INSTRUMENTS

Depending on the indication for endoscopy various instruments may be required including biopsy forceps, foreign body retrieval, cautery loop or cytology brush. Instruments are either single or multi-use but must be sterile. They are checked before and after use for damage to the shaft or hinges as this can cause trauma to the instrument channel if used. Multi-use instruments are cleaned and sterilized between patients.

SPECIFIC PROCEDURES

Depending on the area being scoped there may be specific patient preparation (e.g. enema prior to colonoscopy), equipment requirements and potential complications. The veterinary nurse should be aware of these specific differences.

KEY LEARNING OBJECTIVES

- Know the components of an endoscope
- Learn how to prepare and maintain equipment
- Understand specific endoscopic procedures

MULTIPLE CHOICE QUESTIONS

1. Which of the following statements is TRUE?
 - (A) Flexible endoscopes should be stored in their case
 - (B) Flexible endoscopes should be hung vertically to dry
 - (C) Endoscopes can be sterilized using heat
 - (D) Leak testing is performed once a month
2. Which of these components is not part of the endoscope handpiece?
 - (A) Suction button
 - (B) Insufflation/flush button
 - (C) Air pump
 - (D) Directional dials
3. What colour ring on the endoscope hand piece can indicate that it is safe to fully immerse the equipment?
 - (A) Red
 - (B) Yellow
 - (C) Green
 - (D) Blue

Low-stress bronchoscopy

Laura George

Bronchoscopy is a useful diagnostic (e.g. airway collapse) and therapeutic tool (e.g. foreign body removal) but may also carry uncommon but important risks. Being aware of the required equipment and potential complications is essential to achieve low-stress bronchoscopy.

EQUIPMENT

A flexible endoscope is most commonly used and is examined for damage, leak tested and sufficiently disinfected prior to use. It is recommended to disinfect the endoscope within 3 hours prior to the procedure, hanging it in a clean, safe environment to dry.

Depending on the indication for bronchoscopy, equipment may be required to collect a bronchoalveolar lavage (BAL) including sterile NaCl 0.9%, mucus extractor and BAL catheter. Various endoscopic instruments may be required including biopsy forceps, cytology brushes and foreign body retrieval forceps, all of which must be sterile.

It is advisable to gather equipment enabling oxygen supplementation alongside the scope during the procedure. In larger dogs the endoscope may be passed down the endotracheal tube (ETT) but small dogs are extubated once stable under general anaesthetic (GA) and oxygen can be provided by passing a sterile BAL catheter down the instrument channel and connecting to oxygen.

PATIENT

These patients will benefit from preoxygenation followed by rapid induction and intubation ideally with a sterile ETT. The preferred GA method is total intravenous anaesthesia to maintain a suitable depth while reducing the risk of environmental contamination with volatile agents.

The patient is placed in sternal recumbency with their head slightly elevated. A suitable-size mouth gag is essential but it is important to avoid overextension of the jaw as this can cause cerebral ischaemia (particularly in cats).

The veterinary nurse may be responsible for GA monitoring and alongside vital parameters should monitor oxygen saturation (SpO₂) using a pulse oximeter.

COMPLICATIONS

Airway irritation can occur if GA depth is insufficient and this may manifest as gagging and coughing. Regular assessment of GA depth and clear communication with the veterinary surgeon throughout the procedure is vital.

Hypoxaemia (SpO₂ <95%) can occur both during and after the procedure. If hypoxaemia occurs during, the endoscope is removed, the patient intubated if not already and 100% oxygen supplied. The procedure continues once SpO₂ has normalized. The recovery environment should be calm and quiet and on-going oxygen supplementation is provided until the patient is ambulatory. Pulse oximetry should also remain connected, monitoring for hypoxaemia. It is advisable to have equipment prepared for emergency GA and intubation if required.

Bronchospasm occurs when the bronchi narrow due to the smooth muscles tightening and can lead to respiratory obstruction. This is treated using bronchodilators, for example, terbutaline, and it is useful to have the drug

Canine medicine

dosage pre-calculated prior to bronchoscopy. In some cases the veterinary surgeon may prescribe bronchodilators for 24 hours before the procedure.

