ANAESTHESIA MANAGEMENT WITH ONE LUNG VENTILATION IN A PATIENT WITH LEFT SIDED MASSIVE PLEURAL TUMOR

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HISTORY OF PRESENTING ILLNESS

- A 63 year old male patient came with difficulty in breathing on exertion since 2 months .
- Gradual in onset, progressive in nature increases on lying down position relieved on propped up position .
- Patient complains of difficulty in breathing while walking at his own pace on level ground. (MMRC Grade 2).
- Patient has history of cough with expectoration since 2 months. Sputum is scanty and greenish white in color
- No history of weight loss, chest pain, palpitation, pedal edema, blood in sputum, hoarseness of voice, difficulty in swallowing.

~~Past history~~

- H/o circumcision under spinal anesthesia 5years back
- No h/o cold ,fever
- No h/o hypertension, diabetes mellitus, tuberculosis, asthma, thyroid disorder, ischemic heart disease and epilepsy
- No h/o allergies, blood transfusions, burns
- No h/o ICU admission, COVID

~~Family History~~

- No significant family history

~~PERSONAL HISTORY~~

- Diet: Mixed
- Appetite: Normal but decreased since 2 days.
- Sleep: Adequate, undisturbed.
- Bowel/bladder habits: Normal
- Addictions: H/o cigarette smoking since 20 years (1 ½ to 2 packs per day) (~35 pack years).Last taken 3 days back
- History of tobacco chewing since 30 years last taken 3 days back.
- Occasional alcoholic last taken 6months back
- Drug/ food allergy: None

GENERAL EXAMINATION

- Patient is conscious, afebrile, cooperative and well oriented to time, place and person.
- Moderately built, averagely nourished.
- Weight – 48kg
- Height – 160 cm
- PR – 110/min, regular in rate, rhythm, volume in right radial artery. Peripheral pulsations well felt.
- BP – 120/70 mmHg in right arm in supine position.
- RR – 45/min. Abdominothoracic breathing.
- SpO2: 94% on room air.
- Breath holding time <10seconds
- No pallor, icterus, cyanosis, clubbing, edema, lymphadenopathy.
- Spine – normal

~~AIRWAY EXAMINATION~~

- Mallampati Grading – grade III
- Mouth opening – 3 fingers
- Thyromental distance > 6.5cm
- Upper lip bite test – class 1
- Neck movements normal
- No loose or missing teeth

~~SYSTEMIC EXAMINATION~~

~~Respiratory System:~~

Patient cannot lie supine due to breathlessness and has to be in propped up or right lateral for examination.

Inspection :

- No pursed lip breathing
- Shape of chest – barrel shaped
- Movement of chest during respiration – Decreased on left side
- Accessory muscles of respiration are active.
- Respiratory rate – 45/min abdomino-thoracic pattern
- Trachea deviated to right side.
- Skin over chest is normal
- No dilated veins or scar marks present over chest

Palpation :

- All inspectory findings were confirmed on palpation
- Movement of chest during respiration is diminished on left side.
- Trachea is shifted to right side.
- Tactile vocal fremitus is diminished in left lower zone
- Tenderness – absent

Percussion:

- Dull note found on left side and right lower zone

Auscultation :

- Grossly reduced air entry on the left side of chest and reduced air entry in the right lower zone.
- No wheeze ,rhonchi, pleural rub or conducted sounds

~~CARDIOVASCULAR SYSTEM~~

Inspection

- No Precordial bulge or flattening
- Apical impulse shifted to right 4th ics just inside the mid clavicular line
- No other visible pulsations
- No dilated veins, scars or sinuses

Palpation

- Apex beat palpated in the right 4th ics 1cm inside mid clavicular line
- No parasternal heave
- No palpable thrills

- ~~Percussion~~
  - Left border of heart not clearly delineated
  - Right border of heart not clearly delineated
- ~~Auscultation~~
  - Heart sounds – S1, S2 +
  - No clicks, opening snap or pericardial rub

Central Nervous System:

- Conscious, cooperative, well oriented
- Sensory, motor and higher functions normal
- No focal neurological deficit noted.

