








# *Signs of Depth of Anesthesia*

STAGE	RESPIRATION	PUPILS	EYES	RESPIRATORY
1 Analgesia	Regular Small volume			
2 Excitement	Irregular		Eyelash reflex absent	
3 Anaesthesia Plane I	Regular Large volume		Eyelid reflex absent Conjunctival reflex depressed	Pharyngeal and vomiting reflexes depressed
Plane II	Regular Large volume		Corneal reflex depressed	
Plane III	Regular Becoming diaphragmatic Small volume			Laryngeal reflex depressed
Plane IV	Irregular Diaphragmatic Small volume			Carinal reflex depressed
4 Overdose	Apnoea			

**FIG. 22.1** Stages of anaesthesia. (Modified from Guedel.)

# ***Total Intra-Venous Anesthesia (TIVA)***

- ***TIVA technique for induction and maintenance of anesthesia without inhalational anesthetic agent are widely used.***
- ***Fast Onset and Offset times of agents like (Propofol and Remifentanil) permit rapid titration of drug dose to the required effect for each individual.***
- ***BIS monitoring is recommended to prevent awareness specially when Neuro-Muscular Blocking Agents (NMBA) are used.***

# *Indications for TIVA*

## **Box 22.3**

### **Indications for total intravenous anaesthesia (TIVA)**

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- Malignant hyperthermia risk
- History of severe PONV
- Anaesthesia in non-theatre environments
- Day-case surgery
- Avoidance of neuromuscular blockade
  - ⊕ Myasthenia gravis
  - ⊕ Myotonic dystrophy
  - ⊕ Surgery requiring neurophysiological monitoring (e.g. spinal surgery)
- Transfer of anaesthetised patients between locations (e.g. theatre and ICU)
- Upper airway/thoracic surgery undertaken without a tracheal tube (e.g. rigid bronchoscopy)
- Patient choice

*PONV*, Postoperative nausea and vomiting.

# ***Practical Aspects of TIVA***

## ***Requirements:***

- 1. A secure and reliable i.v. cannula which ideally is accessible for inspection throughout the case.***
- 2. Regular observation of disconnection , leakage and extravasation of the i.v. anesthetic agents.***
- 3. Two- or three-way TIVA set should always be used.***
- 4. Non-return valve on the i.v. line with minimal dead space distal to the point of agent and i.v. fluid mixing.***
- 5. Dedicated Target- controlled Infusion pumps which are regularly serviced .***
- 6. Only Leur-Lock syringes should be used to prevent disconnection from giving set.***
- 7. Checks to ensure a secure main and an operational battery backup.***
- 8. Ensure that the program and the correct syringe and drug contained are actually attached to it.***

# ***Position of patient for surgery***

- 1. Supine position.***
- 2. Trendelenburg position.***
- 3. Reverse Trendelenburg position.***
- 4. Orthopedic table position.***
- 5. Lithotomy position.***
- 6. Prone position.***
- 7. Jack-knife position.***
- 8. Sitting position( Fowler's position).***
- 9. Knee-chest position( lateral or prone).***
- 10. Modified lateral position (Kidney position).***
- 11. Lateral position.***
- 12. Wilson frame position.***

