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CASE REPORT

One lung ventilation: An endeavour for anaesthesia

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ABSTRACT
A 41 years old male presented with complain of difficulty in deglutition since 2 months & regurgitation of food in the last 10 days. Diagnosed as esophagus stricture posted for Ivor Lewis surgery with abdominothoracic esophagectomy with gastric pullup with esophagus gastric anastomosis in thorax under general anesthesia& epidural anesthesia with left sided Robertshaw double lumen endobronchial tube of 37 Fr size for one lung ventilation.

INTRODUCTION

OLV was 1st done in 1936 by Magill using double lumen tube. One-lung ventilation (OLV) is a technique that allows to ventilate one lung, leaving the other deflated. This is extensively applied in chest surgery for esophageal cancer, lung cancer, lung abscess, and bronchiectasis.[1,2]

OLV provides protection of healthy lung from infected/bleeding one,diversion of ventilation from damaged airway or lung, enlargement of surgical field, separate healthy lung, reduce lung injury, and preserve lung function[4]

OLV causesmore manipulation of airway leading to more damage, significant physiologic change and easily development of hypoxemia, OLV requires much skill of the anesthesia team because of difficulty in placement of lung isolation equipment. There are challenges in overcoming hypoxic pulmonary vasoconstriction. The target is to guarantee good surgical exposure while maintaining sufficient oxygenation. The indications for OLV have 2 general goals: lung isolation and lung separation.[4]

CASE REPORT

A 41 years old male presented with complain of difficulty in deglutition since 2 months & regurgitation of food in the last 10 days.Diagnosed as esophagus stricture posted for Ivor Lewis surgery with abdominothoracic esophagectomy with gastric pullup with esophagus gastric anastomosis in thorax under general anesthesia& epidural anesthesia with left sided Robertshaw double lumen endobronchial tube of 37Fr size for one lung ventilation.

History of Presenting Illness

Patient was examined after informed consent in a well-lit room. Patient was apparently alright 2 months back when he developed difficulty in deglutition which was gradual in onset first for liquid and then subsequently for solid also. Patient has similar complaint 10 years back for which esophageal dilatation was done. Patient also has regurgitation of food and pain in below sternum, weight loss, vomiting. Symptoms get aggravated on taking food.
There was not a history of Hypertension, Diabetes Mellitus and asthma. Past general anesthesia history for esophageal stricture dilatation 10 years back, uneventful. There was no history of allergy to any drugs, food or substances observed. Patient was taking mixed diet, has Reduced appetite and has adequate sleep pattern. There was absence of similar complain in the family. Socioeconomic status of the patient waslower middle-class family.

General Examination

Patient was conscious, cooperative & oriented to time, place and person at the time of examination.
He was lying comfortably in supine position. He was having thin built, 160 cm high, Weight 32 kg, BMI 12.5 Gait was normal. Patient was well dehydrated.No obvious deformity nor tenderness found in the Spine.

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Vitals: BPwas 128/86 mm hg Right brachial in supine position and 107/76 mm hg on standing. Heart Rate was 110/min on Right radial artery.Regular rhythm was found with normal pulse volume, no radio-radial, radio-femoral delay was observed.Temperature was afebrile. Respiration was thoraco-abdominal breathing [Rate -16/ min]. No accessory muscleswere used.Pallor observed. Icterus, Cyanosis,Clubbing and Edema were absent.No lymph nodes were palpable over cervical region. No obvious deformity found.