Abdominal Examination:

Inspection :

- Shape – normal
- Movement of abdomen with respiration is normal

Palpation :

- No organomegaly

Percussion :

- No free fluid

Auscultation :

- Normal peristaltic sounds heard

INVESTIGATIONS

Hemogram

Hb- 12.4g/dl

TLC-7900/ul

PLT-3,26000/ul

PT-10.7s

INR-0.88s

Hba1c-5.8%

Bsl-202mg/dl

CKMB-25IU/L

Trop I < 10ng/L

Serology-Neg

Renal function test

Urea-19mg/dl

Creatinine-0.68mg/dl

Sodium-133mmol/L

Potassium-3.9mmol/L

Chloride-111mmol/L

Liver function test

TB-0.5U/lt

DB-0.23U/lt

SGOT-15U/lt

SGPT-20U/lt

ALP-132U/lt

ABG

pH-7.43

Pco2-34mmHg

Po2-69mmHg

Hco3-22mmol/L

Hb-13g/dl

Na-127mmol/L

K-3.6mmol/L

Lac-2.2mmol/L

Glu-128mg/dl

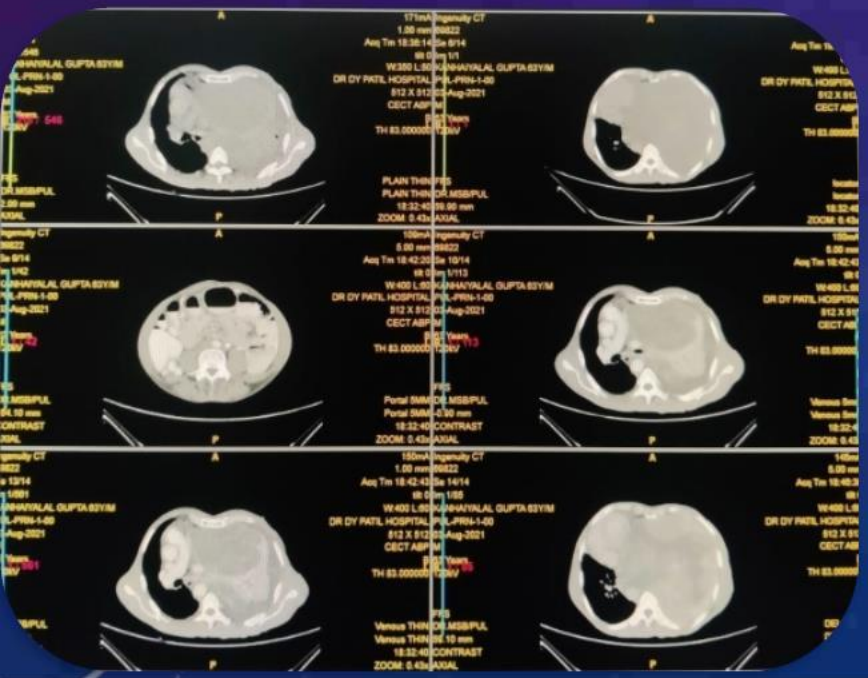
~~CHEST X-RAY~~

- PA view
- Right tracheal shift
- There was a significant mediastinal shift to right.
- No hilar abnormalities.
- Lung fields with area of increased opacity suggestive of ?mass
- Cardiac border and heart shadow not visible in view of large ?mass.
- Loss of costophrenic and cardiophrenic angles
- No bony abnormalities
- No tubes/devices/valves

~~CT CHEST –~~

1) Suggestive of pleural mass measuring 15x 17 x20 cm with left hemithorax abutting left anterior, posterior and lateral chest wall

2) Partial left upper and complete left lower lobe collapse with minimal left pleural effusion.



- USG thorax- Moderate Left sided loculated pleural effusion(250-300cc) with extensive consolidation and collapse of underlying lung parenchyma.

- CT scan findings were suggestive of mesothelioma or a solitary fibrous tumor of pleura.

- Pleural tap histopathology was negative for acid fast bacillus and was suggestive of pleural malignant cytology.

