PROBE INTO SMALL ANIMAL UPPER GASTROINTESTINAL ENDOSCOPY

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Simon Tappin examines the preparation techniques behind effective endoscopy, outlines some of the physical signs that can indicate problems and illustrates appropriate biopsy methods

UPPER gastrointestinal endoscopy allows evaluation of the oesophagus, stomach and proximal small intestine.

The upper gastrointestinal tract can be inspected visually, and biopsies can be taken for histopathology using minimally invasive techniques.

Upper gastrointestinal endoscopy also allows therapeutic intervention, such as the removal of foreign bodies, placement of feeding tubes (gastrostomy and jejunostomy tubes) and dilation of oesophageal strictures.

Endoscopic evaluation of the upper gastrointestinal tract (Table 1) has many indications, but it should always be performed as part of a logical investigative pathway.

This starts with a full history and clinical examination, which should include blood work, imaging and faecal analysis (as needed) prior to endoscopy. Endoscopic evaluation is limited to the proximal small intestine and, although the ileum can be evaluated via lower gastrointestinal endoscopy, mid-intestinal lesions cannot be evaluated.

Similarly, motility disorders and diseases affecting associated structures – such as the pancreas –

cannot be evaluated. Full evaluation of the gastrointestinal tract requires patience, skill and experience.

Passage through the pylorus into the duodenum can be difficult, even for the most experienced operators.

Endoscopy allows the collection of biopsy samples, and has the advantage of having a lower risk of complications when compared to surgical biopsies. However, it is important to note that endoscopic biopsies only allow evaluation of the mucosal layers – therefore, although it is best practice to consider endoscopic biopsies before surgery, in cases where changes are suspected in deeper layers (such as the submucosa or the muscularis) or in diffuse or infiltrative diseases (such as lymphangiectasia or alimentary lymphoma), full-thickness biopsies may be needed to confirm the diagnosis.

Equipment

Flexible paediatric gastroscopes are commonly used to evaluate the upper gastrointestinal tract in dogs and cats. These typically have a working length of around 1.0m, and insertion tube diameters of between 6mm and 10mm (Figure 1). This type of endoscope will allow passage through the pylorus in most dogs. However, in larger dogs, adult gastroscopes (with a working length of around 125cm) or colonoscopes (working length of around 150cm to 200cm) are needed. These longer scopes have larger diameters (10mm to 14mm) and, due to their length, are more difficult to manipulate. Hollow, rigid endoscopes allow evaluation of the oesophagus, and are useful in retrieving oesophageal foreign bodies (Figure 2).

Endoscopic biopsies are obtained using biopsy forceps inserted through the endoscope's working channel, allowing pinch biopsies to be taken from the mucosal surface. The size of the forceps used will greatly influence the size of the biopsies taken. Therefore, ideally, the working channel should accept forceps more than 2mm in diameter (Figure 3).

When upper gastrointestinal endoscopy is performed, gastric and intestinal biopsies should always be taken, even if the mucosa appears normal, as mucosal appearance does not correlate well with histopathological findings.

Effective endoscopy also requires adequate provision of air (to allow insufflation of the stomach and small intestine), suction (to remove fluid and air after the procedure) and light (Figure 4).

Patient preparation

The patient should be starved for at least 12 hours prior to upper gastrointestinal endoscopy. However, water does not need to be withheld. Upper gastrointestinal endoscopy is always performed under general anaesthesia.

Premedication with low-dose acepromazine (0.01mg/kg) in combination with an opioid is usually a good choice. Although it is a theoretical risk that narcotics increase pyloric sphincter tone, practically this is not often a problem.

A cuffed endotracheal (ET) tube is essential, and should be tied to the lower jaw to facilitate passage of the endoscope and prevent the ET tube becoming dislodged during endoscope insertion and manipulation.

Nitrous oxide is not used during endoscopy, as it can diffuse into insufflated organs – especially the stomach – causing over-distension. Intravenous diazepam can be useful to aid pyloric relaxation.

Once anaesthetised, the patient is placed in left lateral recumbency. This positions the pyloric antrum uppermost, allowing it to fill with air; this makes the pylorus more visible and facilitates intubation. A mouth gag is always used to prevent damage to the endoscope. It is essential to record findings during endoscopy, and the WSAVA gastrointestinal standardisation group (www.wsava.org/standardizationgroup) has produced forms that are very useful for this purpose (Figure 5).

Oesophagoscopy

Once the patient is correctly positioned and anaesthetised, water-soluble lubricant is applied to the distal portion – but not the tip – of the endoscope, which is passed into the oesophagus. This is easiest to achieve with the head and neck extended, and the endoscope is passed dorsally over the ET tube and larynx through the upper oesophageal sphincter. If possible, this should be done under direct visualisation – during which the upper sphincter is seen as a star-shaped opening (Figure 6).

