Self-assessment

This section is designed to test your knowledge of selected topics in this issue of the journal. The correct answers are given at the foot of the page.

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MULTIPLE CHOICE QUESTIONS

1 The anaesthetic machine

which of the following are true regarding the characteristics of rotameter?

A. ☐ It is a fixed pressure, variable orifice flowmeter

B. ☐ The rotameters are interchangeable between different gases

C. ☐ The flow is determined by the viscosity of the gas at low flow rates

D. ☐ A pressure reducing valve controls the flow of gas into the rotameter tube

E. ☐ Rotameter tube exhibits the features of an orifice at high flow rates

2 Principles of artificial ventilation

Which of the following are true regarding the effects of positive end expiratory pressure (PEEP) in a mechanically ventilated patient?

A. ☐ PEEP may improve oxygenation by reducing the shunt

B. ☐ In heart failure, PEEP may further reduce cardiac output

C. ☐ PEEP should be set optimally at the higher inflection point of the static compliance curve

D. ☐ Excessive PEEP can cause over-distension of the alveoli and increase dead space

E. ☐ PEEP should be avoided in ventilated patients with acute brain injury

3 Pharmacokinetic variation

Which of the following drugs inhibit the cytochrome p450 enzyme system?

A. ☐ Metronidazole

B. ☐ Griseofulvin

C. ☐ Carbamazepine

D. ☐ Ciprofloxacin

E. ☐ Omeprazole

4 Anaesthetic breathing systems

Which of the following are true regarding the uses and properties of Mapleson breathing systems ?

A. ☐ Mapleson A is a very efficient system for spontaneous ventilation as warm and humidified exhaled dead-space gas is reused

B. ☐ A modification of the Mapleson C system is called the 'Lack' system

C. ☐ Mapleson B requires a very low fresh gas flow to prevent rebreathing

D. ☐ Mapleson D is ideal for paediatric anaesthesia in children weighing less than 20 kg

E. ☐ Mapleson F is a Mapleson D system with an open-ended valve-less bag attached to the expiratory limb

SINGLE BEST ANSWER

5 Which of the following are true regarding total intravenous anaesthesia (TIVA) in children compared to adults?

A. ☐ There is increased risk of emergence delirium in children due to remifentanil in TIVA

B. ☐ Similar models of TIVA can be used in the neonate and adults

C. ☐ Children will need a lower maintenance rate compared to adults

D. ☐ Prolonged infusion will accumulate peripherally to a greater extent compared to adults

E. ☐ Compartment volumes are smaller in children compared to adults

6 Which of the following about TIVA and drugs used for TIVA is true?

A. ☐ Ideal drugs should have a larger peripheral compartment

B. ☐ Morphine is suitable for infusion for a TIVA technique

C. ☐ TIVA causes more postoperative ileus when compared to volatile anaesthesia

D. ☐ Chances of tumour recurrence after surgery may be reduced by utilization of TIVA

E. ☐ NAP5 identified TIVA as a potential risk factor for accidental awareness during anaesthesia

ANSWERS

1. **Correct answers: A, C, E**
2. **Correct Answers: A, D**
3. **Correct answers: A, D, E**
4. **Correct Answer: A, D, E**
5. **Correct Answer: D.** TIVA in paediatrics is a lot less routine than in adults but has many specific advantages to paediatric anaesthesia. These include decreased emergence delirium, reduced airway reactivity and less postoperative nausea and vomiting. However, the pharmacokinetic and pharmacodynamic variability, the effect of propofol metabolism in early life, specific issues in the critically ill and the non-linear changes in volume of distribution and clearance mean TIVA should be used with extreme caution in the neonate and ex-premature infants.

   Compartment volumes in children are about twice the size of that of adults compared to their respective body weight. This results in children being delivered a larger initial bolus dose and infusion rate relative to body weight. This difference normalizes at the age of 16 years. There is also a greater rate of clearance, peaking at 1 year of age, resulting in a higher maintenance rate. Prolonged infusion will also accumulate peripherally to a greater extent compared to adults, producing a slower patient wake-up post termination of infusion.

   The two most widely used and validated paediatric TCI programmes used in practice are the Kataria and Paedfusor models. The Kataria model is suitable for children between the ages of 3—16 years with a weight range between 15 and 61 kg compared to the Paedfusor (a variant of the Marsh model) which is appropriate in children aged between 1 and 16 years who weigh between 5 and 61 kg. Paedfusor features non-linear scaling of V_1 volume above the age of 12 years. Teenage children who weigh more than 61 kg can be managed using the Marsh adult model.
6. **Correct Answer: E.** The duration of action of a drug given as an intravenous bolus is influenced by its degree of distribution to peripheral compartments and clearance from the central (plasma) compartment.

   Drugs which have a smaller peripheral compartment and/or higher clearance would have a more constant context-sensitive half time, which is to say that the off-set of action increases relatively slightly even with longer infusions.

   Drugs that have relatively constant context sensitive half times (such as remifentanil, alfentanil, and propofol) are suitable for infusions and TIVA techniques, in contrast to drugs such as thiopentone. Furthermore, drugs such as morphine with active metabolites will be less amenable for TIVA.

   When compared to volatile anaesthesia, a reduction in postoperative nausea and vomiting is a recogized feature of propofol-based TIVA technique. Along with the potential reduction in ileus, proponents have argued for the role of TIVA as part of an enhanced recovery protocol.

   Additionally, there has been a suggestion that TIVA may have different immunological and inflammatory effects compared to volatile anaesthesia, and that the chances of tumour recurrence after surgery may be reduced by utilization of TIVA. Although this claim is speculative at present, the use of TIVA may expand further should concrete evidence of benefits emerge.

   On the other hand, NAP5 identified TIVA as a potential risk factor for accidental awareness during anaesthesia. This perhaps is not surprising as the current practice of TIVA relies on a theoretical plasma/brain concentration based on infusion rate, rather than on real-time measurements of concentration, as in end-tidal concentrations of volatile anaesthetics. Therefore, the Association of Anaesthetists' standards for minimum monitoring in anaesthesia in TIVA includes the use of concomitant processed electroencephalogram (pEEG) monitoring.