~~ECG~~

Normal sinus rhythm

~~2D ECHO~~

- Heart shifted to right hemithorax
- Ejection fraction 60%
- No regional wall motion abnormality
- Normal left ventricular systolic function
- Grade 1 diastolic dysfunction
- No MS,MR or other valvular abnormalities
- No pulmonary hypertension
- No clots

~~DIAGNOSIS~~

- A 63 year old male with complaints of difficulty in breathing (MMRC 2) and cough with expectoration since 2 months with tracheal and mediastinal shift to right side along with decreased air entry on left side and right lower zone with apex beat shifted to right 4^{th} intercostal space.
- Diagnosed as a massive left sided pleural tumor on CT chest and histopathology .

- Patient was planned for excision of left sided pleural tumor

- After a thorough pre anesthetic evaluation and taking all the written informed consents for high risk, post operative intensive care and ventilator the patient was taken up for surgery underASA III.

IMPORTANT ANESTHETIC CONSIDERATIONS

- Due to mediastinal shift and the tracheal shift intubation was a real challenge.
- While giving general anesthesia the chance of tracheal collapse and stridor due to pressure from of the pleural mass can lead to a can't ventilate/intubate scenario.
- So, awake intubation was the preferred plan of action with double lumen endotracheal tube for one lung ventilation.
- Instruments were kept ready for emergency tracheostomy.
- Post op analgesia.
- All procedures pre-op and intra-op were done in propped up position.

~~PLAN OF ANAESTHESIA~~

- Awake C-MAC guided intubation using left sided double lumen endotracheal tube for one lung ventilation.
- Transtracheal , superior laryngeal and glossopharyngeal blocks given to avoid stress response of awake intubation.
- Thoracic epidural for intra op and post op analgesia.
- Right internal jugular vein central venous catheterisation and right radial arterial line for hemodynamic monitoring.

ANESTHETIC MANAGEMENT

- All preoperative preparation and intraoperative procedures was done in propped up position
- Pre operative optimization by nebulization with Duolin (Ipratropium + Levosalbutamol) and Budecort was advised night prior to and morning of surgery.
- Two large bore peripheral intravenous accesses were secured.
- Intravenous glycopyrrolate 0.2 mg and dexamethasone 8 mg was given in the pre-operative room
- Patient shifted to OT and all necessary monitors were attached(ECG,SpO2,NIBP,Temp,Etco2)

- Right sided internal jugular vein central access was secured under local anesthesia in propped up position.

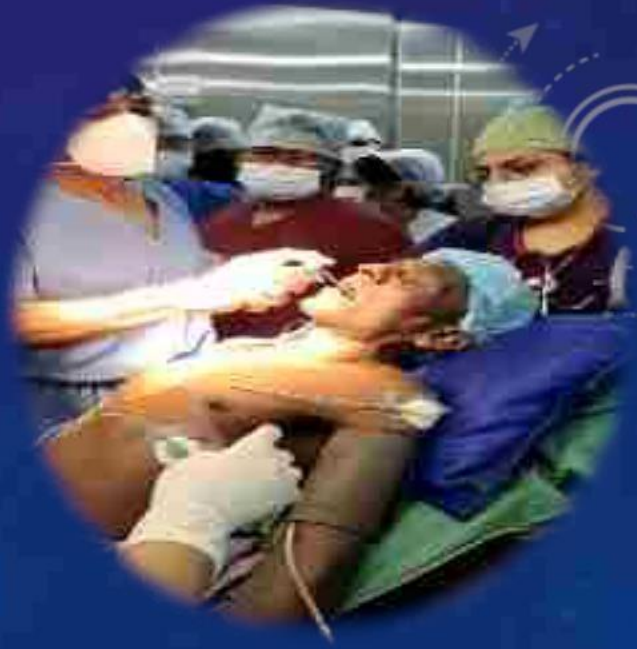
- Thoracic epidural was secured at the level of T7-T8 with 18 G epidural catheter set.