Systemic Examination

CNS was Conscious and oriented. Sensory and motor functions were intact.
CVS: S1 S2 Heard. No murmur heard.
RS: B/L Air Entry present, B/L lower zone air entry reduced, Normal vesicular breath sounds present, no added sounds heard.
P/A: soft

Airway Examination

Nose: Nasal patency adequate, no DNS.
Teeth: No loose teeth seen and no dentures were found.
Mouth Opening: 3 Finger Inter incisor gap present.
Thyromental distance: Normal (> 6 inches)
Movement of head and neck: Good
Mallampati Grade: II

INVESTIGATIONS

HB- 10.00 GM/DL
PLATELET- 4.40 L/CUMM
HIV, HBSAG, HCV- NR
SODIUM- 133 MMOL/L
POTASSIUM- 4.3 MMOL/L
CHLORIDE- 100 MMOL/L
LFT- NORMAL
UREA-16 MG/DL
CREATININE-0.8 MG/DL
INR-1.2
RBS-102 MG/DL
BLOOD GROUP- AB+
ECG and ECHO was normal
CT-Scan for chest revealed tiny reticule-nodular opacities in the medial segment of middle lobe of right lung, Mild bilateral pleural effusion, asymmetrical wall thickening of esophagus showing heterogenous enhancement.Pre-Anesthetic checkup was performed.
NPO was maintained to 6hrs for solid food and 2hrs for clear fluid.

Pre-op assessment on the day of surgery: Patient was shifted to pre operative room. Nil per oral was confirmed. Morning FBS- was 102 mg/dl. Counseling and written informed consent taken. Adequate blood was arranged.

Premedication: Large bore IV access was taken.Anti-emetic- Inj. Ondansetron 4 mg IV given. Antacid- Inj. Pantoprazole 40 mg IV given. Antibiotic- Inj. Ceftriaxone 1.5 gm IV given. Part preparation done.Catheterizationwas done.

Intra-operative period

The temperature of operation theater was kept warm. Emergency cart was made ready. Monitoring was instituted- Electrocardiogram (ECG), Oxygen saturation (Spo2) and Noninvasive blood pressure monitoring was attached. Baseline hemodynamic parameters noted: Temperature- 97.8 F Hear Rate-110/min Respiratory Rate- 14/min Blood Pressure-106/70 mmHg SpO2- 98% at RA. Epidural Anesthesia for intra-op and post-op analgesia. Under all ASP 16 G Tuohy's needle was inserted at T8-T9 intervertebral space. Catheter fixed at 10cm.Tip of catheter at T5-T6 intervertebral space. Test dose Injection lignocaine 2% and adrenaline 1:2lakh 3ml given and epidural infusion was started with Inj. Bupivacaine (0.25%) Plain and Inj. Buprenorphine 150 mcg at rate of 4ml/hr.
Premedication- Injection Midazolam 1mg Injection Glycopyrrolate 0.2 mg iv Injection Buprenorphine 75 mcg iv. Preoxygenation with 100% O2 for 5 minutes.Induction – Injection propofol 80 mg iv, Injection succinylcholine 75mg iv ,37 French Robertshaw left sided Double lumen endobronchial tube inserted and tube fixed at 29 cm.Tube position was checked clinically by auscultation and by using fiberoptic bronchoscope. Maintenance – O2 (2L/min), Air @ 2L/min, Isoflurane (1%), Inj. Vecuronium 0.1mg/kg loading dose then 0.02mg/kg maintenance dose was used.
Ventilator settings
Mode-Volume controlled ventilation, Tidal volume-8ml/kg, FiO2- 50%, Rate- 14 bpm, Under ASP triple lumen venous catheter 7 French inserted at right IJV using Seldinger technique.Arterial line was established at right radical artery for invasive blood pressure monitoring.Two lung ventilation was continued as long as possible.