# *Position of patient for surgery*



*Supine Position*



*Trendelenburg Position*



*Reverse Trendelenburg Position*



*Fracture Table Position*



*Lithotomy Position*



*Prone Position*



*Jackknife Position*



*Fowler's Position*



*Knee-Chest Position*



*Kidney Position*



*Lateral Position*



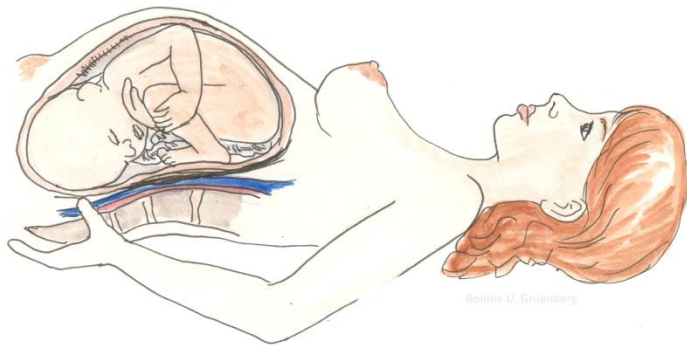
*Wilson Frame Position*

# ***Position of patient for surgery***

- ***After induction of anesthesia the patient is placed on the operating table in one of the 12 positions appropriate for the proposed surgery, taking into account:***
  - a) Surgical access.***
  - b) Patient safety.***
  - c) Anesthetic technique.***
  - d) Monitoring.***
  - e) i.v. cannulae.***
- ***Each may have adverse skeletal, neurological, ventilatory and circulatory effects.***

# ***Adverse effects of different Positions during surgery***

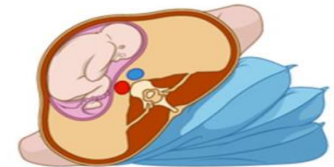
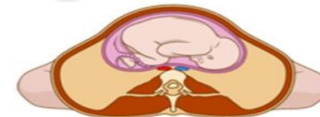
- ***Supine position : 1- Carries risk of supine hypotensive syndrome in pregnant or patients with large abdominal mass.***



## Supine Hypotension Syndrome

- Also called *aortocaval compression* or *vena cava syndrome*
- Occurs if woman lies flat on her back
  - Allows heavy uterus to compress inferior vena cava
  - Reduces blood returned to her heart
  - Can lead to fetal hypoxia
- Symptoms
  - Faintness
  - Lightheadedness
  - Dizziness
  - Agitation
- Turning to one side relieves pressure on inferior vena cava, preferably the left side

[www.openmed.co.in](http://www.openmed.co.in)

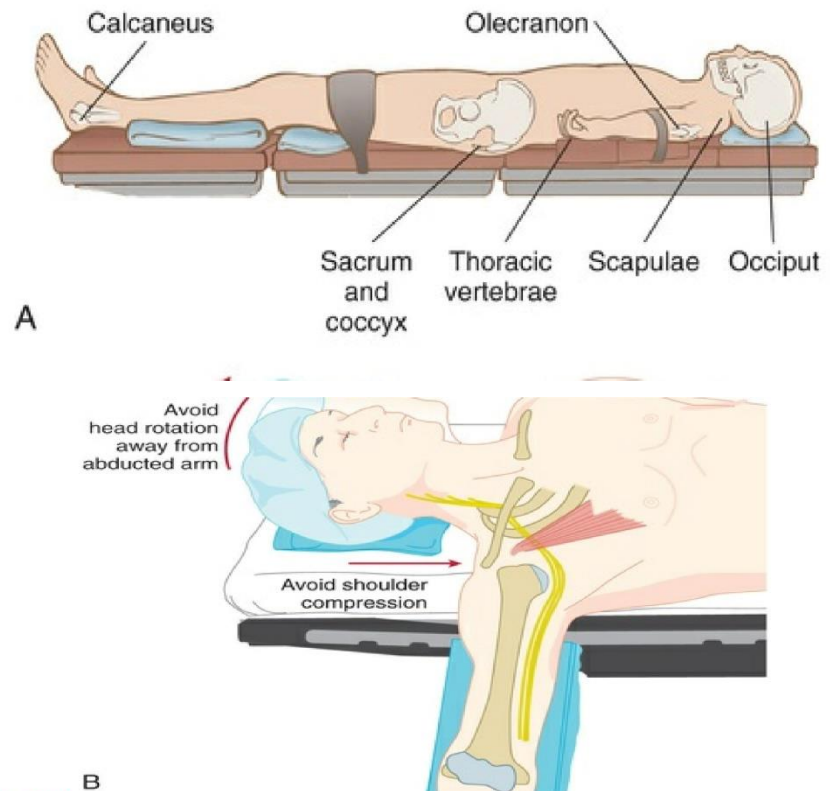


- ***Thus left lateral tilt of the patient using pillows, is a must.***



# *Adverse effects of different Positions during surgery*

*2- Traction injury to the brachial plexus must be avoided.*



**FIG. 22.2** (A) Supine position with potential pressure areas. Care must be taken to avoid (B) traction injury to the brachial plexus. (From Rothrock, J. (2015) *Alexander's care of the patient in surgery*. 15th ed. St. Louis, MO, Mosby.)

