Ministry of Higher Education and Scientific Research

College of Health and Medical Technology Anesthesia Techniques

Department Subject :

Practical Anesthesia

4th stage

2025 - 2026

Anesthetic management for craniotomy

1) Rapid Sequence Induction (RSI) for Head Injuries

Pre-oxygenation : 3–5 mins of 100% O2. Avoid bag-mask ventilation (BMV) to prevent gastric distension and aspiration.

Pre-treatment: Fentanyl (2-3 mcg/kg) and Lidocaine (1.5mg/kg) 3 minutes prior induction to blunt the sympathetic response.

Induction: **Etomidate** (0.2–0.3 mg/kg) : It is the agent of choice for the poly - trauma patient in shock .
Propofol (1.5–2.5 mg/kg) : Titrate Propofol until loss of eyelash reflex .

Protection: Apply Cricoid Pressure (Sellick Maneuver).

Muscle relaxants : Rocuronium (1.2mg/kg) is preferred to avoid the ICP spikes associated with Succinylcholine .
Intubation: Secure ETT immediately. No manual breaths until the cuff is inflated and position is confirmed

2) Therapeutic Hyperventilation : Technical Execution

Hyperventilation is used to "shrink" the brain by lowering PaCO2, causing cerebral Vasoconstriction .

How to perform it ?

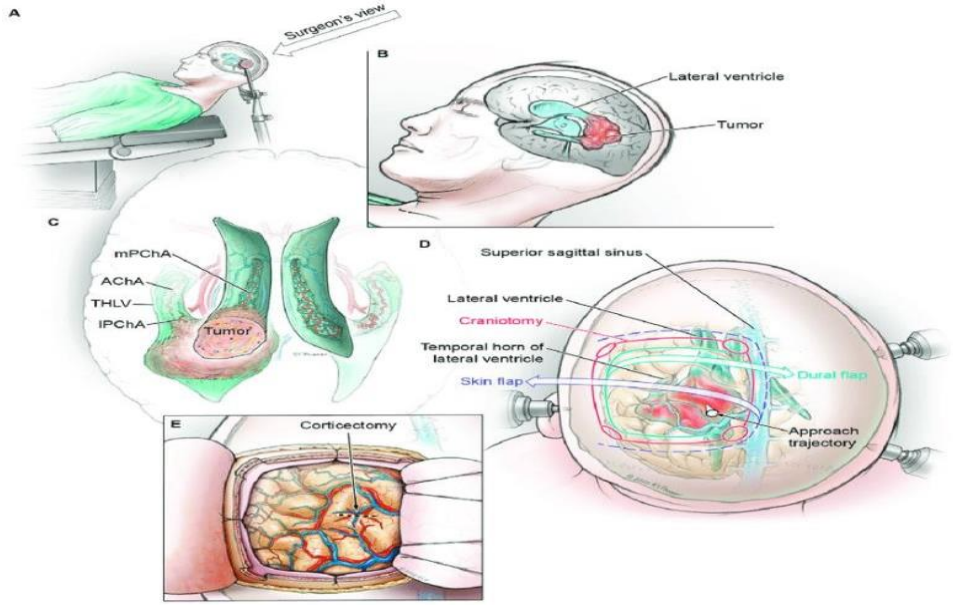
ventilator settings :

1. **Monitor EtCO2:** Your target is **30-35 mmHg**.
2. **Adjust Respiratory Rate (RR):** Increase the rate (e.g., from 12 to 16–18 breaths/min).
3. **Adjust Tidal Volume (Vt):** Keep it at **6-8 mL/kg** of ideal body weight. Do not use excessively high volumes to avoid lung injury .

Warning : Never drop EtCO2 below **25 mmHg**. Extreme hyperventilation can cause severe vasoconstriction leading to brain ischemia

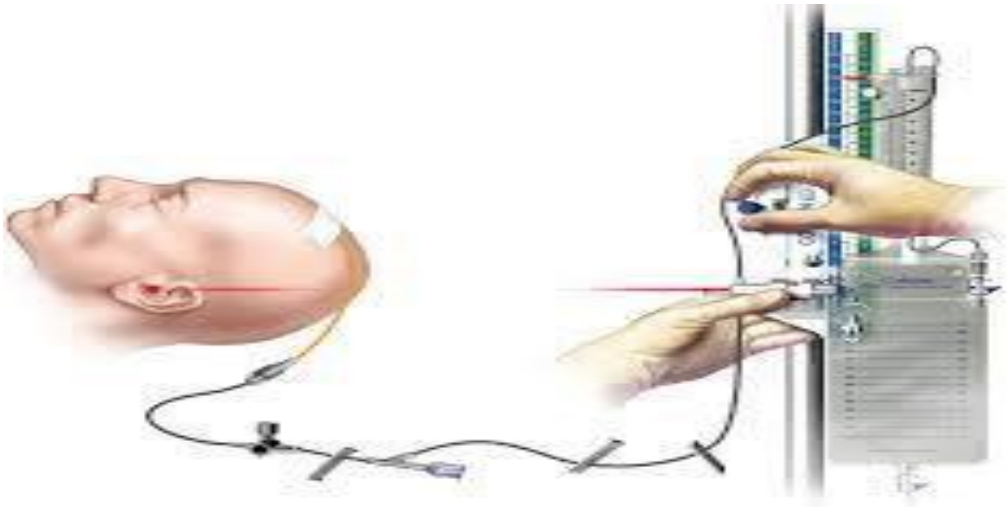
3) Patient Positioning

1. Supine with Head Elevation (15–30°): Ensure the head is above the heart



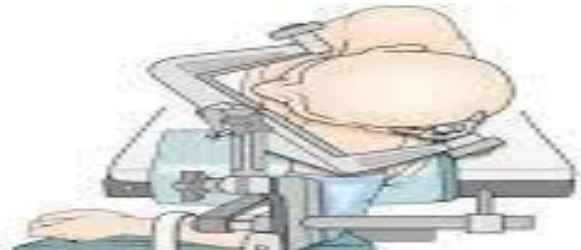
2. The Neutral Neck : Ensure a (**2-finger space)** between chin and sternum.

3. Transducer Leveling : Level the Arterial Line Transducer at the **Tragus of the ear** to accurately measure **Cerebral Perfusion Pressure (CPP)** at the brain level, compensating for the hydrostatic pressure difference when the head is elevated.



4. Prone & Lateral Care :

Pad ulnar nerves, iliac crests, and knees ,Check and eyes .



4) Fluid Management & Mannitol

1- Crystalloids: Commonly Used **0.9% Normal Saline**. Strictly avoid Glucose and Ringer's Lactate.

2- Mannitol

Uses: Reduction of Intracranial Pressure (ICP) and cerebral edema in head injuries / tumors..

Dose : 0.5-1.0 g/kg IV infusion.

Timing : Given after induction or when the Dura is bulging (As requested by the surgeon).

Risks: Electrolyte imbalance,dehydration, and initial fluid overload (caution in heart failure) .

* Practical Tips : How to use mannitol ?

-In-line Filter : Mandatory (5-micron) to catch micro-crystals.

-Crystal Check : Inspect bottle; if crystals are visible, warm or replace.

-Foley Catheter : Must be placed to manage rapid, heavy diuresis.

-Large IV Access : Required for rapid bolus infusion before use .

5) Emergency drugs during craniotomy

Drug	Uses	Timing	Notes
Ephedrin	Treatment of hypotension with bradycardia	During sudden hypotension	Use with caution: It increases CMRO2 and may cross the BBB
Phenylephrine	Treatment of hypotension	During sudden hypotension	Often preferred over Ephedrine in neurosurgery (no HR increase
Furosemide (Lasix)	Adjuvant to Mannitol for brain dehydration	15–30 mins after Mannitol	Monitor urine output closely; ensure cathete is draining properly
Phenytoin	Seizure prophylaxis or active seizure	Intraoperative or post-trauma	Diluted ONLY with Normal Saline. Risk o hypotension/arrhythmi if given fast
Keppra (Levetiracetam)	Seizure prophylaxis/Treatment	Pre-op or intra-op (post trauma).	Safer than Phenytoin; compatible with most IV fluids (NS/LR/D5).

Esmolol / Labetalol	Acute Hypertension (BP surges).	During Intubation, Pinning, or Emergence	Prevents intracranial hemorrhage by keepin MAP < 110-130 mmH
Dexamethasone	Reducing vasogenic edema.	Induction or start of surgery.	Mostly effective for brain tumors; check blood glucose levels post-op

6) Intraoperative monitoring & Management

A) Commonly Used : ETCO2 ,Precordial Doppler, SpO2 ,ECG and Blood Pressure Monitoring .

B) Advanced Monitoring: Processed EEG (BIS/Entropy) , Evoked Potentials (SSEP/MEP) , intracranial Pressure (ICP) .

Q/ How to detect a venous air embolism (VAE) ?

1. **ETCO2 (End-Tidal CO2):** The most practical "early warning" tool. You will see a sudden and significant drop in CO2 levels because the air blocks blood flow to the lungs
2. **Precordial Doppler :** The **most sensitive** non-invasive monitor. It allows the team to **hear** air bubbles (a "washing machine" or "mill-wheel" murmur) immediately, long before other vital signs change..
3. **Pulse Oximetry (SpO2) :** Show a drop in oxygen saturation, though this is often a late sign compared to ETCO2.
4. **ECG and Blood Pressure :** arrhythmias, right heart strain, or a sudden drop in blood pressure

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Raised intracranial pressure : Intracranial pressure (ICP) >25 mmHg

Immediate management

Sedation/Analgesia : Control CMR and minimize BP surges.

