ANAESTHESIA FOR PATIENTS UNDERGOING OESOPHAGEAL SURGERY

Dr. P.K.Bhatia, Assistant Professor, Deptt. of Anaesthesiology & Critical Care, S.N. Medical College, Jodhpur.

The oesophagus is a muscular tube measuring 23-25cm in adults. It enters the superior mediastinum posterior to the trachea, continues down posterior to the pericardium and left atrium and anterior to the descending aorta. Its right side is adjacent to the right mediastinal pleura and lung, and on the left side lies the left mediastinal pleura and lung, along with common carotid artery, subclavian artery and descending aorta. There is a sphincter at both the proximal and distal ends of the oesophagus. The lower oesophageal sphincter has a normal resting pressure of 15 to 20 mmHg. Anticholinergics, dopamine, opioids, halothane, enflurane and beta adrenergic agonists decrease the lower oesophageal sphincter tone while the drugs that increase it include anticholinesterases, metoclopramide, succinylcholine, pancuronium, histamine and antacids.

The most frequently encountered lesions of the oesophagus presenting for surgery are-

- Tumors
- Benign strictures: caused by caustic ingestion and reflux oesophagitis
- Hiatus hernia
- Diverticuli
- Tracheooesophageal fistula: congenital or malignant
- Traumatic perforation
- Foreign body
- Diverticuli

The diagnostic workup for oesophageal lesion includes the history, physical examination, and barium swallow under cinefluoroscopy, followed by oesophagoscopy and tissue biopsy.

Preoperative considerations

Patients with oesophageal diseases usually have dysphagia with poor nutrition and weight loss. Dehydration, secondary to poor fluid intake, makes these patients susceptible to haemodynamic instability intraoperatively, and prerenal failure postoperatively. Hypoalbuminemia may lead to exaggerated response to anaesthetic drugs such as thiopental, muscle relaxants, and local anaesthetics, and the decreased plasma oncotic pressure secondary to hypoproteinemia makes the patients more susceptible to pulmonary oedema. Anaemia due to poor nutrition or from chronic bleeding from the tumor reduces the oxygen carrying capacity of the blood. Hypokalaemia can cause cardiac arrhythmia especially in digitalised patients. Hypomagnesemia can affect the electrocardiogram and can alter the patient's sensitivity to muscle relaxants. Patients with obstructive lesions of the oesophagus are prone to regurgitation and aspiration.

Patients with oesophageal cancer are often treated with chemotherapeutic agents. Frequently used drugs include

adriamycin, bleomycin and mitomycin C. All these drugs depress erythropoiesis leukocyte and platelet production. The cardiovascular effects of anticancer drugs include rhythm disturbances, cardiomyopathy and vascular effects on coronary and systemic arteries. Dose related adriamycin toxicity includes cardiomyopathy and congestive heart failure. Cardiomyopathy is irreversible in 60%of cases and is also refractory to inotropic therapy. Bleomycin produces pulmonary toxicity that is life threatening in 15% to 25% of patients. Predisposing factors include age>29 years, dose >400 units, underlying pulmonary disease, prior radiotherapy and administration of high concentration of oxygen during anaesthesia, as the disease may progress to ARDS and pulmonary fibrosis.

Preoperative preparation

Preoperative preparation of the patients includes optimization of nutritional status preoperatively, which has been shown to lower mortality and morbidity and decrease the incidence of wound sepsis. Indication of total parental nutrition in patients with dysphagia are - inability to swallow any food, more than 10% decrease in body weight, serum albumin level <3 g, cachexia, total lymphocyte count <1000 cells/mm3, and serum transferrin level <180mg.

During and following thoracotomy for oesophageal surgery, there is a high incidence of supraventricular tachyarrhythmias due to manipulation of the heart and lungs. Preoperative digitalization is controversial due to more chances of its toxicity although the incidence of dysrhythmias decreases by the use of digitalis preoperatively. Many of the patients with oesophageal carcinoma are elderly further increasing the chances of cardiopulmonary dysfunction

Other preoperative considerations include the use of antacids, H2-blockers metoclopramide or a parietal cell proton-pump inhibitor (omeprazole) particularly in a case of hiatus hernia.