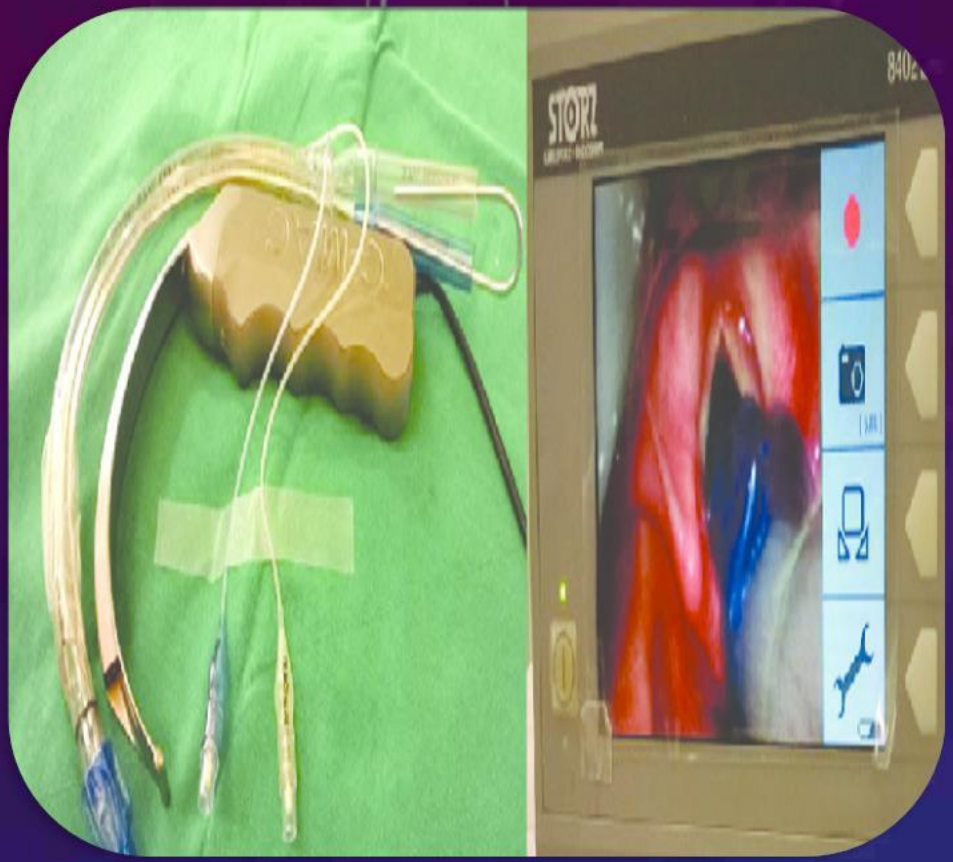
- Under all aseptic precautions transtracheal block was given with 2 cc of 4% injection loxicard.

- Bilateral superior laryngeal nerve block was given with 2% inj.Lignocaine (2cc on each side).
- Bilateral glossopharyngeal nerve block, 2cc on each side, was given at the anterior tonsillar fossa with a 26G Quincke Babcock's spinal needle with 2% inj.lignocaine .

- In the meantime patient was being pre oxygenated in propped up position with 100% oxygen.

- Topical 10% lignocaine spray was applied on oral cavity to avoid stress response during intubation





- Using C-Mac video laryngoscope 35 Fr left sided double lumen tube was used to intubate the patient in propped up position.
- To avoid any untoward event of desaturation and to prevent hazardous situation of cant ventilate cant intubate scenario

- Following awake intubation patient was injected with Inj.Midazolam 0.2 mg/kg, Inj.Fentanyl 2mcg/kg, Inj.Propofol 2mg/kg, Inj.Vecuronium 0.1mg/kg.
- Patient was initially maintained on 50% O2 and 50% air + sevoflurane(inhalational agent).
- Tube placement was confirmed by clamping tracheal cuff followed by bronchial cuff to check air entry in individual lungs.
- Baseline peak pressure was 41 and plateau pressure was 38.
- Arterial line was secured in right radial artery for invasive blood pressure monitoring .

- Patient was given right lateral position and air entry reconfirmed before incision was taken.

- Inj.Dexmedetomidine infusion started at 0.3mcg/kg/hr as an adjuvant for anesthesia.

- Epidural morphine 3 mg with 0.125 % Inj.Bupivicaine 6cc was given after a test dose of 3 cc injection lignocaine-adrenaline at the start of surgery.

