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Care of flexible endoscopes for veterinary nurses

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ABSTRACT: Endoscopy is becoming an increasingly common procedure in many veterinary practices and a wide range of endoscopes are more readily available on the market. The registered veterinary nurse (RVN) can play a vital role in the setup, conducting and the clean down of the procedure but knowledge of how to handle and care for these expensive pieces of equipment is crucial. This article will outline the basic components of flexible endoscopes, describing how to maintain them and discuss the ancillary equipment that may be used during the procedure.

Keywords: Endoscope; Components; Maintenance; Handling; Instruments

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Endoscopy is a form of diagnostic imaging and it means to 'look inside' (Chamness, 2008). The term endoscopy encompasses a variety of procedures including gastrointestinal (GI) endoscopy, rhinoscopy (nose), bronchoscopy (airway) and cystoscopy (lower urinary tract). Both rigid and flexible endoscopes are available with the former being cheaper and less fragile but with limited uses including anterior grade rhinoscopy, arthroscopy and laparoscopy for example. This article will focus on the two types of flexible endoscope, how to maintain them and will discuss the ancillary equipment that may be used during the procedure.

Fibreoptic vs video

The two types of flexible endoscope available are fibreoptic and videoendoscopes – both use fibreoptic bundles to transmit light but use different methods of transmitting the image back to the eyepiece or monitor.

- Fibreoptic scope – the image is transmitted by fibreoptic bundles to an ocular lens in the eye piece of the scope and an endoscopic video camera is attached to the eyepiece. This video camera, containing a video chip, transmits the image to a TV monitor. This type of endoscope can be used without a TV monitor if necessary, as the operator can use the eye-piece to view the image. Fibrescopes are generally cheaper to purchase but provide a poorer image quality and if individual fibre optics become damaged, they appear as black spots on the image.
- Videoendoscope – the image is transmitted by a video chip, located at the distal end of the insertion tube, to a video processor and then TV monitor. Videoendoscopes are more expensive to purchase but produce a better image quality and resolution than fibrescopes (Walker, 2016a).

Components

All flexible endoscopes are constructed in a similar way and consist of three main sections: the handpiece, the insertion tube and the umbilical cord.

Handpiece (Figure 1)**:**

The handpiece is designed to be held in the left hand of the veterinary surgeon (VS) and consists of:

- **suction button** – allow the VS to remove excess liquid or air.
- **insufflation/irrigation button** – the VS can use air to insufflate the GI tract to aid visualisation by covering the hole in this button with a finger. To irrigate with water the button is fully depressed, this can be useful to dislodge bodily fluids obscuring the view.
- **directional dials** – some endoscopes have a single up/down two-way

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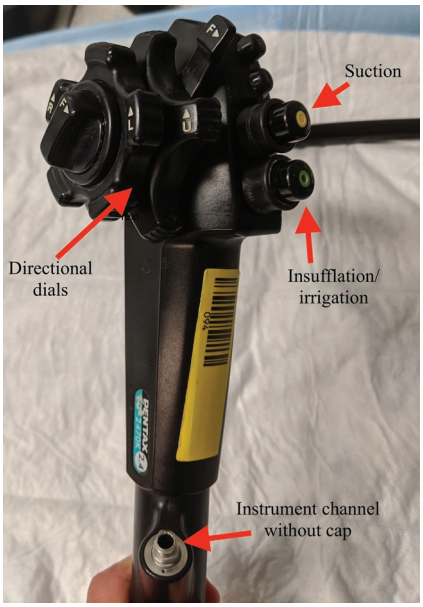

Figure 1. Components of a flexible endoscope handpiece.

directional dial (bronchoscope) and some have four-way directional dials (GI endoscope) allowing for up/down and left/right deflection. These dials can be locked into place during use.

- **eyepiece (fibreoptic scope)** – if using a fibreoptic scope the handpiece will have an eyepiece that a video camera is attached to allowing the image to be transmitted to a TV monitor.

Insertion tube

The insertion tube is the long flexible tube of the endoscope that is guided into the patient and is fragile, so careful handling is needed to prevent damage. It contains channels allowing for insufflation and irrigation along with a shared channel for suction and for passage of endoscopic instruments, the insertion tube also contains deflection cables allowing the up/down and left/right movements (Walker, 2016a). The distal tip of the insertion tube, usually the last few centimetres, is flexible and controlled by the deflection cables (Forman and Merrill, 2012).