Surgical approach

It depends upon the site of lesion. Patients with tumors of upper third of oesophagus are treated with combined laparotomy and cervical incision. Patients with lesions of middle third of the oesophagus are treated with laparotomy and right sided thoracotomy, while patients with tumor of lower third of oesophagus are treated by oesophagogastrectomy through a left sided thoracotomy, transhiatal oesophagogastrectomy, and gastric pull through technique. When insufficient length of stomach exists in cases of lesions in upper third of oesophagus, oesophagogastrectomy with colon interposition is done which is done in two stages.

Monitoring

In addition to the routine monitoring the patient undergoing oesophageal surgery may need invasive and continuous arterial pressure monitoring, with intermittent blood gas examination, and central venous pressure monitoring. Pulmonary artery pressure monitoring may be done if indicated by patient's preoperative cardiac condition. Continuous pulse oxymetry is very important, as there may be hypoxaemia particularly during one lung anaesthesia.

Premedication

Most of these patients are elderly and have limited cardiorespiratory reserve. Heavy sedation and respiratory depressants should be avoided in such patients. An anticholinergic agent may be used particularly if an awake intubation is planned.

Induction of anaesthesia

Before induction of anaesthesia a large bore nasogastric tube must be passed and the proximal oesophageal pouch emptied. These patients are always at risk of aspiration so either an awake intubation or a rapid sequence induction with cricoid pressure is indicated. If airway compression is caused by large mediastinal lymphadenopathy, spontaneous respiration should be maintained until an endotracheal tube is passed beyond the obstruction.

Choice of endotracheal tube

For lower oesophageal surgery using a left thoracoabdominal incision, a single lumen endotracheal tube can be used and surgical exposure can be obtained by retraction of left lung. For oesophageal surgery via thoracotomy, it is usually necessary to put in a double lumen endobronchial tube to collapse the ipsilateral lung. A left-sided double lumen endobronchial tube is generally used as it has less risk of obstruction to the upper lobe ventilation orifice. In non-pulmonary surgery the nondependent lung is not severely diseased (hence no HPV and more shunt) and the pulmonary artery is never ligated. The hypoxaemia that occurs in these patients during one lung ventilation is greater than that during pulmonary surgery and lasts as long as the lung is collapsed. Intraoperative hypoxaemia is corrected by 100% oxygen, CPAP to the nondependent lung with or without PEEP to the dependent lung.

Maintenance of anaesthesia

Anaesthesia is maintained with a combination of inhalation anaesthetic agents in oxygen with narcotics and nondepolarising muscle relaxants. High concentrations of nitrous oxide are avoided with bowel present in the chest due to bowel distention resulting in respiratory impairment and possible interference with surgical exposure. In addition one lung anaesthesia is carried out using a high inspired concentration of oxygen. Bradycardia and hypotension can occur from stimulation of carotid sinus during neck dissection and mobilization of oesophagus. This is easily reversed with atropine. Surgery of lower end of oesophagus can cause compression of inferior vena cava, decreased venous return and hypotension. The surgeon should be informed and asked to relieve the compression. Hypovolemia from blood loss can also cause hypotension, which is corrected by volume replacement through large bore I.V. lines. Extreme hypotension can occur when the stomach is brought up through the posterior mediastinum, during transhiatal oesophagectomy without thoracotomy. It may be deleterious in patients with advanced cardiac disease and are not good candidates for that surgical approach. Tracheal damage is another complication that can occur during transhiatal oesophagectomy without thoracotomy as well as during dissection of middle third of oesophagus during thoracotomy. It can be managed by ventilating only via the bronchial lumen of the double lumen endobronchial tube if present, or by advancing the single lumen endotracheal tube beyond the tracheal rupture into the bronchus.

Due to the magnitude of surgery, the patient's advanced age, debilitation and cardiorespiratory impairment, these patients are usually left on mechanical ventilator in the ICU. Postoperative complications include pleural effusion, wound infection, pneumonia, and leak from anastamotic site resulting in mediastinitis, sepsis, hydrothorax, or

pyothorax. Hypoxia can occur due to intraoperative lung manipulation, anaesthesia and postoperative incisional pain. Effective postoperative pain relief encourages deep breathing, cough, and mobilization of secretion and cooperation in chest physiotherapy thus decreasing the morbidity. Postoperative analgesia can be achieved by thoracic or lumbar epidural catheter, and infusion of epidural narcotics with or without local anaesthetics. Cryoanalgesia, intercostal nerve blocks, and intrapleural analgesia are other means to provide analgesia.

References

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