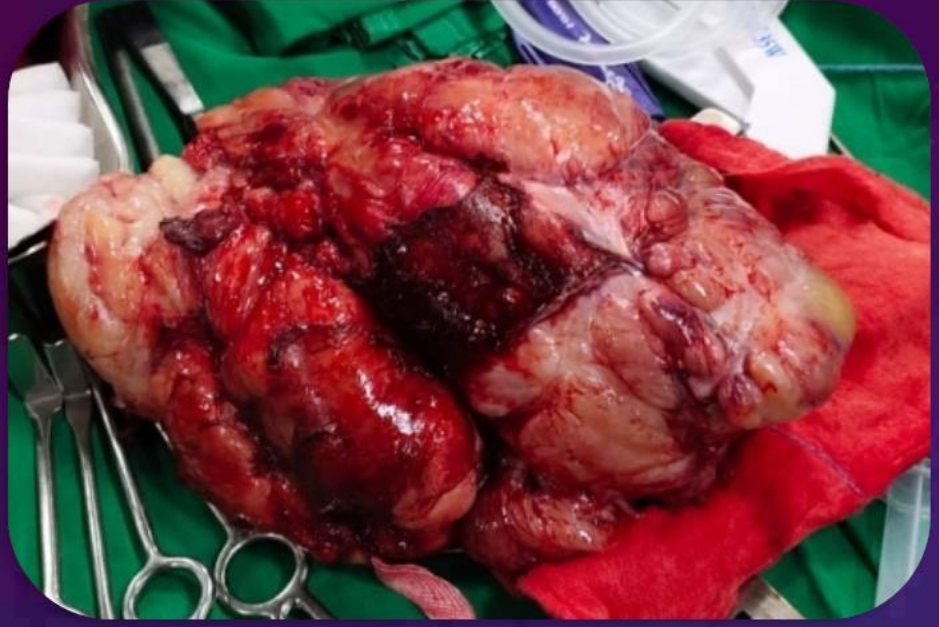
• Once inside the cavity one lung ventilation was started by clamping left bronchial cuff so as to collapse the left lung and provide ventilation for right lung.

• Sudden drop in saturation to 89% normalized after declamping of bronchial cuff for some time and one lung ventilation resumed again.

• Once one lung ventilation started there was hypotension (90/50mmhg) which was managed by bolus doses of phenylephrine and noradrenaline infusion at 4 ml/hr and was tapered according to bp.

INTRAOP MONITORING

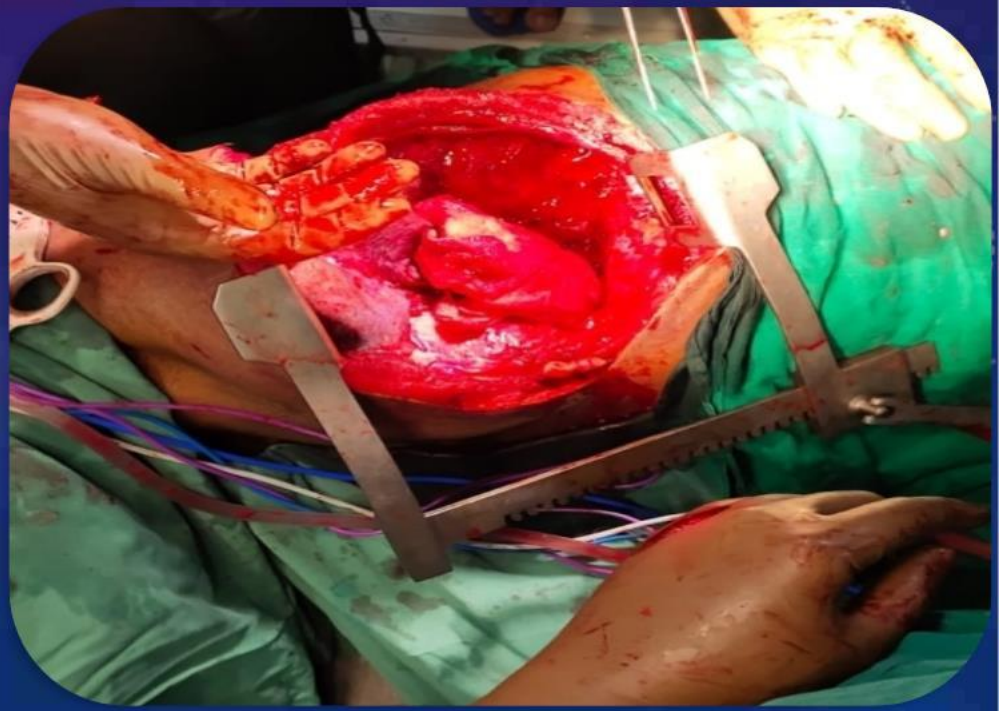
TIME	IBP (mm/hg)	PULSE RATE (bpm)	SPO2 (%)	Etco2 (mm/hg)	CVP (mm/hg)	IV fluids (ml)	Urine output (ml)
9:40	100/70	98	100	34	15	500	-
10:40	96/70	88	98	32	10	400	100
11:40	90/50	86	89	34	8	400	50
12:40	110/70	84	98	37	6	300	70
1:40	120/70	82	88	34	8	200 +300ml blood	80
2:40	112/78	80	98	32	10	200 +300ml blood	100
3:40	130/88	98	98	34	9	300	100
						Total-2900ml	Total-500ml