Ventilation : Maintain $PaO_2 > 100$ mmHg and $PaCO_2$ 30–34 mmHg.

Positioning : 20–30° head-up, neutral neck, unobstructed veins.

Perfusion : Maintain CPP > 60 mmHg ; treat MAP > 130 mmHg .

Osmotherapy : Mannitol 20 % (0.5-1 g/kg) or hypertonic saline .

7) Recovery Criteria

1. **Neurological Status:** Only when the patient follows commands (e.g., "Squeeze my hand).
2. **Airway:** Spontaneous breathing with adequate tidal volume and patent airway.
3. **Reflexes :** Intact cough/gag reflex to prevent aspiration; IV Lidocaine used to prevent "bucking".
4. **Hemodynamics :** Strict BP control; avoid hypertension to prevent hemorrhage or edema.
5. **PONV & Pain :** Manage nausea / vomiting aggressively to prevent ICP spikes . avoid over sedation .
6. **Temperature:** Maintain normothermia
7. **Suction** the airway while the patient is still deep

Anesthetic Management for Bronchoscopy

1) Types :

Flexible : Most common, primarily diagnostic .

Rigid : Used for therapeutic or interventional cases.

Indications: Evaluation of masses, infection diagnosis (BAL), biopsy, foreign body removal, and airway bleeding control.

2) Preoperative Preparation

Aspiration Prophylaxis: Necessary as the airway is often unprotected.

Regimen: Omeprazole 40 mg orally the night before and 2–6 hours before the procedure.

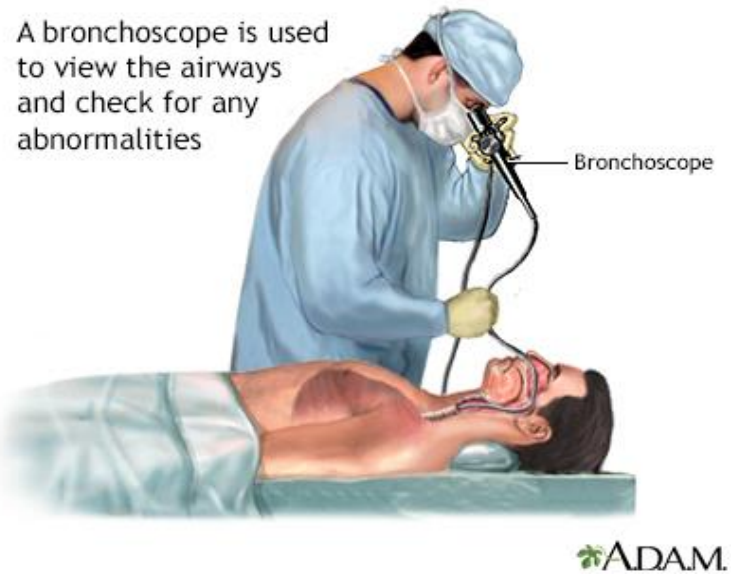
Alternative: Metoclopramide and dexamethasone

3) Patient Positioning

Position: Supine or semi-recumbent.

Head Elevation: Should be elevated if possible

Access: Ensure easy access to the airway and monitoring equipment



4) Monitoring & Airway Equipment

- Standard Monitoring: ECG , Pulse Oximetry (SpO2), and Non-invasive blood pressure.

- Supplemental Oxygen: Mandatory for all cases.

- Capnography : Required if deep sedation or General Anesthesia (GA) is used.

- Airway Preparation: Emergency airway equipment and suction must be immediately available .

Common Complications during bronchoscopy & Anesthetic Management

1. Hypoxia (Most Common)

Causes: Airway obstruction by the scope , sedation-induced hypoventilation , or pre-existing lung disease.

Management :

A. Ensure supplemental oxygen is mandatory for all patients.
B. Ask the surgeon to "Withdraw the scope" to allow for ventilation.
C. Increase inspired oxygen concentration (FiO2) and assist ventilation if necessary.
D. Cease suction to prevent further lung volume depletion.
E. Perform a jaw thrust or chin lift to ensure patency

2. Laryngospasm

Signs : Stridor , silent chest , "rocking" breathing

Causes :

- Irritation of the vocal cords or bronchi by the scope, especially if local anesthesia is inadequate.

- Accumulation of secretions, blood, or gastric reflux (acid) irritating the glottis.

- Airway Hyper-reactivity.

Management :

Use adequate topical anesthesia (Lidocaine spray/gel) to the cords and pharynx For Active Spasm

- Deepen anesthesia with Propofol

- Provide positive pressure ventilation with 100% O2

- CPAP with bag-mask, or Succinylcholine .

3. Hemodynamic Instability (Vagal & Sympathetic)

Bradycardia: Caused by vagal stimulation during scope manipulation.

Management : Stop stimulation; administer Atropine or Glycopyrrolate if persistent.

Hypertension & Tachycardia: Caused by sympathetic surge during airway instrumentation.

Management : Deepen sedation /anesthesia (Remifentanil , Fentanyl or Propofol) .

4. Bleeding (Post-Biopsy)

Signs : Bright red blood in the scope

Cause : Trauma to vascularized tumor tissue or bronchial mucosa during biopsy .

Management :

- Suction the airway immediately to maintain patency.

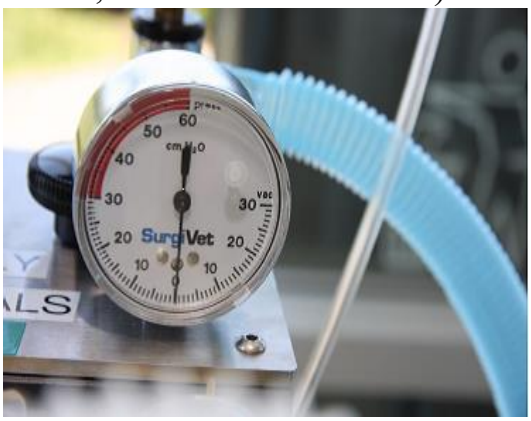
- Position the patient with the bleeding side down to protect the Dependent lung.

- If severe , the surgeon may apply topical epinephrine or cold saline through the scope .

5. Pneumothorax

Signs : Sudden high airway pressure (more than 30 cmH2O , absent breath sounds)

Cause : Usually occurs after a transbronchial biopsy .



Management :

- Monitor for sudden respiratory distress or drop in SpO2 in the recovery room .

- Confirm with a chest X-ray and prepare for chest tube insertion if clinically significant .

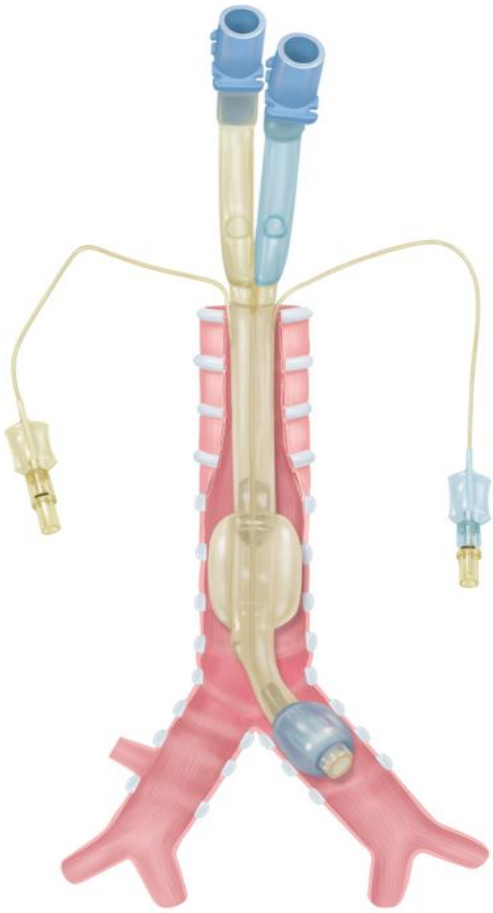
Anesthetic management for pneumonectomy

Insertion of Double - lumen tubes (DLT)

Start : Insert DLT with concavity facing **anteriorly** .

Rotation: Once past the glottis, remove stylet and rotate tube **90°** toward the target bronchus.

Head Position: Rotate head to the **opposite side** of the target bronchus to assist entry .



Source: Tobin MJ: *Principles and Practice of Mechanical Ventilation, 3rd Edition:* www.accessanesthesiology.com

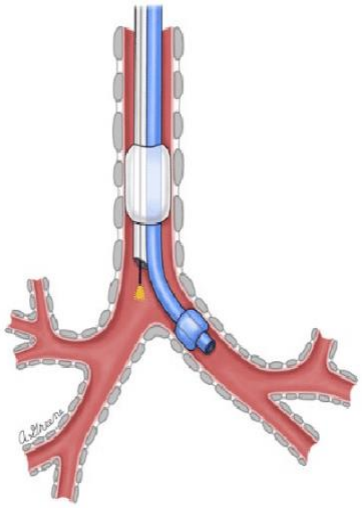
2. Depth & Inflation

General Rule: Average depth is **29 cm** in men and **27 cm** in women (measured at teeth).

Adjustment : Depth increases by **1 cm** for every **10 cm** increase in patient height.

Cuffs: Inflate tracheal cuff first; inflate bronchial cuff slowly (**usually < 3–4 mL air**)

Common complication during pneumonectomy



A- Hypoxia during One-Lung Ventilation (OLV)

1. Definition : Oxygen saturation (SpO2) < 90% during OLV.

Pattern: Gradual decrease occurs 3–10 minutes after switching to one lung .

2. Immediate Management

- FiO2: Increase to 100%.
- Check DLT patency.

