2 minutes.
- Timing is critical for correct result interpretation. Do not read strips in direct sunlight.
- Record the test result in the computer according to department protocol.

Nasogastric Tube Insertion

INDICATION

- To empty gastric contents pre-op
- To obtain specimen
- For lavage in drug overdosage or poisoning
- In trauma, for prevention of vomiting and aspiration
- for enteral feeding if PO is not safe
- Irreversible dysphagia
- For delivery of oral agent eg radiological contrast, activated charcoal

Contra-indication

- Severe facial trauma
- k/c/o esophagitis and stricture
- Esophageal diverticular

Equipment

- Gloves
- NG/OG tube (size: 16, 12,10)
- Topical anesthetic
- Lubricating gel – Lignocaine
- Adhesive tape
- Cup of water (if necessary)
- Emesis basin / towel
- Stethoscope
- syringe
- pH indicator strips- litmus paper

WHEN PT COMES TO YOU…

- Introduce yourself!
- Explain what you going to do, what will happen, possible complications etc
- Make sure you get his consent!!!
- Position : pt sit up right
- Measure: tubing from xiphoid process to the angle of mandibula, to the bridge of nose
- fixate the tube on the nose!

Confirmation!

- Pt able to talk w/o respi distress
- No respi sound heard over the tube
- Gurgling sound audible by stetoscope at epigestrium
- Able to aspirate gastric content
- X-ray !

COMPLICATIONS

- aspiration and tissue trauma.
- Placement of the catheter can induce gagging or vomiting
- Pneumothorax
- Esophagitis/ perforation
- Perforation of stomach
- Epitaxis and erosion
- Sinusitis
- Intracranial placement

Per Rectal Examination

Indication:

- For detection of abnormal masses in the rectum
    - Haemorrhoids
    - Prostatomegaly
    - Rectal carcinoma.
- Hx of GI bleed

Equibments : gloves and lubricant

When pt comes to you,

- IPPEC
- Position : pt lie on his left side, with both leg bend up to abd
- Exposure :only the perineum area
- Don glove (double layer)

External inspection

Internal inspection

- Apply gel on both your hand and pt's anus
- Press **right index finger** against side of the anus
- Ask pt to breath deeply while you insert finger slowly
- Check every side

Peritoneal Tapping@ Abdominal Paracentesis

Indication: to get cytological/ bacterial diagnosis

-> exclude spontaneous bacterial peritonitis

Contraindication :

- end stage cirrhosis
- coagulopathy
- hyponatriaemia (< 126mmol/l)
- spesis

Relative Contraindication :

- Pregnancy
- Organomegaly
- Small bowel obstruction
- Abdominal adhesion

complication

- hypovolemia
- Hyponatriamia
- Intrabdomen organ injury
- bleeding

Remember!!!

- X abdomen hematoma
- X inflammation site
- X surgical scar
- X engorged vessels
-

Before starting

1. Check platelet count & clotting time
2. Make sure good IV access
3. Examine abdomen, x organomegaly, mark
4. Take consent from patient and explain procedure and complications

During procedure :

1. Lay patient supine on 1 pillow
2. Mark location of puncture :
   - 2cm below umbilical, midline
   - Left/ right lower quadrant , lateral to rectus muscle
3. Don with gloves, mask and gown
4. Cleanse skin over the proposed puncture
5. Drape to define a sterile field
6. Anesthetize the skin over the proposed puncture site with the lidocaine drawn up in the 5 cc syringe with the attached 25 gauge needle.
7. Anesthetize down to the peritoneum. Aspirate periodically; if ascitic fluid returns, withdraw the needle slightly to re-enter tissue before further anesthetic is infiltrated
8. Insert the 18 gauge needle perpendicularly through the anesthetized abdominal wall, and advance until hub of needle is 5mm-1cm from the skin surface. (2 methods)
9. Withdraw ascitic fluid – send for investigation
10. When paracentesis is done, simply remove needle from abdominal wall. Place a small pressure dressing on puncture site. Have patient remain supine for 2-4 hours
11. Monitor BP, Heart rate

Ascitic fluid analysis

a) Colour
Straw coloured -> causes of transudative ascites
Bloody -> Malignancy
Turbid -> Infection
Milky -> Chylus

b) Cell count
>500 polymorph/L -> Spontaneous bacterial peritonitis
Lymphocyte predominance -> TB peritonitis

c) Gram stain/Culture
Present of E.coli -> highly suggestive of SBP

d) Amylase level -> Pancreatitis
e) Cytological examination -> Malignancy
f) Serum-Ascitic Albumin Gradient (SAAG)

Determined by finding the difference btw the concentration of albumin in serum & ascitic fluid

If **= or > than 11gm/L -> transudate**
Causes : Liver cirrhosis, Nephrotic syndrome, Fulminant hepatic failure, CCF, Budd-Chiari's syndrome

