

TUBES AND DRAINS

FOLEY CATHETER

Length of male urethra is 20-25 cm, female urethra is 3.5-4 cm. 1 French gauge = 0.3 mm and this is used to measure the diameter of the urethra for the circumference of the catheter. The appropriate size can be chosen based on the age of the patient:

Age (years)	Size (French gauge)
<5	5-8
5-10	8-10
10-14	10
14-18	10-14
>18	12-16 (clear urine) 18-20 (pus, blood)

Measure the size of the urethral meatus to decide which one to use exactly.

Indications

Diagnostic

1. obtain urine sample (in retarded patients, or for clean-catch)
2. monitor urine output
3. voiding cystourethrography
4. urodynamic studies
5. measurement of post-void residual volume

Therapeutic

1. to relieve urine retention
2. chronic use in debilitated patients (use condom in males if possible, intermittent self-catheterization in females)
3. irrigation of bladder
4. instillation of chemotherapy or immunotherapy
5. postoperative (hypospadias) or preoperative (to prevent bladder injury)

In chronic retention drain 250-500 cc of urine every hour to avoid hematuria.

Contraindications

1. trauma to urethra
2. complete stenosis (shown by retrograde urethrography)
3. bladder neck contracture

Complications

Early

1. failure to insert, usually due to inadequate anesthesia (insert 10 cc and wait for 10 minutes; if not useful insert 20 cc), or may be due to stricture
2. trauma to bladder neck, hematuria, urethral injury, creation of false passage
3. allergy (not with silicon catheters) and anaphylaxis

Late

1. CAUTI → 80% of nosocomial infections; risk factors are improper technique, females, immune compromised, pre-existing UTI, open draining system; usually established from day 6; take a sample, remove the catheter, if needed you can put another catheter or insert silicon catheter (less chance of infection), but if stricture present do not remove catheter; can give prophylactic antibiotics (nitrofurantoin 100 mg nightly) to avoid this but it increases resistance of the bacteria and changes the flora of the urethra
2. obstruction
3. stone formation if left for long duration
4. squamous cell CA
5. failure to remove, if due to clot irrigate with saline, if not follow these steps:
 - a. inject some water then re-try deflation as this may reshape the contour of the balloon and facilitate deflation
 - b. cut the channel externally since the obstruction may be at that point
 - c. insert a guidewire into the channel and puncture the balloon by the rigid tip
 - d. US-guided puncture by 22-gauge spinal needle percutaneously or transvaginally

SUPRAPUBIC CATHETER

Indications

1. contraindications to foley catheter
2. preferred for prolonged catheterizations
3. postoperatively for hypospadias (which also have a foley in for patency) and ureteric re-implantation

Contraindications

1. scar of previous operation in suprapubic region since there may be adhesions and cause injury to bowel
2. bleeding diathesis

3. suspected bladder tumor

Complications

1. same as those of foley catheter
2. extravasation of urine
3. bowel injury
4. seeding of bladder tumor

NEPHROSTOMY

Indications

1. failure to insert retrograde stenting in distal obstruction (stone, PUJO, etc); if bilaterally needed or if single kidney then go straight to nephrostomy rather than JJ stenting
2. adjunct to PCNL
3. obtain urine sample
4. palliative measure in inoperable pelvic tumors
5. pyonephrosis
6. injection of contrast (nephrostogram)
7. instillation of chemotherapy

Complications

Early

1. bleeding, AV fistula, pseudoaneurysm
2. organ injury, pneumothorax

Late

1. infection (post-PCNL pyelonephritis)
2. blockage of tube → flush with 20 cc normal saline (in and out), if not pinch outflow, if not move the tube in and out
3. slippage of tube

CHEST TUBE

Chest tubes are generally inserted into the pleural cavity for two reasons: to drain fluid, thereby preventing pleural fluid accumulation, and to evacuate air if an air leak is present

Indications:

Indications for tube thoracostomy (chest tube insertion) include the following:

I. Emergency

1. Pneumothorax : In all patients on mechanical ventilation, or if pneumothorax is large in a clinically unstable patient, tension pneumothorax after needle decompression, recurrent or persistent, secondary to chest trauma, iatrogenic, or if large and clinically significant
2. Hemopneumothorax : massive and moderate
3. Esophageal rupture with gastric leak into pleural space

II. Nonemergency

1. Pleural effusion: malignant, recurrent, parapneumonic or empyema
2. Chylothorax
3. Treatment with sclerosing agents or pleurodesis
4. Postoperative care (e.g., after coronary bypass, thoracotomy, or lobectomy)

Site of insertion:

1. Safety triangle: This is the triangle bordered by the anterior border of the latissimus dorsi, the lateral border of the pectoralis major muscle, a line superior to the horizontal level of the nipple, and an apex below the axilla.
2. Second intercostals space for drainage of pneumothorax if necessary

Techniques of chest tube placement

The two techniques for insertion commonly employed are as follows:

- (1) Trocar method; and
- (2) Blunt Dissection.

Chest tubes should always be connected to an underwater seal

Contraindications

There are no absolute contraindications for drainage by means of a chest tube except when a lung is completely adherent to the chest wall throughout the hemithorax.