- Auscultate lower lung for added sounds.
- Suction : Clear mucus, blood, or pus from the dependent (lower) lung.
- Ventilator Settings : Target Vt7–8 mL/kg and inflation pressure < 30 cmH2O}.
- Recruitment: Manually inflate the dependent lung to expand collapsed areas.

B- Sudden High Airway Pressure during One lung ventilation OLV

1. Definition: Peak airway pressure > 30 cmH2O while delivering a tidal volume (VT) of 7–8 mL/kg .

Presentation: Sudden high-pressure alarms on the ventilator or a sharp drop in delivered volume if using pressure-controlled modes .

2. Immediate Management

- **Increase FiO2 to 100%** if SpO2 < 90% .
- **Immediately switch to manual ventilation** to feel lung compliance and rule out dynamic hyperinflation (air trapping) .
- **Ensure the delivered VT** is strictly 7–8 mL /kg (avoiding excessive volumes).
- **Inspect**: Check for kinks, tube displacement, or incorrect clamping of Y peice (See figure).
- **Fiberoptic** : Verify DLT position ; rule out cuff herniation or right upper lope obstruction .
- **Suction**: Clear mucus plugs or blood using the DLT catheter.
- **Auscultate** : Listen for wheezing and treat bronchospasm

Anesthetic management for Preeclampsia & eclampsia

What is pre-eclampsia?

Severe preeclampsia is a disorder of pregnancy characterized by high blood pressure (≥160/110 mmHg) , significant proteinuria (≥ +++ (≥ 300 mg/24 h) , and high platelet count after 20 weeks gestation .

Which anesthesia technique is preferred ?

-Regional anaesthesia in the absence of coagulopathy .

-General anaesthesia if the patient has no risk of failed intubation due to sever edema in the upper airway.

Immediate management :

Hypertension

First-line agent:

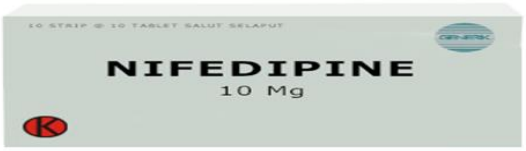
labetalol (Labetalol blocks α1 -, β1 -, and β2-receptors).

Intravenous therapy

- IV bolus or infusion
- **Contraindicated in asthmatic patients**

2- Second-line agent : Nifedipine or Hydralazine

- Nifedipine is an oral calcium channel blocker
- Hydralazine relaxes arteriolar smooth muscle, causing dilation of precapillary resistance vessels.
- Intraoperative hypertension is usually controlled with an intravenous dose of 5–20 mg of Hydralazine.
- The onset of action is within 15 min, and the antihypertensive effect usually lasts 2–4 hr.



Blood pressure rarely falls in true pre-eclampsia with any RA, but can be managed with Phenylephrine .

- NSAIDs (Ex: Diclofenac)should be avoided for patient with PE as acute kidney injury is often already present .

-Methylergometrine (Methergin) should be avoided in patient with PE ,and hypertensive patient .

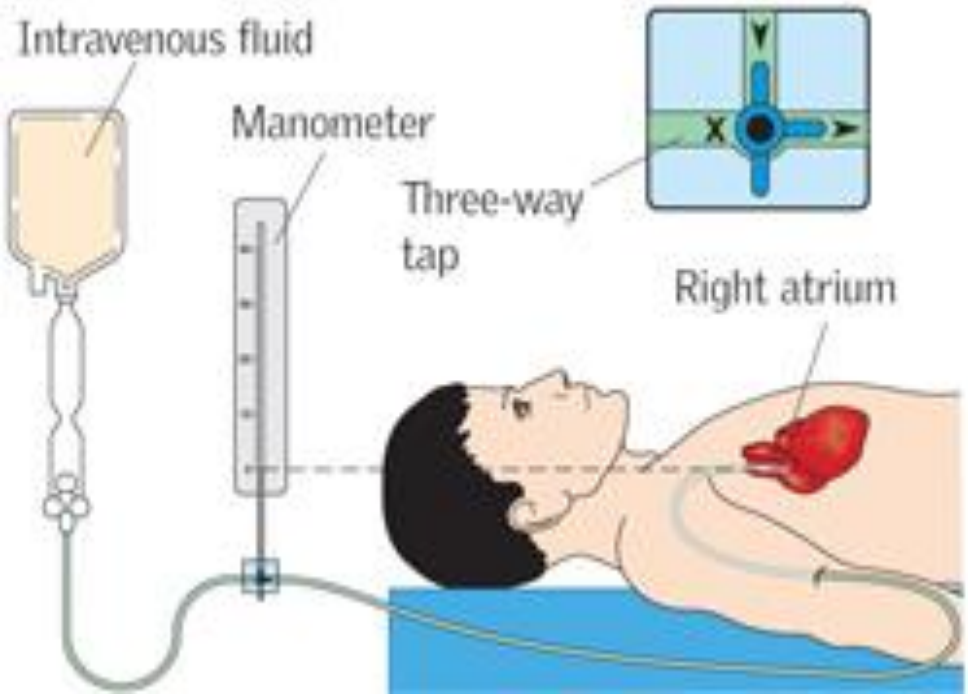
-Urine output should be closely monitored via urinary catheterization

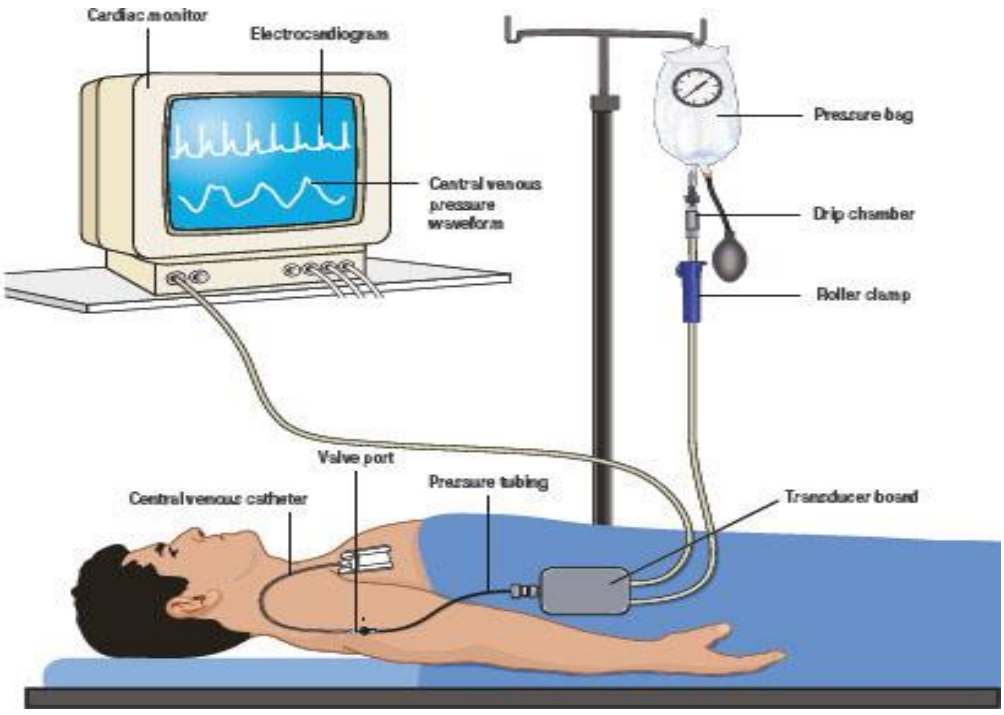
Fluid balance

Fluid restrict—1 mL/kg/h .

Why the fluid input should be restricted for the patient with pre-eclampsia ?

- Fluid overload and pulmonary oedema can occur rapidly with severe pre-eclampsia.
- Fluid challenges of more than 250 mL should only be given with CVP and invasive blood pressure guidance.





Eclampsia

is defined as the onset of generalized tonic-clonic seizures and/or coma in a patient with preeclampsia. It is a multisystemic crisis that occurs in the peripartum period (during pregnancy, labor, or up to 6 weeks postpartum).

For a diagnosis of eclampsia, these seizures must **not** be attributable to other neurological conditions (e.g., epilepsy, stroke, or a brain tumor).

Premonitory Signs

- **Neurological:** Severe , persistent frontal or occipital headache.
- **Visual :** Photopsia (flashing lights) , blurring, or scotomata (blind spots).
- **Gastrointestinal** : Epigastric or Right Upper Quadrant (RUQ) pain—often indicating liver capsule stretching.

Emergency Management Protocol

When a seizure occurs, the clinical priority is **stabilization over speed of delivery.**

A. Immediate Airway & Safety

- Most eclamptic seizures are self-limiting (usually lasting 60–90 seconds).

- **Airway Management:** Position the patient to prevent aspiration. Intubation is only indicated if the patient cannot protect their airway or remains hypoxic.
- **Fetal Resuscitation:** Intrauterine resuscitation is performed by stabilizing the mother (oxygen, lateral positioning).

B. Pharmacological Intervention

1. **Magnesium Sulfate (MgSO4) :** The undisputed **first-line agent**. It is superior to standard anticonvulsants (like phenytoin or diazepam) for preventing recurrent seizures in eclampsia.
2. **Refractory Seizures:** If MgSO4 is unavailable or seizures persist, consider:
    - **Benzodiazepines :** Midazolam or Lorazepam.
    - **Induction Agents :** Propofol (especially if intubating) .
    - **Antiepileptics :** Levetiracetam.