# ***Adverse effects of different Positions during surgery***

- ***Trendelenburg position:***
  - 1) ***Upward pressure on the diaphragm by abdominal contents reduces tidal volume.***
  - 2) ***Damage to the brachial plexus by pressure from the shoulder supports.***
  - 3) ***Pooling of blood in the upper part of the body may result in brain edema and delayed recovery.***



# ***Adverse effects of different Positions during surgery***

- ***Lithotomy position :***

***1) Leg (medial and lateral) nerve damage from stirrup which should be well padded.***

***2) Thrombo-embolism as a result of calf compression and venous stasis.***

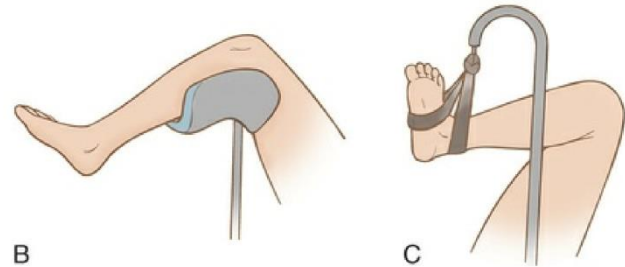
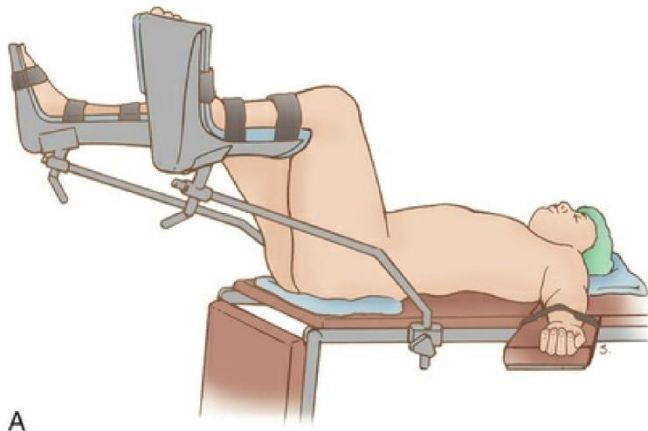
***3) Back pain as a result of asynchronous leg elevation and pelvic asymmetry or unsupported sacrum.***

***4) Pooling of blood in the lower extremities during rapid lowering of the lower limbs and resultant hypotension.***

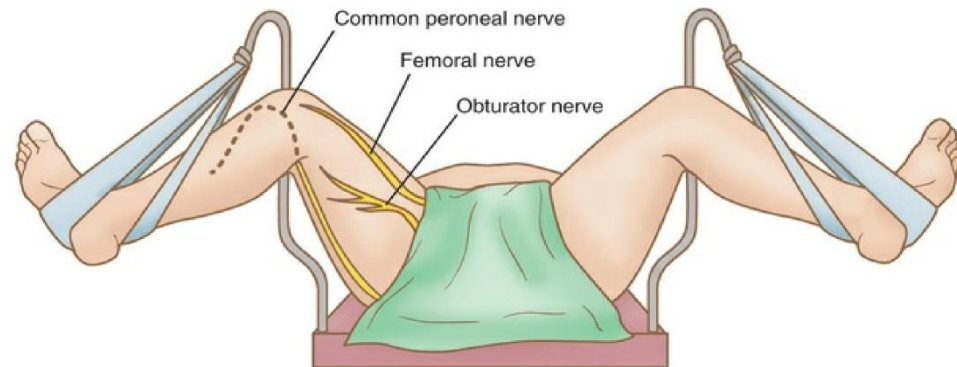


# *Adverse effects of different Positions during surgery*

## *Lithotomy position :*



**FIG. 22.3** Lithotomy position using (A) boot-type, (B) knee crutch and (C) candy cane stirrups. (From Rothrock, J. (2015) *Alexander's care of the patient in surgery*, 15th ed. St. Louis, MO, Mosby.)