Relative contraindications include:

1. risk of bleeding in patients taking anticoagulant medication or in patients with a predisposition to bleeding or abnormal clotting profiles; whenever possible,

coagulopathies and platelet defects should be corrected with the infusion of blood products, such as fresh frozen plasma and platelets

2. suspected diaphragmatic rupture

Removal of the tube:

Chest tube should be removed after:

- A. the tube has been on water and air seal for ≥ 24 hours
- B. the chest tube output is < 150 ccs over a 24 hour period and
- C. the chest radiograph demonstrates that the lung is expanded

Indications of urgent thoracotomy in hemothorax:

1. The initial blood drainage from the chest tube is >1500 ml.
2. When bleeding persists at a rate of 200 to 300 ml per hour over 3 to 4 hours.
3. When there is haemodynamic instability.

TRACHEOSTOMY

It is an operative procedure that creates a surgical airway in the cervical trachea

Indications: To bypass obstruction

1. Intubation failure
2. Bilateral Vocal Cord Paralysis
3. Trauma (laryngeal, maxillofacial fractures)
4. Edema (tongue, laryngopharynx)
5. Foreign body obstruction
6. Subglottic or tracheal stenosis

Surgical techniques

1. Open procedure
2. Percutaneous procedure

Types of tracheostomy tubes

1. Cuffless tubes
2. Cuffed tubes

Tracheotomy care

1. Suctioning: Not aggressive and not too much deep
2. Skin care: To prevent irritation and secondary inflammation due to discharge
3. Inner tube care: Once or more daily remove and clean. Attention on crusts
4. Humidification: "Artificial nose"
5. Tube position:
 - a. To prevent decubitus of trachea
 - b. Not to cover with blanket!
 - c. Pay attention on patient's beard and chin position!

DRAINS

1. Rubber vs Silicone
2. Active vs Passive
3. Closed vs Open

List of Things to Drain

1. Blood, Serum/lymph, Pus, Urine
2. Bowel anastomotic leaks, Saliva, Pancreatic secretion, Bile

Active or passive

Active drains: are maintained under suction

Passive drains: have no suction; work according to the differential pressure between body cavities and the exterior

Types of open drains drain fluid on to a **gauze pad** or into a **stoma bag**

1. Corrugated Drain
2. Penrose Drain (made of soft, pliable rubber, is used to drain incisions)

3. Yeates drain (series of approx 2mm diameter PVC tubes attached side by side)

Drains may be

1. superficial, i.e. in the wound;

2. deep:

- a) intraperitoneal, e.g. covering an intestinal anastomosis,
- b) in a hollow organ or duct, e.g. a T-tube in the bile duct,
- c) in an abnormal channel, e.g. a fistula,
- d) to drain a deep cavity, e.g. an abscess or haematoma

Close passive drains

1. Pig-tail Catheters (nephrostomy)

2. Percutaneous Transhepatic Biliary Drains (more side holes)

3. Urinary Catheter

4. Intercostal Catheter

Close suction (active) drains

- 1. Bellovac[®]
- 2. Blake[®] drain
- 3. Exudrain[®]
- 4. Hemovac[®] (Davol, redivac)
- 5. Jackson-Pratt[®]
- 6. Sump Suction Drains
- 7. 'Shirly' wound drainage (suction drain with an intake tube supplying air to the bottom of the main tube)

General guidance

If active, the drain can be attached to a **suction** source and set at a prescribed **pressure**

Ensure the drain is **secured** (dislodgement is likely to occur when transferring patients after anaesthesia).

Accurately measure and **record drainage** output.

Monitor **changes** in character or volume of fluid e.g. leaking fluid.

Use measurements of fluid loss to assist intravenous **replacement** of fluids.

Closed

1. Lower **infection** rate.
2. Reduce risk of **contaminating staff** and other patients.
3. Reduce **nursing** time
4. More accurate **measurement** of drainage output.
5. Protect **skin** from irritating discharges.

Open

1. Penrose for its **softness**
2. Lower tendency to be **blocked**.
3. Greater pt **comfort** and **mobility**

Problems of drains

1- Mechanical

1. Trauma to tissues
2. Erosion of adjacent tissues- may lead to perforation or fistula formation ,haemorrhage
3. Herniation of viscera through the drain tract.

2-Physiological

1. Bacterial colonization and sepsis
2. Loss of fluid and electrolytes
3. Pain-
4. Pneumothorax pneumoperito-
5. Restricted mobility

3-Drain malfunction

1. Blocked, leaking, vacuum failure (suction drains)
2. Loose drain, retraction, falling out, broken
3. Inflamed exit site, high output, atypical Drainage Fluids; anastomotic leaks, or drain erosion into adjacent structures e.g. bowel, bladder, or blood vessels.

When to remove

- Drains left in place for **prolonged** periods may be **difficult** to remove.
- **Early removal** may decrease the risk of some **complications**, especially infection.

Removal

- Drainage has **stopped** or becomes less than about **25 ml/day**.
- Drains can be '**shortened**' by withdrawing them gradually (typically by **2 cm** per day) and so, in theory, allowing the site to heal gradually.
- Warn the patient that there may be some **discomfort** when the drain is pulled out.
- Consider the need for **pain relief** prior to removal.
- Place a **dry dressing** over the site where the drain was removed.
- **Some drainage** from the site commonly occurs until the wound heals.