- The surgery lasted 6 hours
- There was approximately 900ml blood loss which was replaced with 2 packed cell volumes.

- The mass excised was 4kg in weight and measured 15 x 17 cm .

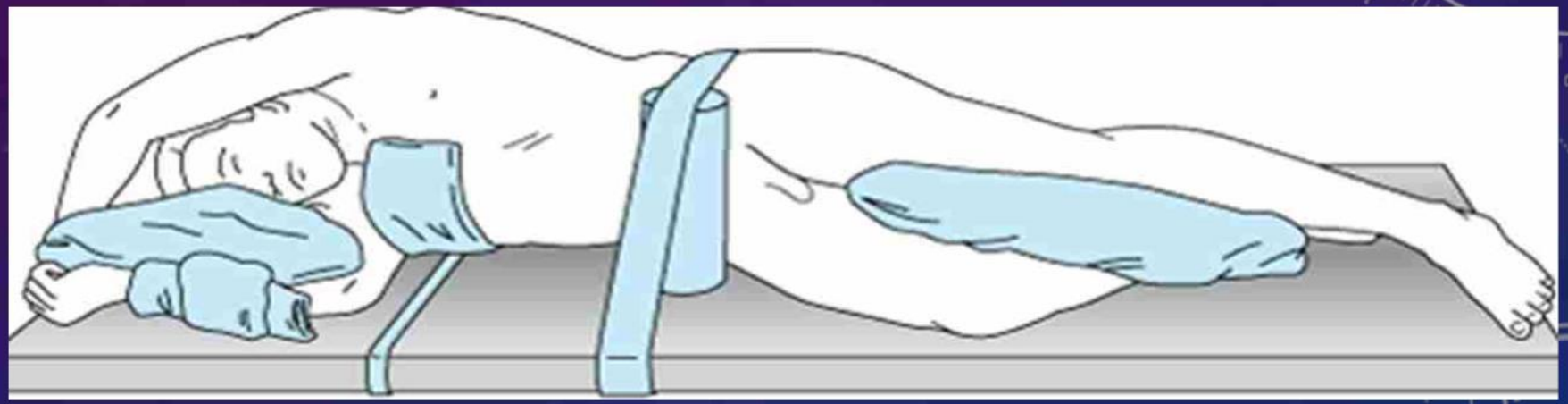
- Once the mass was out, closure was started bronchial clamp was removed and double lung ventilation was started.



- During closure epidural infusion 0.25% inj. Bupivacaine at 3 ml/hr was given for analgesia.
- As the cavity was closed blood pressure normalized and vasopressors were not required any further.
- Endotracheal and oral suctioning was done.
- Once the patient started having adequate spontaneous respiratory efforts reversal for neuromuscular blockade was given and patient was extubated.
- Post extubation patients Hr-98bpm, Spo2-98% on 2L/o2 ,Bp-130/88mmhg
- Patient was shifted to ICU for observation post operatively.

ONE LUNG VENTILATION

- The mechanical separation of the two lungs, to allow ventilation of only one lung, to facilitate thoracic, pulmonary and thoracic spine surgeries.