Pneumothorax is a rare complication but can occur if diseased lung parenchyma ruptures. Various sizes of sterile syringes and needles should be prepared for emergency thoracocentesis.

KEY LEARNING OBJECTIVES

- Learn about efficient preparation: equipment and patient
- Understand the potential complications
- Understand prevention and treatment of complications

MULTIPLE CHOICE QUESTIONS

1. Which type of drug is it sensible to have calculated and ready to draw up prior to starting bronchoscopy?
(A) Antibiotic
(B) Anti-diuretic

- (C) Bronchodilator
- (D) Opioid

2. Why is a flexible endoscope most commonly used for bronchoscopy?
(A) It is a cheap piece of equipment so readily available in every practice
(B) It is manoeuvrable so allows evaluation of different parts of the airway
(C) It is easier to clean and maintain than a rigid endoscope
(D) There is no risk of bronchospasm when using a flexible endoscope
3. How long should a patient receive oxygen supplementation and have their oxygen saturation levels measured during recovery?
(A) Until extubation
(B) For 1 hour
(C) Until the respiratory rate is 16 per minute
(D) Until they are ambulatory and no longer tolerating it

All the maths: clinical calculations revisited and reworked

Sam McMillan

There are many reasons why math creeps into the every-day lives of veterinary nurses. It is imperative that drugs are administered accurately and calculations must be learnt and understood in order to enable this.

DRUG DOSE CALCULATION BASED ON PATIENT WEIGHT

Drug dose in mg = body weight in kg × drug dose prescribed in mg/kg.

Medications can be measured in both weight and volume, and both parts are needed to determine the concentration of the drug. A drug labelled as 5 mg/ml means that each millilitre (volume) of the drug contains 5 mg (weight) of the drug.

Drug dose in ml = drug dose in mg/concentration of drug in mg/ml (the drug concentration is always listed on the bottle or packaging).

Example:

- 22-kg dog, 4 mg/kg drug dose, drug concentration 50 mg/ml
- $22 \text{ kg} \times 4 \text{ mg/kg} = 88 \text{ mg}$
- $88 \text{ mg} / 50 \text{ mg/ml} = 1.76 \text{ ml}$ drawn up and administered.

PERCENTAGE SOLUTION CALCULATIONS

The easiest way to think about percentage solutions is to move the decimal point one place to the right (multiply it by ten) to establish the mg/ml concentration of the solution. For example, a 10% solution, decimal point moved one place to the right, 10.00 then it becomes 100.0 so it is a 100 mg/ml solution.

CONSTANT-RATE INFUSIONS

From mg/kg/h or µg/kg/h or mg/kg/min or µg/kg/min, the amount of drug to be administered per hour can be calculated. This is done in the same way as drug dosage.

Example:

- 10-kg dog to be administered intraoperatively at 10 µg/kg/min, so
- $10 \text{ kg} \times 10 \text{ µg} = 100 \text{ µg/min}$
- Concentration of ketamine is 100 mg/ml
- 1000 µg in a mg so $1000 \times 100 = 100,000 \text{ µg/ml}$
- $100 \text{ µg per min} / 100,000 \text{ µg per ml} = 0.001 \text{ ml/min}$ of ketamine at the current dilution.

If the dilution of the ketamine is considered and changed to 1 ml (100 mg) of ketamine to 499 ml of fluid then the drug concentration has been changed to 100 mg/500 ml:

- $100 \text{ mg} / 500 \text{ ml} = 0.2 \text{ mg/ml}$
- To get to µg: $1000 \times 0.2 \text{ mg} = 200 \text{ µg/ml}$
- To find out how much of the new dilution the dog needs: $100 \text{ µg per min} / 200 \text{ µg/ml} = 0.5 \text{ ml/min}$ of the new diluted ketamine
- Scale this down to avoid wastage, so for a 2-hour surgery
- $2 \times 60 \text{ min} = 120 \text{ min}$
- $120 \text{ min} \times 0.5 \text{ ml/min ketamine} = 60 \text{ ml of solution}$ required.

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