Anesthetic Management for Aortic Aneurysm / Peripheral vascular procedures

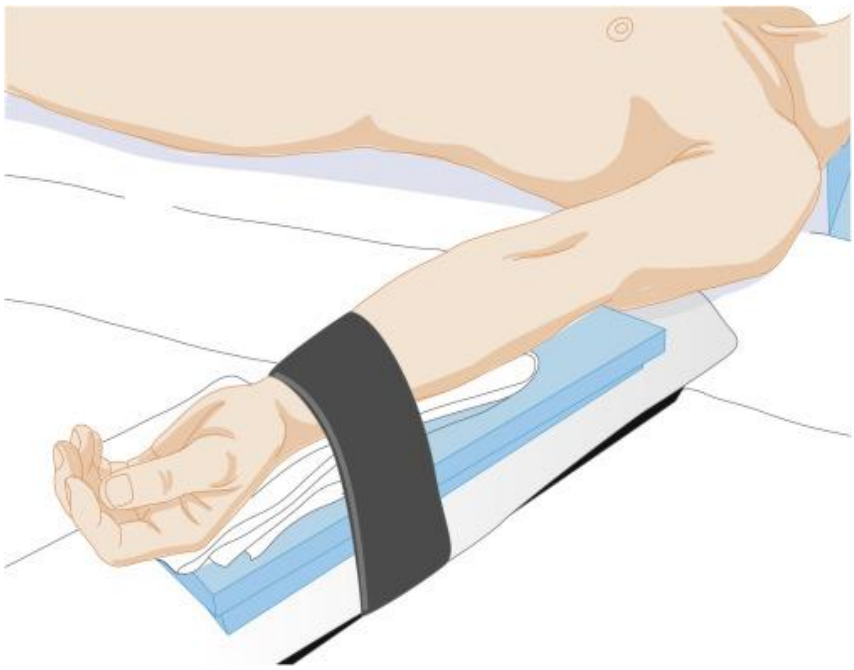
Patient Positioning :

• Supine with Arm Protection

• Arm Positioning: Usually both arms are abducted (out on arm boards).

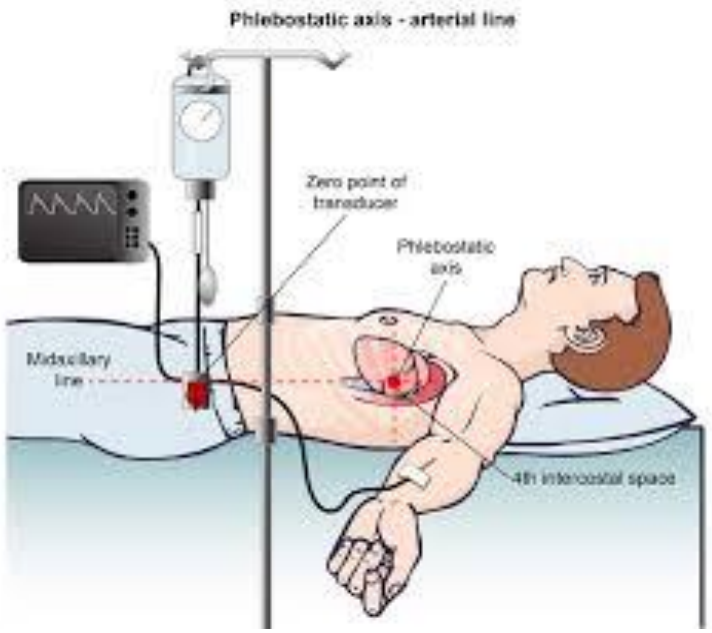
• Technician Note: Ensure the arms are at less than 90° to prevent Brachial Plexus injury.

• Pad the heels , sacrum, and elbows .



2. Specialized Equipment : Hemodynamic Monitoring

1- Arterial Line : It must be placed *before* induction to monitor the "Pressor Response" during intubation.
2.Central Venous Catheter (CVC) / PA Catheter..
3.Rapid Infuser (see the figure on the right) : You must be ready to give liters of blood/fluid in minutes if the aneurysm ruptures.
4 Transducer Level: Level at the Phlebostatic Axis (Heart Level).(see the figure on the left)

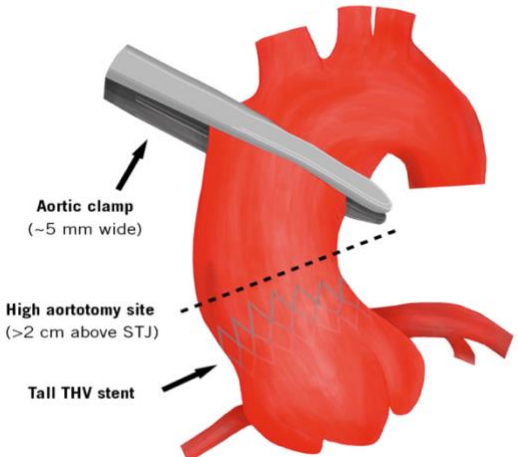


Practical Steps : The "Cross-Clamp" Management .

A. Pre-Clamp (Preparation)

Goal : "Afterload Reduction ."

Action : The technician should have Vasodilators (e.g., Nitroglycerin or Sodium Nitroprusside) ready.



B. During the Clamp

- Monitor Urine Output closely..

Complication	Signs	Immediate Management
Aortic Rupture	**Sudden massive BP drop, surgical field flooding**	**Maximum speed fluid/blood infusion; Activate "Massive Transfusion Protocol."**
Myocardial Ischemia	**ST-segment changes on ECG**	**Optimize Oxygen/BP; Nitroglycerin.**
Metabolic Acidosis	**Low pH on ABG after unclamping**	**Sodium Bicarbonate; Increase ventilation.**

- Ensure Mannitol or Furosemide is ready.
- Heparin will need to be given just before cross- clamp—3000–5000U is usual
- Avoid placing warming blankets on lower limbs during aortic cross-clamping to prevent worsening ischemia .

- Cross-clamp time is usually 30–60min, During clamping, fluids should be administered to raise CVP 5 cmH_2O above baseline.

C. The Unclamping

The Danger : BP drops severely **.**
Action: "Load the patient." Ensure the IV pints are full. Have Vasopressors (Phenylephrine/Norepinephrine) ready in hand .

common complication during aortic surgery

Common complication during peripheral vasular procedure

Complication	Signs	Immediate Management
Cardiac Arrest	**Flat Arterial Line, EtCO2 drop**	**Start CPR; Give Epinephrine; Stop all Anesthetics.**
Coagulopathy	**Oozing from IV sites/wound**	**Consider Cryoprecipitate or Tranexamic Acid (TXA).**
Acidosis/Hyperkalemia	**Peaked T-waves, Low pH**	**Consider Sodium Bicarbonate or Calcium Chloride.**

Postoperative Management

Disposition : Mandatory ICU / HDU admission .

Extubation Criteria : Patient must be warm, hemodynamically stable, and have effective analgesia (e.g., working epidural). Otherwise, transfer intubated to ICU.

Analgesia: Epidural is preferred; alternatively, use Opioid infusions or PCA.

Monitoring : * Continuous invasive monitoring (Arterial line & CVP) .

Strict hourly urine output .

Frequent assessment of distal pulses.

Fluid Balance : Be prepared for large fluid shifts requiring aggressive replacement to maintain stability .

Anesthetic management of placenta previa & Abruptio placenta

1. Clinical Presentation & Priorities

The primary goal in managing obstetric hemorrhage is maintaining maternal hemodynamic stability while ensuring fetal well-being .

Placenta Previa : Characterized by *painless* bright red bleeding. Usually elective or semi-urgent.

Abruptio Placenta: Characterized by *painful* dark bleeding and uterine rigidity. Often an absolute emergency involving hypovolemia and potential DIC (Disseminated Intravascular Coagulation) .

Monitoring: Standard ASA monitors + Foley catheter to monitor urine output (goal : > 0.5 mL/kg/hr).

Labs : Immediate Type and Cross-match (minimum 4 units RBCs), Coagulation profile (PT, PTT, Fibrinogen) .

2. Anesthetic Choice

Clinical Scenario	Technique	Reasoning
Stable Placenta Previa	Regional (Spinal/Epidural)	Reduced airway risks; mother is awake for birth.
Active Bleeding / Unstable	General Anesthesia (GA)	Speed of induction and better control of severe hypotension
Abruptio + Coagulopathy	General Anesthesia (GA)	Regional is **contraindicated** if there is a risk of spinal hematoma or severe shock.

3. Anesthesia management

1- Wide pore cannula with rapid infusion equipment .

in case of difficult venous access , intraosseous cannula .

2- Consider general or regional anaesthesia if cardiovascular stable .

3- Combined spinal–epidural preferable as operation may be prolonged.

4- Consider intra-arterial and central venous monitoring, particularly if actively hemorrhaging or if increased risk of placenta accreta .

5- If GA required , use rapid sequence induction. Consider TIVA , as avoiding volatile anaesthetics may help uterine contraction .

Hemorrhage Cart (Essential Supplies)

1.Vascular Access : Multiple large-bore IV catheters (14G, 16G).

2. Fluid Management : Rapid infusion system or pressure bags and fluid warmers.

3. Blood Products : Warmed O-negative, group-specific, or cross-matched blood.

Hemostatic Agents : Fresh frozen plasma (FFP) and platelets.

How to use pressure bag ?

Setup: Place the blood or fluid bag into the pressure bag sleeve and hang it.

Priming: Spike the bag and prime the IV tubing completely to prevent air embolism.

Inflation: Pump the bulb to **300 mmHg** for rapid delivery.

Monitoring: Stay with the bag; it will empty quickly and requires constant pressure adjustment.