DEPENDENT LUNG -The lung which is ventilated

NON DEPENDENT LUNG -The lung which is collapsed to facilitate the surgery

INDICATIONS FOR OLV

Initially: absolute and relative: obsolete

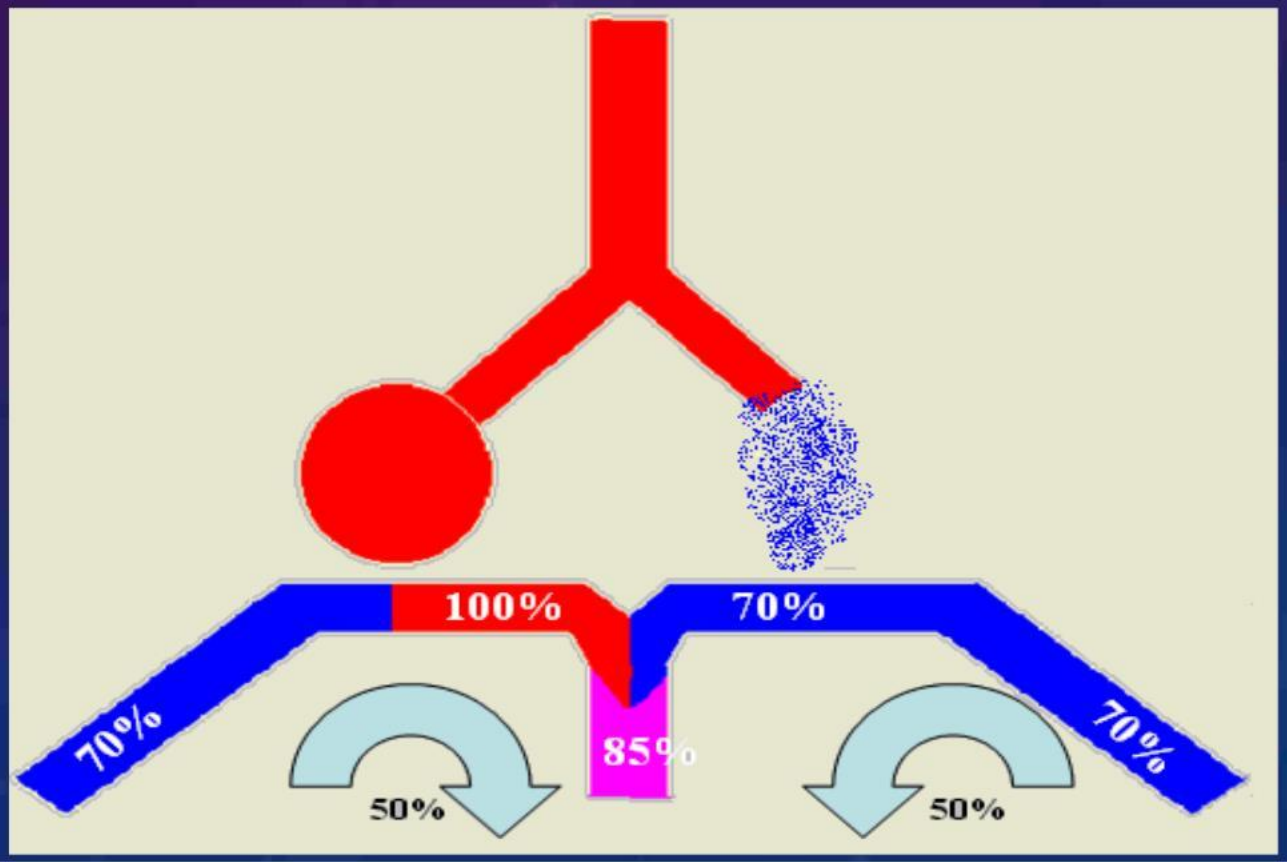
Now:

- Lung isolation:
  - Bleeding
  - Pus
  - Alveolar proteinosis
  - Bronchopleural fistula
- **Lung separation:**
  - **For improved surgical exposure**

Surgical exposure:

1. High priority:
   - Thoracic aortic aneurysm
   - Pneumonectomy
   - Upper lobectomy
   - Thoracoscopy
2. Low priority:
   - Middle and lower lobectomies
   - Esophageal surgery
   - Thoracic spine surgery