**FIG. 22.4** Lower limb nerves at risk of damage when stirrups are used. Femoral and obturator nerves can be stretched by overextension of the hips or surgical team members leaning on the thighs. The common peroneal nerve can be compressed if the lateral knee rests against the stirrup bar. (From Rothrock, J. (2015) *Alexander's care of the patient in surgery*, 15th ed. St. Louis, MO, Mosby.)

# ***Adverse effects of different Positions during surgery***

- ***Prone position:***
- ***there is reduced risk of pulmonary aspiration.***
  - 1) ***Abdominal compression which may cause ventilatory and circulatory embarrassment thus pelvic and shoulder support is essential .***
  - 2) ***Shoulder and nerve injury by excessive extension.***
  - 3) ***Face( eyes, ears, nose, lips, tongue and teeth) injuries.***
  - 4) ***Risk of kinking, inward displacement or outward dislodgement of tracheal tube, thus avoid pressure on and firmly secure the tube.***
  - 5) ***Dislodgement and/or inaccessibility of i.v. cannulae***

# *Adverse effects of different Positions during surgery*

- *Prone position:*
- *Requires:*
  1. *Manual handling team work.*
  2. *Foam or gel face and head pad.*
  3. *Tabletop body supports such as the Monteral mattress and Wilson frame.*

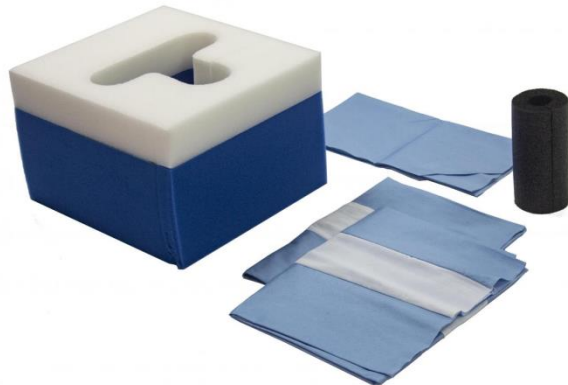
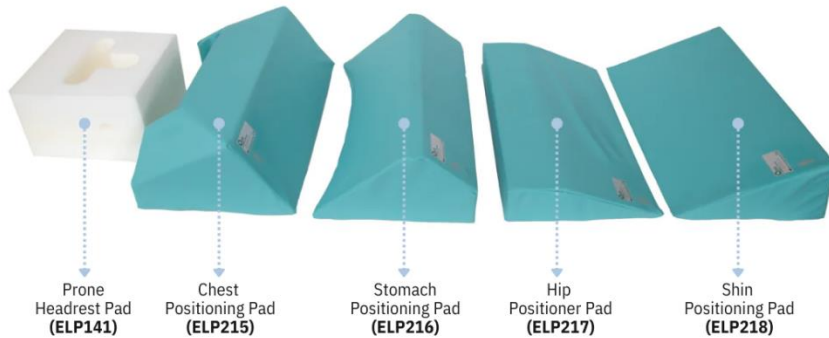


**FIG. 22.6** Prone positioning on (A) Jackson table and (B) Wilson frame. Variations of the prone position include the (C) knee-chest (pressure areas at risk are highlighted in red) and (D) jack-knife positions. (From Rothrock, J. (2015) Alexander's care of the patient in surgery, 15th ed. St. Louis, MO, Mosby.)