Completion: Open the valve to deflate before removing the empty bag.

4. Medications :

Uterotonics: Oxytocin , Methergine , Hemabate , and Misoprostol.

Anti-fibrinolytics : Tranexamic Acid (TXA).

Electrolytes : Calcium Gluconate or Calcium Chloride (to treat hypocalcemia from transfusion).

Lab Supplies : Tubes for urgent Hgb , coagulation profiles , and cross-matching .

3. Essential Medications : Timing & Compatibility

1. Oxytocin (Pitocin)

Timing: Administered immediately after the delivery of the infant (and before or after the placenta, depending on surgeon preference).

Administration:

IV Infusion: 10–40 units in 500–1000 mL of fluid .

IV Bolus : Avoid rapid undiluted bolus
(causes sudden hypotension) .
3–5 units slowly over 3–5 minutes if needed .

Diluent : Normal Saline (NS) or Lactated Ringer's (LR).

Side Effects : Hypotension , tachycardia .

2. Methylergonovine (Methergine)

Timing: Used if Oxytocin is insufficient to contract the uterus.

Administration:

Intramuscular (IM) : 0.2 mg.

Contraindication : IV injection (causes severe hypertension).
Avoid in patients with Pre-eclampsia or Hypertension .

Side Effects : Hypertension, headache, seizures , nausea/vomiting .

3. Carboprost (Hemabate / PGF2α)

Timing: Third-line agent for refractory uterine atony.

Administration:

IM or Intramyometrial :

Contraindication: Asthma (causes severe bronchospasm).

Side Effects : Diarrhea (very common) , bronchospasm , flushing and hypertension .

4. Misoprostol (Cytotec)

Timing: Often used as an adjunct to other uterotonics.

Administration:

Rectal/Sublingual/Oral : Rectal is preferred during surgery to avoid interference with anesthesia .

Side Effects: Shivering , pyrexia (fever) and nausea.

5. Tranexamic Acid (Cyklocaprone)

Timing: Given early (within 3 hours of bleeding onset) to stabilize clots.

Administration:

IV: 1 gram slowly over 10 minutes. A second dose may be given if bleeding persists after 30 mins.

Diluent : Usually given undiluted or in 100 mL of NS.

Side Effects : Hypotension (if infused too fast), visual disturbances and risk of thrombosis.

Extubate if :

- Hemodynamically stable
- Bleeding controlled
- Normal consciousness
- Adequate respiration

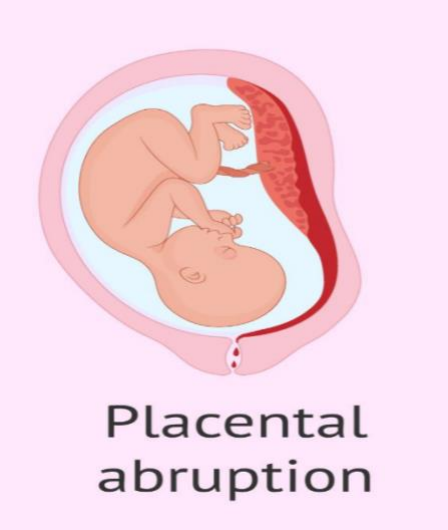
Delay Extubation if :

- Massive transfusion
- Ongoing bleeding
- Coagulopathy

Differences Between Conditions

Abruptio Placenta

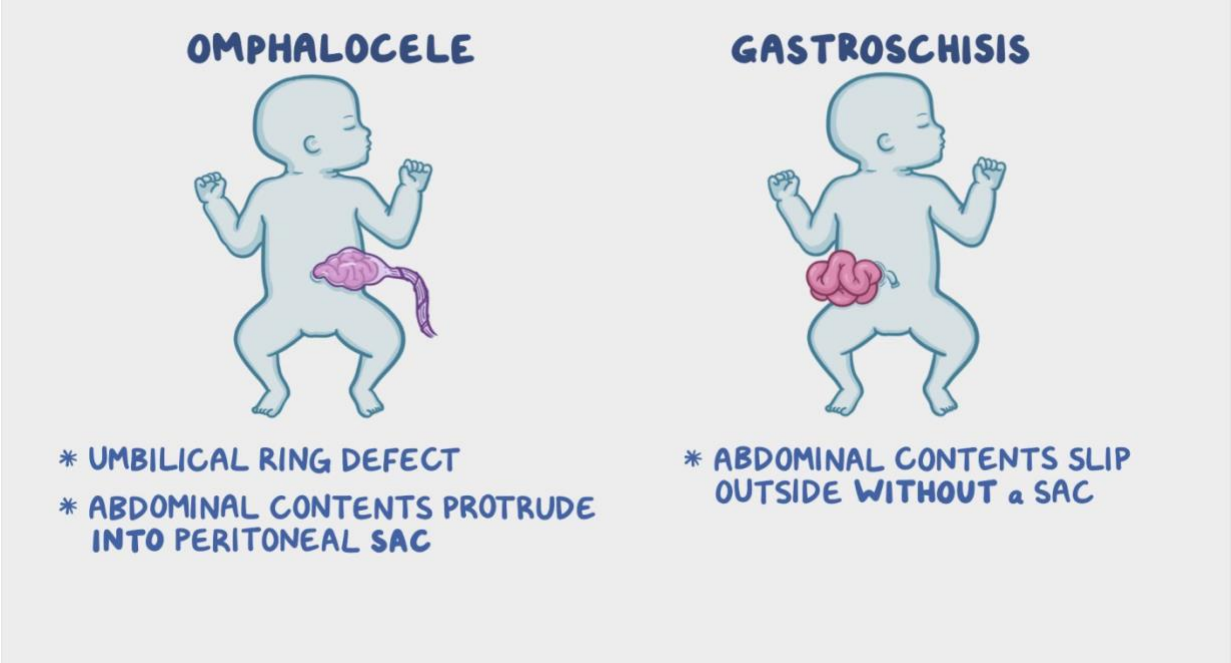
- Painful bleeding
- Rigid uterus
- High risk of DIC
- Fetal distress common



Placenta Previa

- Painless bleeding
- Soft uterus
- Less DIC risk
- Massive hemorrhage risk

Anesthetic management for pediatric with Omphalocele & gastroschisis



How are patients with omphalocele or gastroschisis managed in the perioperative period ?

1- It is important to prevent evaporative and heat loss from exposed viscera .

2-Respiratory distress is uncommon .

3-Ventilation is controlled with muscle relaxants to facilitate return of the bowel into the Abdomen.

4-After intubation , a nasogastric tube should be placed .

Practical tips for NG tube insertion

Measurement: Use the NEX method (Nose to Earlobe to Xiphoid).

Tube Selection: Use a small, flexible 5 Fr to 8 Fr silicone tube.

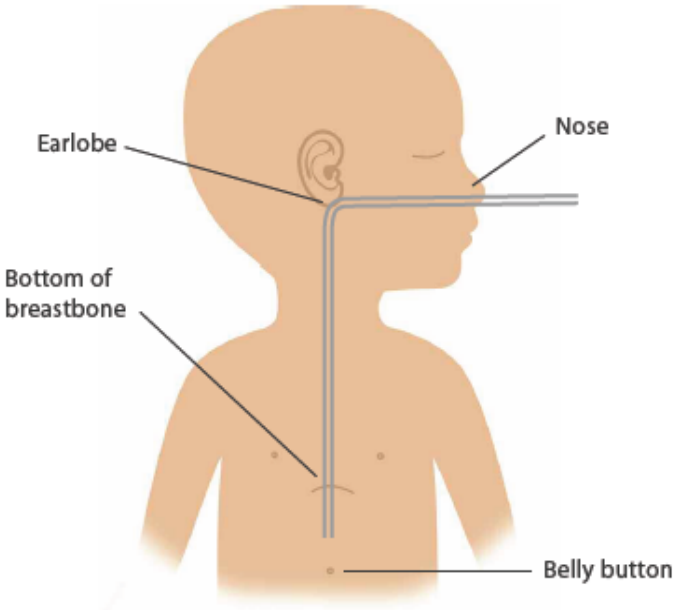
Positioning: Keep the head in a neutral "sniffing" position; use a pacifier to encourage swallowing.

Confirmation: Verify placement via pH testing (< 5.5) and X-ray (Gold Standard).

Skin Care: Apply a hydrocolloid barrier (e.g., Duoderm) to protect the cheek and avoid pressure on the nostril.

Measuring NG tube insertion distance

To help ensure the nasogastric (NG) tube is inserted to the correct distance, measure from the tip of the patient's nose to the earlobe, and from the earlobe to the point midway between the xiphoid process and umbilicus. To remember this, think "NEMU"—**N**ose, **E**ar, **M**id-**U**mbilicus.