If **<11gm/L -> exudate**
Causes : Peritoneal carcinomatosis, Serositis, Pancreatic/Biliary ascites, TB peritonitis

Normal Values

Full blood picture			
TWBC		4.0-11.0	$x10^4/L$
RBC	M	4.5-6.5	$x10^{11}/L$
	F	3.9-5.6	$x10^{11}/L$
Hb	M	13.5-18	g/L
	F	11.5-16.0	g/L
PCV	M	0.4-0.54	I/L
	F	0.37-0.47	I/L
MCV		76-96	Fl
MCH		27-32	Pg
MCHC		30-36	g/dl
Neutrophils		2.0-7.5	$x10^4/L$
Lymphocytes		1.5-3.5	$x10^4/L$
Monocytes		0.2-0.8	$x10^4/L$
Eosinophiles		0.04-0.44	$x10^4/L$
Basophiles		0.0-0.1	$x10^4/L$
Platlet		150-400	$x10^4/L$
Renal Function Test			
Sodium		135-145	mmol/L
Potassium		5.4-5.0	mmol/L
Urea		2.5-7.5	mmol/L
Creatinine		70-130	umol/L
Uric Acid	M	180-420	umol/L
	F	130-360	umol/L
Calcium	Total	2.2-2.6	mmol/L
	Ionized	1.18-1.35	mmol/L
Phosphate		0.6-1.52	mmol/L
Amylase		<82	IU/L
Glucose	FBS	4.0-5.5	mmol/L
	RBS	4.0-6.6	mmol/L
Chloride		98-107	mmol/L
Magnesium		0.6-1.05	mmol/L
Osmolality		225-295	mosom/L
Urine			
Albumin		<150	mg/24h
Amylase		<600	IU/24h
Calcium		2.5-7.5	mmol/24h
Creatinine	Total	8800-17700	umol/24h
	Clearance	70-140	ml/24h
Magnesium		2.0-6,2	mmol/24h
Phosphate		162-495	mmol/24h
Potassium		40-120	mmol/24h
Protein		<250	mg/24h
Sodium		80-250	mmol/24h
Uric Acid		1.5-4.4	mmol/L
VMA		<51	umol/24h
Osmolality		300-900	mosom/kg
Urine output		0.5-1.0	ml/h/kg
Lipids			
Triglycerides	M	0.68-1.38	mmol/L
	F	0.46-1.60	mmol/L
Cholestrol	Total	3.6-6.3	mmol/L
	HDL (M)	0.75-1.81	mmol/L
	HDL (F)	0.75-2.20	mmol/L
	LDL (M)	2.55-5.57	mmol/L
	LDL (F)	2.33-2.75	mmol/L
Liver Function Test			
Total Protein	Adult	66-87	g/L
	Children	60-80	g/L
	Infant	48-76	g/L
	Neonate	48-68	g/L
Albumin		36-50	g/L
Globulin		28-43	g/L
Billirubin	Total	3.4-17.1	umol/L
	Direct	0.8-5.1	umol/L
	Indirect	2.6-12.0	umol/L
AST	M	<37	IU/L
	F	<31	IU/L
ALT	M	<40	IU/L
	F	<31	IU/L
ALP	Adult	39-117	IU/L
ACP	Total	<10	IU/L
	Prostatic	<3.5	IU/L
Lactate		0.63-2.44	mmol/L
BUSE			
Sodium		135-145	mmol/L
Potassium		3.5-5.0	mmol/L
Urea		2.7-7.5	mmol/L
Chloride		98-107	mmol/L
Ammonia		6.0-35	mmol/L
Arterial Blood Gases			
pH		7.35-7.45	
pCO2		35-45	mmHg
pO_2		80-100	mmHg
HCO_3		22-28	mmol/L
TCO_2		24-30	mmol/L
BE		(+/-) 2	mmol/L

Cardiac Enzyme			
CK	M	<195	IU/L
	F	<170	IU/L
CK-MB		<25	IU/L
LDH		230-460	IU/L
AST	M	<37	IU/L
	F	<31	IU/L
Cerebral Spinal Fluid			
Protein	Total	0.15-0.45	g/L
Glucose		2.2.-4.4	mmol/L
Chloride		118-132	mmol/L
Coagulation test			
TT		10-15s	
PT		10-14s	INR 0.9-1.2
PTT		35-45s	
Endocrine			
TSH		0.5-5.7	mU/L
T4		70-140	mmol/L
T3		30-Dec	mmol/L
Cortisol	am	450-700	mmol/L
	midnight	20-280	mmol/L
Vital Signs			
Blood Pressure	120/70 mmhg	Temperature	37^0C
Respi Rate	14-20/min		
Pulse	72 beat/min		