

Questions And Answers - Part 16

O Wenker

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Abstract

QUESTION 1

Intra Aortic Balloon Pump Counterpulsation (IABP)

- what are the contraindications for IABP
- how is the IABP triggered

QUESTION 2

Inhalation anesthetics:

- What are the metabolic rates for halothane, enflurane, isoflurane, and nitrous oxide ?
- What is the minimum alveolar concentration (MAC) ?

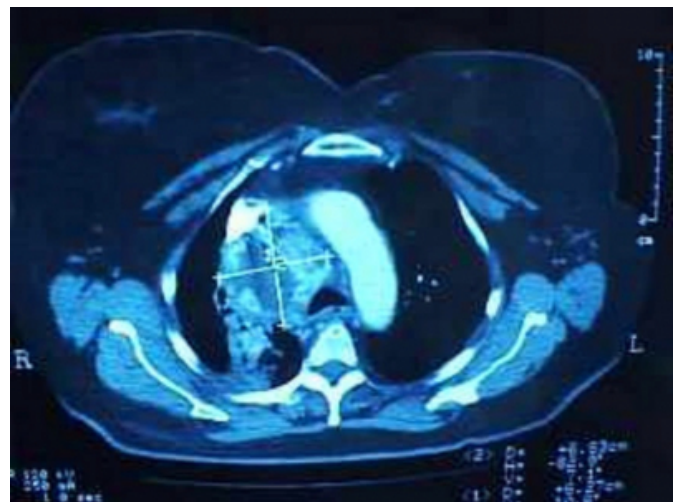
QUESTION 3

What is wrong with this X-ray and chest CT ?

Figure 1



Figure 2



ANSWER 1

a) Contraindications for IABP are:

- Severe Aortic valvular insufficiency
- Aortic dissection
- Severe peripheral vascular disease
- Brain Damage

b) Triggering

To achieve optimal effect of counterpulsation, inflation and deflation need to be correctly timed to the patient's cardiac cycle. This is accomplished by either using the patient's ECG signal, the patient's arterial waveform or an intrinsic pump rate. The most common method of triggering the IABP is from the R wave of the patient's ECG signal. Mainly balloon inflation is set automatically to start in the middle of the T wave and to deflate prior to the ending QRS complex.

Tachyarrhythmias, cardiac pacemaker function and poor ECG signals may cause difficulties in obtaining

synchronization when the ECG mode is used. In such cases the arterial waveform for triggering may be used.

ANSWER 2

a) Microsomal enzymes responsible for metabolism are mainly located in liver and kidneys. The rates of metabolism in the human body are approximately 10 to 20 percent for halothane, 2.5 percent for enflurane, about 0.2 percent for isoflurane, and zero percent for nitrous oxide.

b) Anesthetic potency of volatile anesthetics is measured by the minimum alveolar concentration (MAC). This value represents the alveolar concentration of an anesthetic (at one atmosphere) that prevents movement in 50 percent of the subjects in response to pain. A variety of noxious stimuli have been used to provoke response. For determination of MAC in humans, the usual stimulus used is surgical skin incision. In daily practice, MAC must be exceeded by a factor of 1.3 in order to assure sufficient surgical anesthesia for most of our patients. 1.3 times MAC will prevent movement in about 95 percent of the patients. The idea of measuring MAC is that after a short period of equilibration the alveolar concentration of the gas equals the blood concentration and a little later equals the brain concentration. It represents after a short time the partial pressure of the anesthetic in the central nervous system (CNS) and it is therefore the most useful index of anesthetic potency. MAC is age-dependent, being lowest in newborns, reaching a peak in infants, and then decreasing progressively with increasing age. MAC values for inhaled anesthetics are additive, which means that the addition of nitrous oxide will decrease the MAC of another volatile anesthetic. The MAC can also be altered following administration of opioids. Inhalation anesthetics alone are not able to suppress hemodynamic responses to painful stimuli nor does MAC for skin incision predict the concentrations of inhalation anesthetics necessary to avoid the motor responses to other painful stimuli such as endotracheal intubation. As a rule of thumb, the addition of every one percent of alveolar nitrous oxide to another inhalation anesthetic will decrease in the MAC of that gas about one percent. Increases in MAC result from hyperthermia and hypernatremia. Decreases in MAC can result from hypothermia, hyponatremia, pregnancy, hypotension, and drugs such as lithium, lidocaine, opioids, and α_2 agonists.

Minimum alveolar concentration of inhaled anesthetics in 100% oxygen:

- Halothane 0.74 percent

- Enflurane 1.68 percent
- Isoflurane 1.15 percent
- Desflurane 6.3 percent
- Sevoflurane 2.0 percent
- Nitrous oxide 104 percent

ANSWER 3

- Chest X-ray: atelectasis of the right lung with mediastinal shift to the right
- Chest CT scan: mediastinal mass (7 cm in diameter) compressing the trachea just above the carina

A CT image taken at a level just below the carina demonstrates a intrabronchial mass obstructing the right main bronchus.

Figure 3



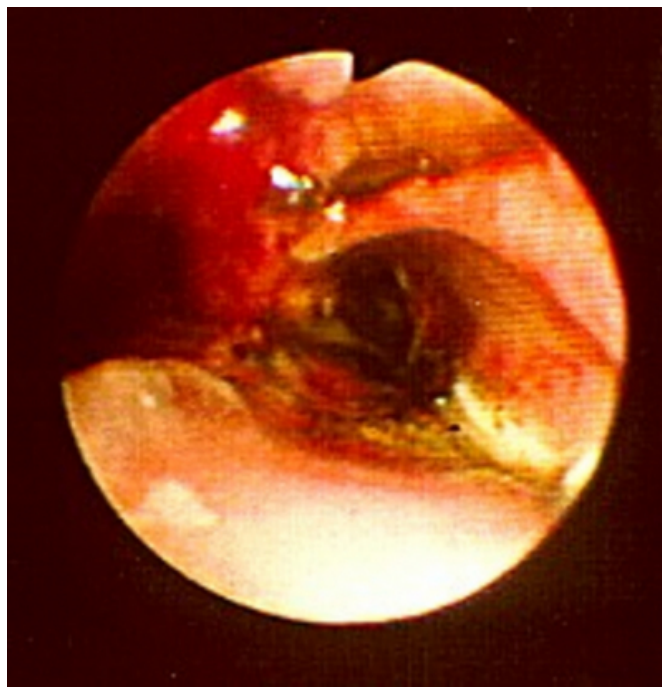
Bronchoscopy revealed the intrabronchial mass occluding the right main bronchus leading to atelectasis of the right lung.

Figure 4



The mass was removed with laser surgery. The image below demonstrates postoperative open airway.

Figure 5



The postoperative chest X-ray shows that the right lung is ventilated again.

Figure 6



References

Author Information

O. Wenker, M.D.

MD Anderson Cancer Center, The University of Texas