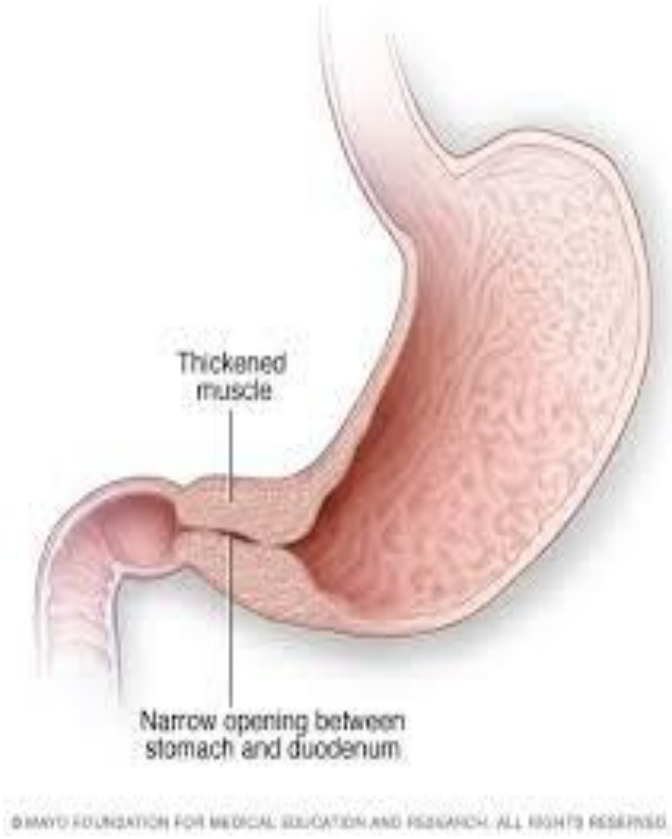
5- Patients need good IV access to replace third-space and evaporative losses.

6- The abdominal cavity may be too small for the viscera. Venous return from or blood flow to the lower extremity may be compromised.

A pulse oximeter ?? on the foot helps to detect such changes.
Renal perfusion may decrease and manifest as oliguria

7- Patients usually remain intubated after surgery .

Anesthetic management for pediatric pyloric stenosis



Pathophysiology : Hypertrophic pyloric stenosis impedes emptying of gastric contents. Persistent vomiting depletes potassium, chloride, hydrogen, and sodium ions, causing hypochloremic metabolic alkalosis .

Anesthetic management

1- Operation for correction of pyloric stenosis is never an emer gency.

2- Empty the stomach via a nasogastric or orogastric tube, suctioning in supine, lateral, and prone positions

3- Muscle relaxation

4-These neonates risk respiratory depression and hypoventilation postoperatively due to persistent metabolic

5- Intubation and induction techniques vary, but aspiration risk must always be considered

Anesthetic Management for Posterior Spinal Reconstructive Surgery / Arthroscopy

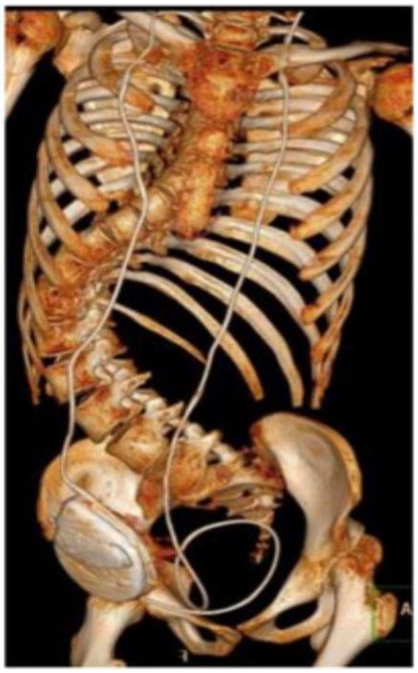
1. Introduction & Surgical Scope

• Procedures Correction of scoliosis and kyphosis

• Stabilization of spinal fractures or tumors

• Anesthetic Challenges

• Massive blood loss ,Prolonged surgery ,Prone positioning and Spinal cord protection



2. Preoperative Assessment

• Respiratory System

• Restrictive lung disease (common in scoliosis)

• Measure FVC If FVC < 40% → high risk, consider postoperative ventilation

• Cardiovascular System

- Pulmonary hypertension
- ECG for all patients
- Echocardiography if severe deformity or symptoms

• Airway Assessment

- Limited neck movement and Cervical spine instability
- Prepare for difficult intubation

3.Positioning

Proper positioning is essential to maintain adequate ventilation, stable hemodynamics, and to prevent pressure or nerve injuries.

. Respiratory and Hemodynamic Considerations

- The abdomen should remain free-hanging using a Jackson table or Wilson frame.
- This prevents increased intra-abdominal pressure.
- ↓ abdominal pressure improves venous return and decreases epidural venous congestion.
- Consequently, surgical bleeding is reduced.

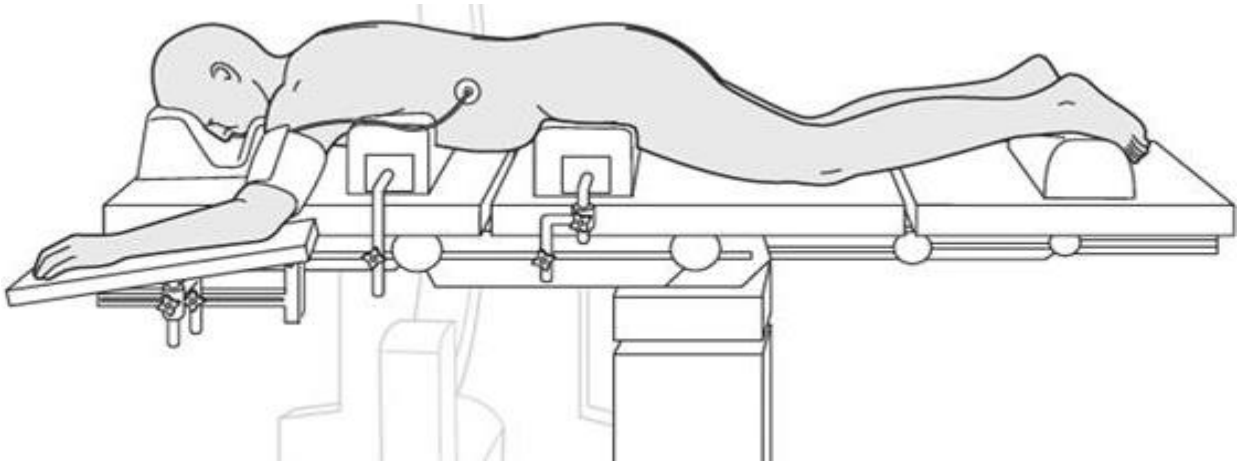
. Eye and Head Protection

- Prone positioning carries a risk of postoperative visual loss.
- The head should be kept in a neutral position.
- Direct pressure on the eyes must be avoided.
- Adequate MAP should be maintained to ensure proper ocular and spinal cord perfusion.

. Pressure Point Care

- All pressure areas must be well padded to prevent nerve and soft tissue injury.

• Protect the elbows (ulnar nerve), knees, iliac crests , breasts and genitalia.



4.Anesthetic Technique

• Total intravenous anesthesia (TIVA) is the preferred technique.

A combination of propofol and remifentanil provides adequate hypnosis and analgesia while preserving the quality of somatosensory and motor evoked potentials.

• Avoid inhalational anesthetics as they depress evoked potentials

• Avoid or minimize muscle relaxants as they abolish motor responses

• Avoid nitrous oxide as it reduces sensory signal amplitude

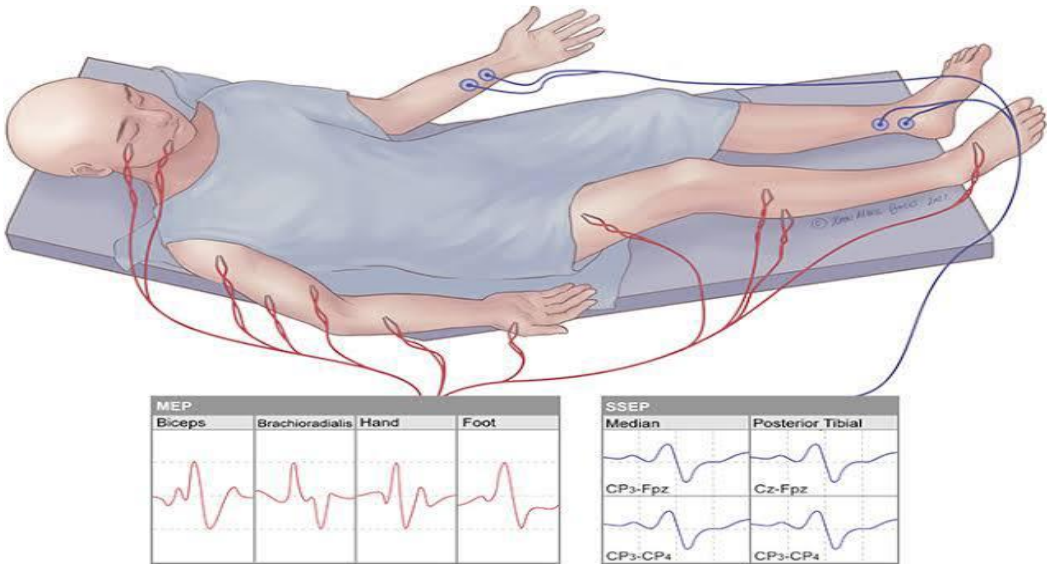
Intraoperative Neuromonitoring

Neuromonitoring is used to detect early neurological injury.