Umbilical cord

The umbilical cord is the part of an endoscope that connects to the light source and, in videoendoscopes, to the video processor, there will also be connectors for the insufflation pump, suction pump and irrigation bottle if these features are present on the endoscope (Forman and Merrill, 2012). The suction unit that is connected may be either wall-mounted or a portable unit.

Care and maintenance

All flexible endoscopes are maintained in a similar way regardless of being a fibreoptic scope or videoendoscope and if being transported must be done so in a suitable case to protect from damage. When not being transported they should be stored in a designated cupboard to prevent accidental damage and the insertion tube is hung vertically. If an endoscope is stored in a transport case there is a risk the distal tip will develop a permanent curl, making it unusable. It is important to be careful when closing the cupboard door, it is very easy to trap an insertion tube and crush the tip which can be very expensive, sometimes impossible to repair. The main difference between fibreoptic and videoscopes during maintenance is that the latter has a waterproof cap on the end of the umbilical cord (Figure 2) which must be placed prior to cleaning.

The endoscope must be watertight to prevent damage from fluid leaking into the inner workings and causing expensive, sometimes irreparable damage. Visual examination and leak testing (Figures 3 and 4) of endoscopes must be performed before and after every use without exception and immediately prior to cleaning – it is cheaper to repair a leaking endoscope if detected early rather than long-term damage from on-going undetected leaks. Any deviation in the level of pressure should warrant further investigation and the endoscope removed from use until it has been checked.

Due to the endoscope being multi-use there is a risk of cross-contamination between patients if not thoroughly cleaned and disinfected between patients, not only does this pose an infection risk to the patient but can also lead to spurious results of patient samples leading to delays in correct treatment and the potential requirement for repeat endoscopy. It is important to develop and implement an effective cleaning protocol for all endoscopes and seeking guidance from the endoscope supplier and manufacturer is key to ensuring each individual endoscope is correctly maintained, but below is a general guidance which is followed after every use.

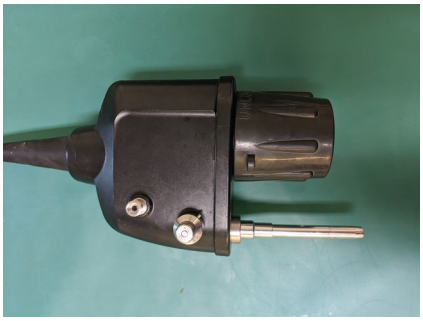

Figure 2. A waterproof cap is placed on the end of the umbilical cord prior to cleaning.

Cleaning of endoscopes occurs immediately following use to prevent mucous and bodily fluids drying in the instrument channel, which can lead to corrosion. It is important to establish if the endoscope insertion tube and handpiece can be fully submerged, a blue ring around the handpiece generally signifies it is safe to do so but, due to the risk of expensive damage, it is prudent to check with the manufacturer. No part of the processor connectors should be submerged, and great care must be taken to ensure no water touches them and that, on a videoscope, the waterproof cap is in place.

An enzymatic cleaner is used during the cleaning process helping to breakdown proteins in any bodily fluids left within the channels and once cleaned a high-level disinfectant is used to destroy various bacteria, viruses and fungi (Walker, 2016b), it is important to check with the endoscope manufacture which cleaners and disinfectants are suitable. To ensure the cleaner and disinfectant are effective it is important to follow correct dilution rates and check whether variations in water temperature will affect their function. Remember to wear the appropriate personal protective equipment when cleaning endoscopes and handling cleaning/disinfectant agents.

Precleaning

The exterior of the insertion tube is wiped with a wet cloth immediately after removal from the patient to remove any organic material.

- Whilst the endoscope is still attached to the processor and suction pump, water and air are alternately suctioned though the instrument/suction channel.
- Flush the water channel using the irrigation button.
- Detach the endoscope from the processor and suction pump and either:

  1. Remove the video camera from a fibreoptic endoscope
  2. Place the protective cap over the connectors on a videoendoscope

- Transfer to the reprocessing area.