# *chest and pelvic support*

ARDS Prone Positioning System ELP200



# *Headrest for prone position*



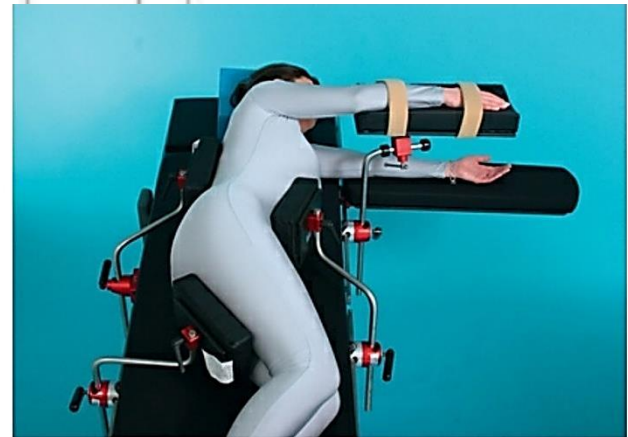
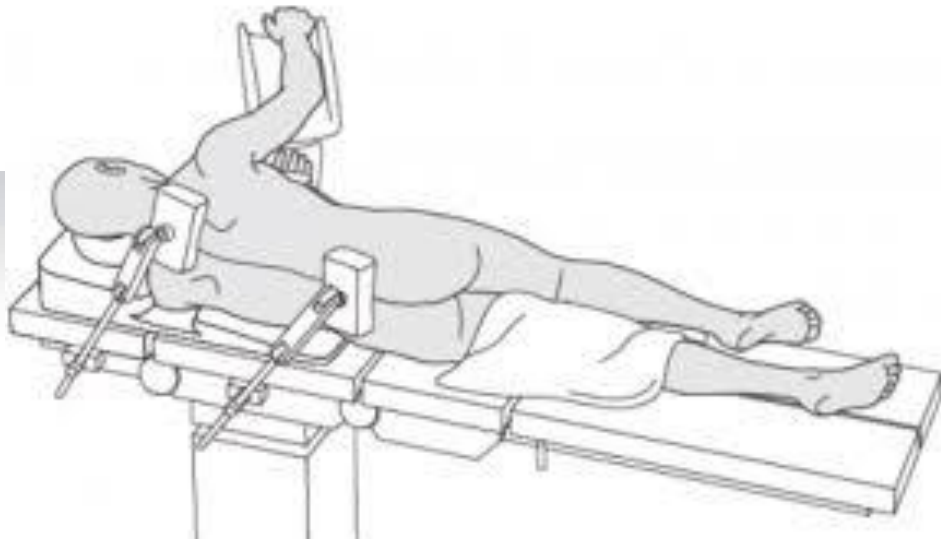
# ***Adverse effects of different Positions during surgery***

- ***Lateral position:***
  - 1) ***Asymmetrical lung ventilation resulting in ventilation/perfusion (V/Q) miss match.***
  - 2) ***Arms position may lead to skeletal and neurovascular injury and congestion of the dependent arm ,thus chest and arm's support is mandatory.***
  - 3) ***Rolling backwards and falling from the table or forward into recovery position, thus pelvis and shoulders must be supported.***



# *Adverse effects of different Positions during surgery*

- *Lateral position:*



**FIG. 22.5** Lateral position with three lateral braces (abdomen, lower back and upper posterior thigh) and arm supports. (From Rothrock, J. (2015) *Alexander's care of the patient in surgery*. 15th ed. St. Louis, MO, Mosby.)

# ***Adverse effects of different Positions during surgery***

- ***Modified lateral (Kidney) position:***
- ***in addition to the adverse effects of lateral position, further effects are:***
  - 1) Skeletal injury (spine and limbs).***
  - 2) Nerve injury.***
  - 3) Stretching of inferior vena cava causes decreased venous return to the heart and impairs cardiac output.***

# ***Adverse effects of different Positions during surgery***

- ***Sitting or Beach-Chair position:***

- 1. Careful attention to support the head.***
- 2. Venous pooling and resultant CV instability.***
- 3. Venous air-embolism during craniotomy.***



**FIG. 22.9** Sitting position with head secured using Mayfield pins. (From Rothrock, J. (2015) *Alexander's care of the patient in surgery*. 15th ed. St. Louis, MO, Mosby.)