• Somatosensory evoked potentials monitor sensory pathways

• Motor evoked potentials monitor motor pathways

• Any decrease or loss of signals may indicate spinal cord ischemia or compression and requires immediate correction



5. Hemodynamic Management & Blood Conservation

- Vascular Access
- Two large-bore IV lines or Central venous catheter if major blood loss expected
- Blood Loss Control
- Controlled hypotension (MAP 60–70 mmHg)

6. Postoperative Management

- **Analgesia**
- IV opioids (PCA)
- Ketamine infusion
- Neurological Assessment
- Immediate motor and sensory examination in PACU

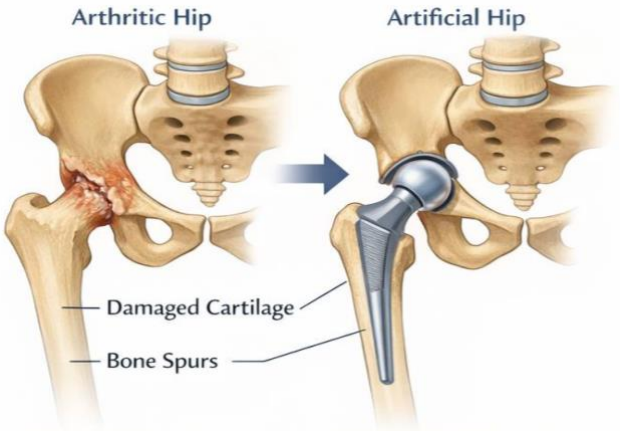
7 • Postoperative Complications

- Spinal epidural hematoma
- Respiratory failure
- Surgical site infection

Anesthetic Management for Total Hip & Total Knee Replacement

Preoperative Assessment in Total Hip Replacement

Airway evaluation



- Osteoarthritis cause limited neck movement
- Rheumatoid arthritis cause difficult airway

In rheumatoid arthritis always think:

- Cervical spine instability → risk of spinal cord injury
- Limited mouth opening
- Narrow glottis

Plan

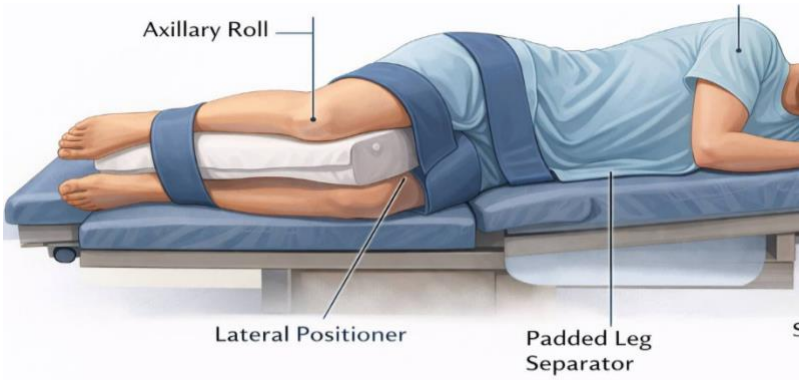
- Avoid excessive neck extension
- Use video or fiberoptic intubation if needed
- Prepare difficult airway equipment

Medical optimization

- Elderly patients with cardiac disease are common
- Check hemoglobin (possible blood loss)
- Check renal function
- Review NSAID use (bleeding risk)

Positioning concerns

- Supine or lateral position
- In lateral: use axillary roll
- Protect pressure points
- Monitor ventilation carefully



Intraoperative priorities

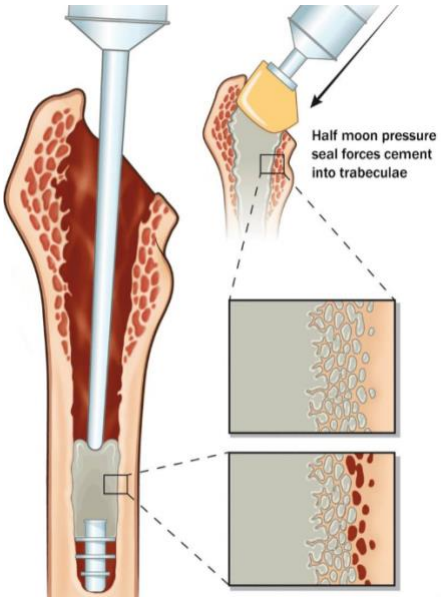
1. Blood loss

- Can be significant
- Secure two large IV lines
- Crossmatch blood
- Consider arterial line in high-risk patients

2. Bone Cement Implantation Syndrome

Occurs during cement insertion Watch for:

- Sudden hypotension



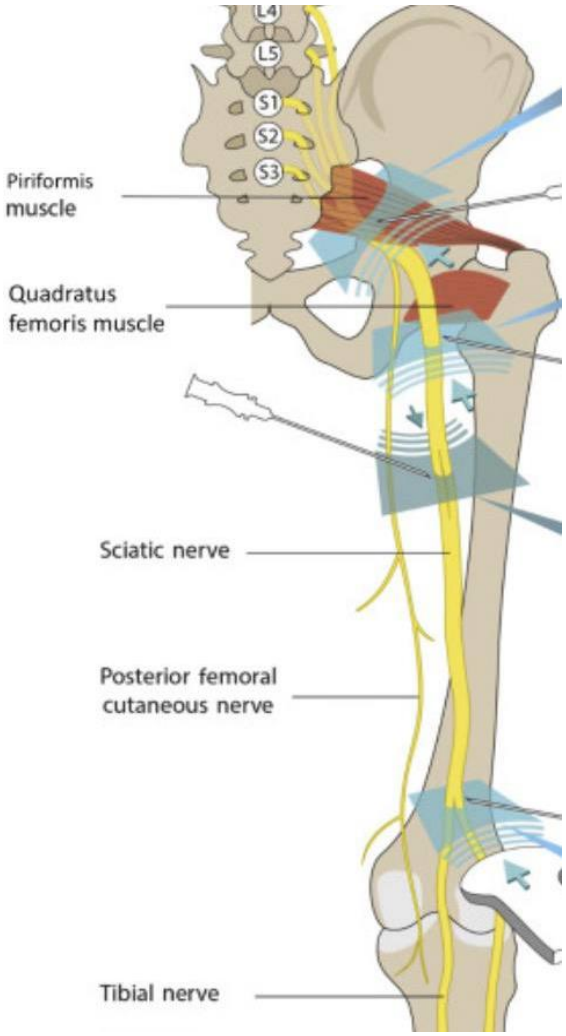
- Hypoxia
- Drop in ETCO2
- Cardiovascular collapse

Prevention and management

- Give 100% oxygen during cementing
- Ensure adequate hydration
- Inform surgeon before cementing
- Treat quickly with fluids and vasopressors

Postoperative care

- Good analgesia
- Oxygen therapy
- Monitor hemoglobin
- Start thromboprophylaxis
- Early mobilization

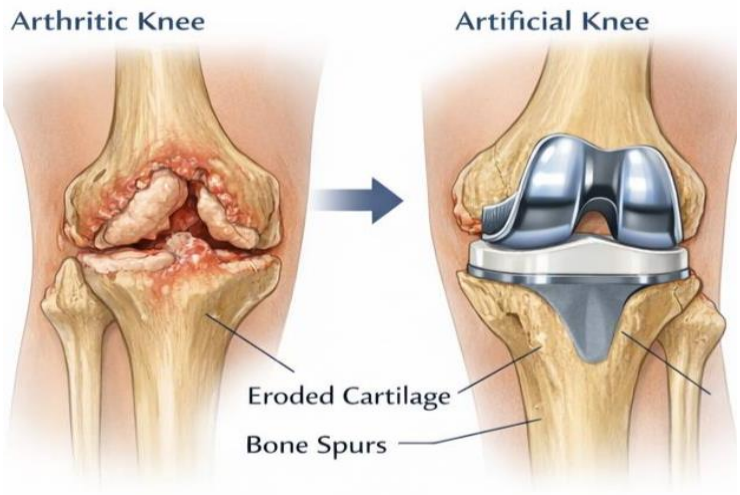


Total Knee Replacement (TKA)

Short surgery but very severe postoperative pain

Preoperative

- Similar assessment as hip surgery
- Elderly with comorbidities
- Optimize cardiovascular status



Choice of Anesthesia

Common anesthetic options

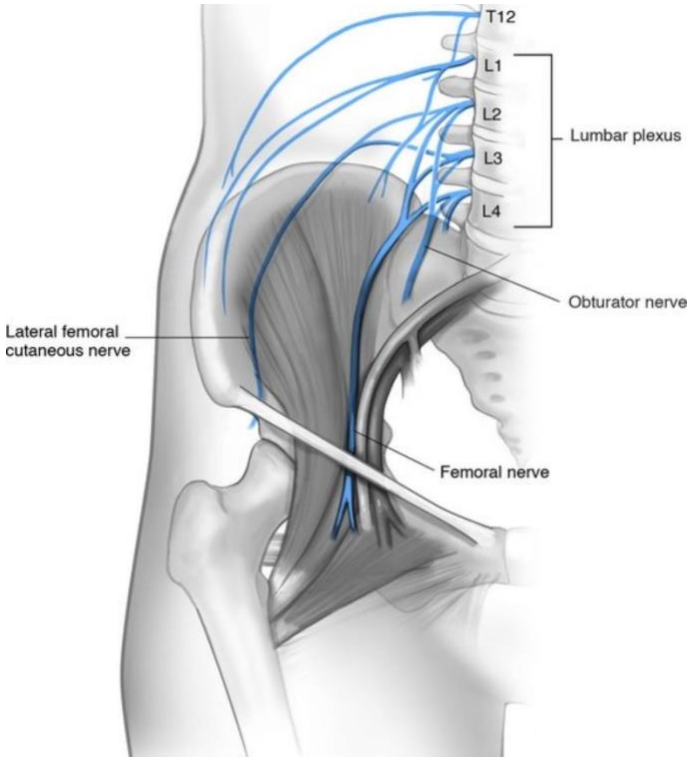
- General anesthesia
- Spinal anesthesia
- Peripheral nerve blocks

Preferred techniques in many patients

- Spinal anesthesia combined with intrathecal opioids
- Femoral nerve block ± sciatic nerve block

Why are regional techniques preferred?