- In one lung ventilation , collapsed lung continues to be perfused but is deliberately no longer ventilated
- The patient develops a large right-to-left intrapulmonary shunt (20–30%) due to the mixing of unoxygenated blood from the collapsed lung with oxygenated blood from the still-ventilated dependent lung



DOUBLE LUMEN TUBE(DLT)

- Bifurcated tube that can be used to achieve isolation of either the right or the left lung

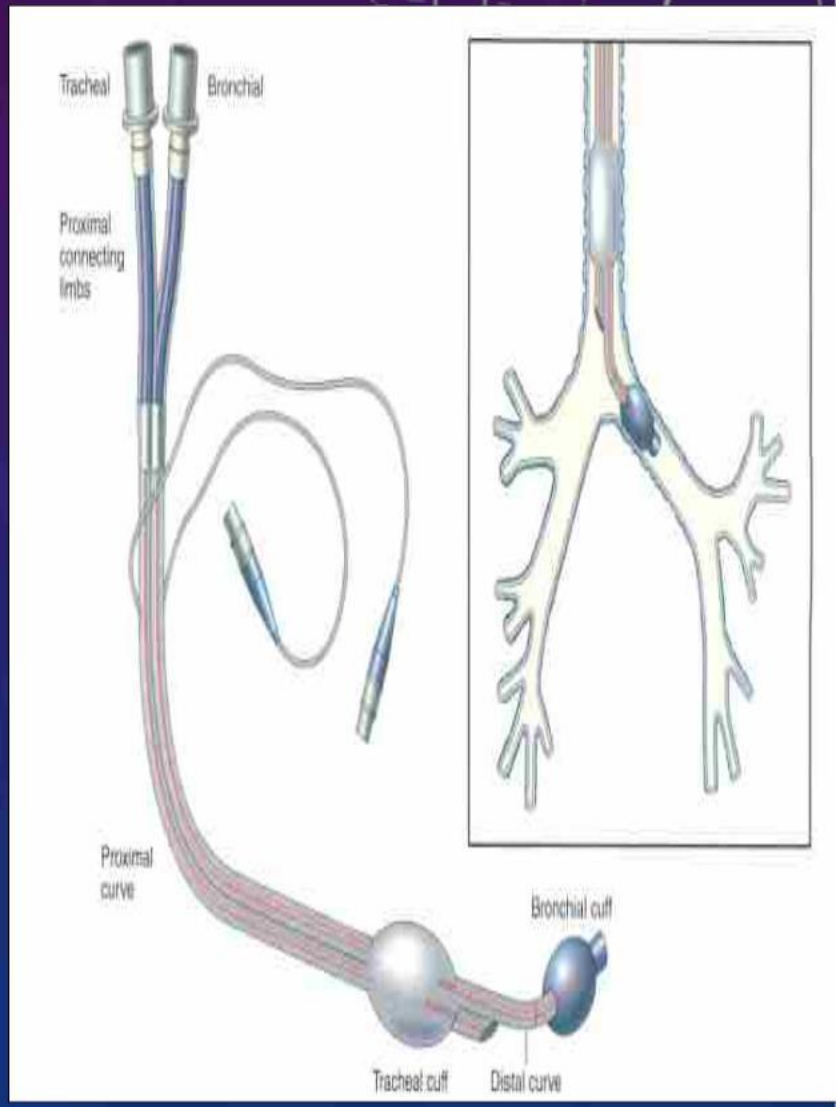
1. Longer **bronchial lumen** (enters either the right or left main bronchus).

2. Shorter **tracheal lumen** that remains in the lower trachea.

3. A preformed curve that allows preferential entry into either bronchus.

4. A bronchial cuff

5. A tracheal cuff




Right sided
Left sided

~~Conclusion~~

- Challenges faced by an anesthesiologist in performing one lung ventilation arise from a combination of lateral decubitus position , open pneumothorax ,instruments and anesthetic technique.

- Familiarity with the use of instruments, optimal placement of a double lumen tube and physiology of one lung ventilation is essential to perform safe anesthesia,improve the outcome of surgery and post operative recovery of the patient.

THANK YOU