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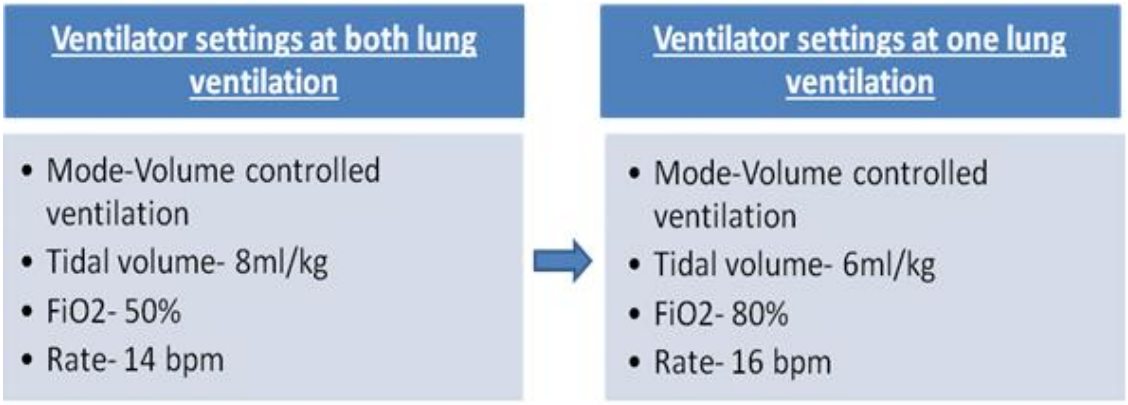

At the end of surgery : DLT was replaced with single lumen cuffed endotracheal tube and patient shifted to ICU for post op ventilation.

At the time of one lung ventilation: -
Tidal volume reduced to 4ml/kg
Respiratory rate 16/min
FiO2- 80%
Mode – Volume controlled ventilation
Patient vitals were stable throughout the intraoperative period.
1 PRBC was given
At the end of surgery double lumen tube was replaced with single lumen cuffed endotracheal tube of No 8 fixed at 20 cm.
POST OPERATIVE
Patient was shifted to SICU for post op care and ventilation support.
Vitals signs were monitored.
Hypothermia prevented using warm blankets and fluids.
For analgesia epidural top-up was done every
12 hourlies with Inj. Buprenorphine 100 mcg diluted with 10 ml NS & inj. Paracetamol 1gm iv 8 hourly.
After proper ABG monitoring, gradual weaning from ventilation was done & patient was extubated after 24 hours after standard extubating criteria were fulfilled.
Patient was kept on supplemental oxygen supply@ 6l/min
Chest physiotherapy
Chest X-ray
CBC
ANAESTHETIC CHALLENGES[6-11]

Intra operatively
Establishing adequate lung isolation: -The choice of DLT was made on the basis of the patient's anatomy, ease, speed, better deflation and less changes of dislodgement.
Patient position: -Lateral decubitus position given with adequate padding done, cervical spine aligned & lower extremities slightly flexed.
Lung injury: -Lung protective ventilator settings done.
When increase in airway pressure was noted:
Tube position confirmed tidal volume decreased
Ventilator mode-Pressure control mode
Ventilator mode-Pressure regulated volume control mode
HYPOXIA: -
FiO2 increased, circuit integrity & tube positioning confirmed
Suctioning done, lower TV & optimal PEEP was applied
Frequent alveolar recruitment maneuver applied
Bilateral lung inflation done
Reinflation of collapsed lung: -Gradual and careful reinflation of lung with positive pressure
Post operatively-
Post op atelectasis.
Decreased respiratory drive due to pain.
Difficulty in weaning.

DISCUSSION
Basal lung function and the tolerance to surgery and anesthesia are poor in older patients. Extended use of OLV is an independent risk factor for postoperative pulmonary dysfunction and perioperative complications. [4]Thus, appropriate mode of OLV is necessary for older patients who undergo chest surgery.
The parameters, including tidal volume and ventilation mode, should be adjusted when two-lung ventilation is changed to OLV. The shear force caused by excessive stretching or repeated opening of lung tissues acts as an important cause of VILI.[5]

CONCLUSION
Anesthetic management of OLV should be performed by a properly trained person, from the preoperative evaluation and the choice of the device for lung separation up to the management of mechanical ventilation.
Proper management of OLV must avoid intraoperative hypoxemia and at the same time protect the lung from injury. Modern protective mechanical ventilation during OLV is multimodal and comprises low TV, PEEP application and ARM. There are no

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absolute values of TV and PEEP to be applied; rather, values must be adjusted according to the patient's respiratory mechanics while avoiding overdistention and tidal recruitment.

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