- Provide superior postoperative pain control
- Reduce opioid requirements
- Facilitate earlier mobilization
- Improve overall recovery



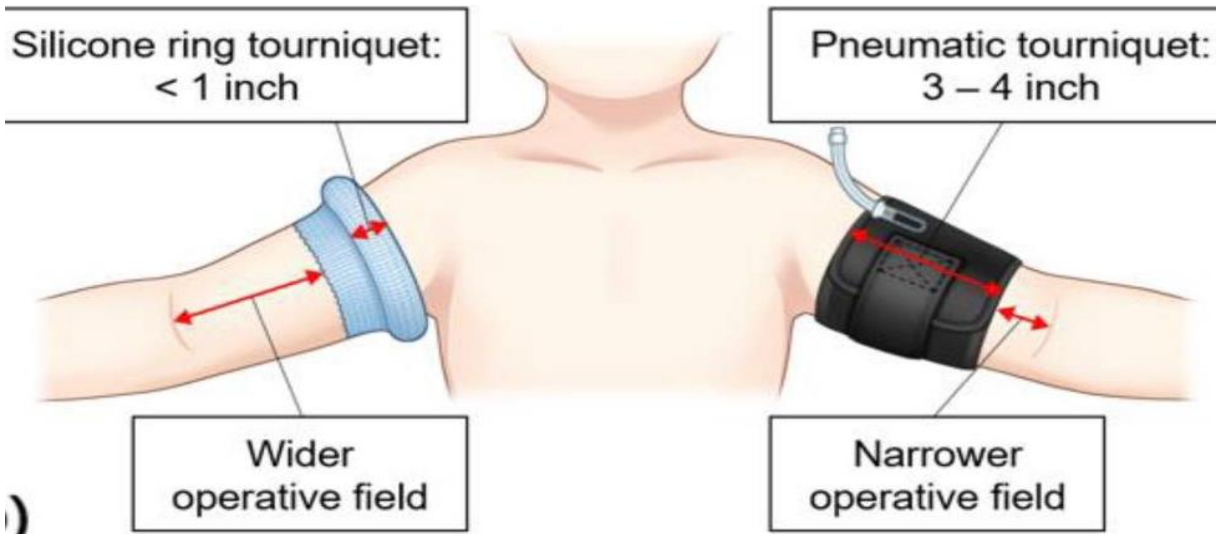
Tourniquet-related problems

Tourniquet pain (after about 1 hour)

- Hypertension and Tachycardia

After tourniquet release

- Hypotension
- Increased ETCO2
- Temporary desaturation
- Give fluids before release
- Be ready with vasopressors



Postoperative priorities

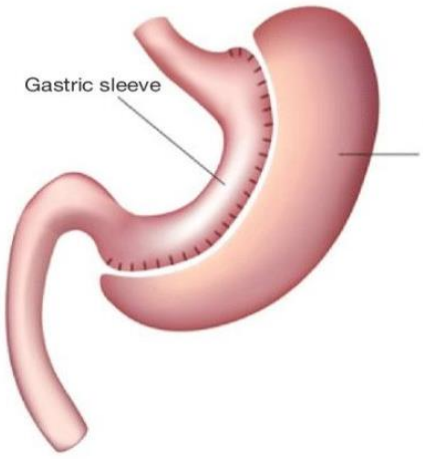
Pain control is the main goal By multimodal analgesia [Nerve blocks, NSAIDs and PCA opioids]

Also monitor

- Drain output
- Hemoglobin
- Early physiotherapy within 24–48 hours

Anesthetic management for Sleeve Gastrectomy & Anesthesia

Sleeve Gastrectomy



- Most common bariatric surgery Done laparoscopically
- Restrictive procedure and 70–80% stomach removed

Anesthetic importance

- Morbid obesity and High aspiration risk
- Difficult airway and Rapid desaturation
- Increase postoperative respiratory complications

1. Preoperative Assessment

Respiratory

- High risk → difficult airway + rapid desaturation + post-op hypoventilation

STOP-BANG: Screening tool for OSA

Snoring	Do you snore loudly?
Tiredness	Do you often feel tired during the daytime?
Observed apnoea	Has anyone observed you stop breathing?
Blood pressure	Do you have high blood pressure?
Body mass index	BMI over 35 kg/m^2
Age	Over 50 years
Neck circumference	Over 40 cm
Gender	Male

Interpretation:

- **0–2** → Low risk
- **3–4** → Intermediate risk
- **5–8** → High risk → CPAP and close monitoring

Cardiovascular

- Hypertension, Ischemic heart disease, pulmonary HTN

• Optimize BP and cardiac status

Metabolic

• Diabetes → optimize glucose and Check HbA1c

• Correct electrolytes

Aspiration risk

• GERD common and Delayed gastric emptying

• Consider all patients “full stomach”

• Prepare PPI / H2 blocker ± metoclopramide

2. Airway & Induction

Preoxygenation

• 100% O_2 for 3–5 min with Tight mask seal

• **TV:** 6–8 mL/kg IBW

• **PEEP:** 10–12 cmH_2O

• Adjust RR to keep $ETCO_2$ 35–40

• Rapid Sequence Induction and Video laryngoscope

• Difficult airway cart available

3. Drug Dosing Principles

Weight-based dosing

• **Propofol** → Lean Body Weight

• **Opioids** → Lean Body Weight

• **Rocuronium** → Ideal Body Weight

• **Succinylcholine** → Total Body Weight

• Avoid long-acting sedatives

4. Intraoperative Ventilation

Problems in obesity

• ↓ FRC and compliance cause Atelectasis and Rapid desaturation

Effects of Pneumoperitoneum (CO2)

• Diaphragm pushed up

• ↓ FRC and compliance

• ↑ airway pressure , $PaCO_2$ and SVR

• need Close capnography monitoring

Reverse Trendelenburg position

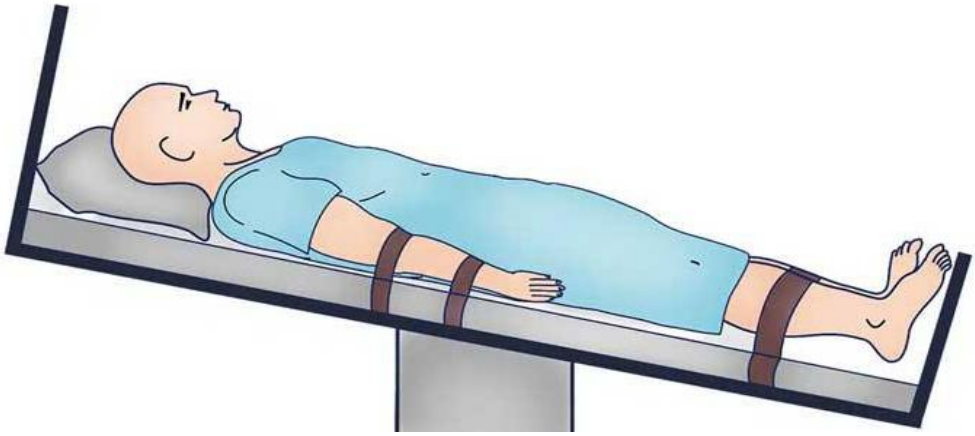
• Better exposure and Improved lung mechanics

• ↓ venous return and cause Hypotension

• ↓ cardiac output so the management :

• give IV fluids and Vasopressors if needed

• Frequent BP checks



5. Intraoperative management

• Large BP cuff or arterial line

• Temperature control

• DVT prophylaxis

• Minimize opioids

6. Analgesia (opioid-sparing)

• Paracetamol , NSAIDs ,TAP block and Local infiltration

7. OSA care

• Resume CPAP immediately

• Continuous SpO_2 monitoring

Allergic reaction to Anesthesia

1. Definition

• Adverse immune response to anesthetic drugs or substances used perioperatively.

2. Common Allergens

• **Neuromuscular blockers (NMBAs):** e.g., succinylcholine, rocuronium

• **Latex:** surgical gloves, catheters

• **Antibiotics:** beta-lactams (e.g., penicillin, cephalosporins)

• **Induction agents:** propofol (rare) , thiopental

• **Opioids:** morphine (histamine release)

• **Colloids & blood products**

3. Types of Reactions

1. IgE-mediated (Type I)

• Anaphylaxis: hypotension, tachycardia, bronchospasm, urticaria

2. Non-IgE mediated

• Direct histamine release (e.g., opioids, radiocontrast)

3. Delayed hypersensitivity

• Skin rash, itching (rarely significant in anesthesia)

4. Risk Factors

• Previous allergic reactions

• Atopy (eczema, asthma, allergic rhinitis)

• Multiple exposures to NMBAs or latex

5. Clinical Presentation in OR

- **Cardiovascular:** hypotension, tachycardia, arrhythmias
- **Respiratory:** bronchospasm, laryngeal edema, hypoxia
- **Skin:** urticaria, flushing, angioedema
- **GI**: nausea, vomiting (less common)

6. Diagnosis

- Sudden hypotension, tachycardia
- Bronchospasm, urticaria
- Serum tryptase (post-event)

7. Immediate Management

ABCDE approach

- **Airway:** secure, oxygen
- **Breathing:** bronchodilators (salbutamol)
- **Circulation:** fluids, epinephrine 0.01 mg/kg IM/IV
- **Discontinue** offending drug
- **Epinephrine infusion** if refractory hypotension

Other supportive measures:

- **Antihistamines:** H1 + H2 blockers
- **Corticosteroids:** methylprednisolone
- **Vasopressors** if needed

8. Prevention

- Preoperative allergy assessment (history + previous reactions)
- Avoid known allergens
- Latex-free environment if patient sensitive
- Emergency drugs & protocols ready in OR