(Forman and Merrill, 2012)

Cleaning

- Perform leak testing (Figure 3)
- Fill a large tub or sink with the correctly diluted enzymatic cleaner – this should be discarded between each patient to prevent cross-contamination.

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Leak-testing of endoscopes is performed before and after every use so any leaks are detected early.

- Check with the endoscope manufacturer/supplier what pressure should be tested.
- Remove all buttons and instrument channel caps.
- Attach the leak tester and pressurise to the recommended level.
- Submerge the pressurised insertion tube in water and, using the directional dials, carefully flex the distal tip in all directions.
- Observe for any evidence of bubbles indicating a leak.
- If the pressure deviates at all or bubbles are observed, the endoscope should be removed from use until it can be checked by an appropriate person e.g. manufacturer.

Figure 3. Leak-testing method.

Figure 4. A leak tester is attached and pressurised to the correct level to check for leaking.

- Immerse the endoscope fully and leave immersed for the following steps.
- Use a small, soft brush to thoroughly clean all removable parts such as buttons and the instrument channel cap.
- Use a non-scratch cloth or sponge to clean any material from the external aspect of the endoscope.
- Pass an appropriate sized cleaning brush through the insertion tube, umbilical cord and handpiece – the endoscope supplier/manufacturer should be able to provide full training in this part to ensure it is performed thoroughly.
- Leave the endoscope to soak in the enzymatic cleaner for the recommended amount of time – as specified by cleaner manufacturer.
- Rinse the endoscope and all parts with clean water (or distilled if the manufacturer specifies this) and flush channels. Purge all channels with air to remove water and dry the exterior.

(Forman and Merrill, 2012)

Disinfection

- After cleaning (above) the endoscope is immersed in a large tube of disinfectant made to the correct dilution and all buttons/caps are added to the tub.
- Disinfectant is flushed through all channels of the endoscope – it is important to make sure no air pockets are present.
- Soak for the recommended amount of time.
- Flush all channels with clean (or distilled) water and rinse all immersed parts thoroughly.
- Purge air through the channels to remove all water.
- Dry the exterior of the endoscope and hang with the insertion tube vertical to dry.

(Forman and Merrill, 2012)

Automatic processors are available for endoscopic cleaning/disinfecting and these provide constant flushing of disinfectant through channels and controlled soaking times (Walker, 2016b).

Various sterilisation methods are available for endoscopic equipment including ethylene oxide gas and it is important to check with the manufacturer which methods are suitable. Flexible endoscopes are rarely compatible with steam sterilisation as the high temperatures cause extensive damage.

Ancillary equipment

Mouth gags must be used whenever an endoscope passes through the mouth to prevent accidental damage to the endoscope should the patient become reactive under anaesthesia and these are cleaned and sterilised between patients.

Depending on the indication for endoscopy various flexible instruments may be required including biopsy forceps, foreign body (FB) retrieval forceps, cautery loop, aspiration needle or cytology brush. Some instruments, for example the FB retrieval forceps, are reusable and must be cleaned, disinfected and sterilised between each patient. The instruments are thoroughly checked prior to use for any damage to the shaft or hinges that may cause trauma to the instrument channel if used. Only instruments of the correct diameter for the channel should be used and the VS should never force an instrument if any resistance is met due to the risk of trauma to the endoscope.

If biopsy samples are to be collected, equipment will be needed to store and transport these. Endoscopic biopsy samples are very small and delicate, and care should be taken to avoid damaging them when removing from the forceps. One method is to insert the tip of the forceps into the preservative and shake the sample off, the forceps must be thoroughly rinsed with water between sampling. A second method is to use a 25 G needle to gently remove the sample into the preservative carefully avoiding damage to the sample. Biopsy cassettes are also available for endoscopic biopsies and the choice of method is usually down to the VS personal choice.

Conclusion

Endoscopes are an expensive investment for any veterinary practice and correct maintenance is crucial to prevent damage or breakage of this equipment. Advice should be sought from the endoscope manufacturer or supplier when planning a cleaning protocol to ensure that the products and techniques are most suitable for the individual endoscope and all staff that will be handling this equipment should receive full training. It is important not to become complacent when handling and cleaning this equipment as this can lead to inadequate maintenance of the equipment.

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