It is often difficult to coordinate this, and red outs (loss of visualisation due to intraoperative bleeding) often occur, so more frequently, the endoscope is passed blindly. Once past the upper oesophageal sphincter, the oesophagus is gently insufflated to allow visualisation of the mucosa.

The endoscope can then be gently advanced so that the entire length of the oesophagus is examined. The endoscope position should be adjusted so the whole oesophageal circumference is in view. General anaesthesia leads to smooth muscle relaxation, which can give the oesophagus a dilated appearance – care must be taken not to confuse this with megaoesophagus. In the proximal oesophagus, the tracheal rings can be seen indenting the trachea ventrally, and the great vessels indent the lumen over the heart base (Figure 7).

Passage of the endoscope will allow assessment of the mucosa, which is normally an even, pale pink. Oesophagitis causes inflammation and an irregular surface to the mucosa (Figure 8). Biopsies are not normally taken in the oesophagus, unless masses are present or the aetiology of the lesions seen is unclear.

On passing the heart base, the lower oesophageal sphincter will be visible; this usually has a slitlike appearance.

Occasionally, the lower oesophageal sphincter appears reddened due to the transition to gastric mucosa. This is not normally a significant finding, as long as there is no associated mucosal inflammation (Figure 9).

The last few centimetres of the feline oesophagus has circular mucosal folds, giving it a so-called “herring bone” appearance. These are normal and should not be confused with constrictions relating to oesophageal strictures (Figures 10 and 11).

Gastroscopy

Once the oesophagus has been fully examined, the endoscope is gently passed through the lower oesophageal sphincter.

This usually requires slight angulation of the endoscope tip and gentle insufflation. If passage is difficult, it is most likely that the endoscope is abutting the oesophagus wall, lateral to the sphincter. The scope should be repositioned, rather than forcing the endoscope onwards.

Once in the stomach, an initial examination can be performed. However, the aim is to pass through the pylorus quickly, leaving full examination and gastric biopsies until after the duodenum has been evaluated. Spending too long evaluating the stomach before attempting to intubate the pylorus can lead to over-distension of the stomach, making intubation more difficult. Thus, although a description of the examination and biopsy techniques for the stomach follow here, they are performed after the duodenoscopy.

On entering the stomach, it needs to be gently insufflated to allow a visualisation. The initial view should be of the stomach’s fundus. Mucosal folds will be obvious initially, and these run longitudinally towards the pylorus (Figure 12). The mucosal folds flatten as the stomach distends, and care should be taken not to over-distend the stomach, as it can reduce venous return and stimulates pyloric contraction, making subsequent pyloric intubation more difficult.

The endoscope is then gently advanced and will follow the rugal folds of the fundus towards the pyloric antrum. The pyloric antrum has less rugal folds and a smoother mucosa; the pylorus should be visible at the end of the pyloric antrum.

To evaluate the cardia and body, the endoscope is retroflexed (angled back on itself towards the cardia) to perform the J manoeuvre (so-called as retroflexion of the endoscope causes a J shape to the tip), allowing visualisation of the cardia. Fluid will pool in the cardia (Figure 13), as this is the most dependent part of the stomach. Suction should be used to remove this, and allow a full evaluation. This is important, as foreign material will also pool in this area.

The normal gastric mucosa has a variable colour (from pale pink to red), but should have a smooth appearance. Gastritis causes erythema and, as the severity increases, the mucosa appears thickened, friable and may become eroded; this can lead to gastric ulceration. Gastric ulcers have a variety of appearances, and can be benign in origin (Figure 14) or secondary to neoplasia (Figure 15). Neoplastic ulcers are most commonly seen in association with gastric adenocarcinoma, which has a predilection site for the lesser curvature, and often has raised edges of abnormal tissue.

Biopsies are taken from any areas of abnormal tissue and representative areas of normal tissue. At least two biopsies should be taken from each area of the stomach, and include the pyloric antrum, cardia and body (both the lesser and greater curvature). When taking stomach biopsies, it is important to only pass the forceps through the endoscope in a neutral position, as passage of the forceps through a retroflexed endoscope can damage the endoscope. Once biopsies (Figure 16) have been taken, air is removed from the stomach to reduce post-procedure discomfort, respiratory compromise and the risk of reflux.

Duodenoscopy

Once an initial examination has been performed, the endoscope is passed into the duodenum through the pylorus. If the pylorus is open (Figure 17), this is relatively straightforward. However, in most cases the pylorus is closed and pyloric intubation can be challenging, especially if peristaltic waves are present.

With the endoscope in the pyloric antrum, it is gently advanced towards the pyloric opening. The stomach should be as empty as possible at this stage, as over-distension may impede the forward movement of the endoscope and stimulate peristalsis. As the endoscope is advanced towards the pylorus, the pyloric opening should be maintained in the centre of the field of vision.

As the endoscope engages the pylorus, the view will be lost as the tip of the endoscope abuts the mucosa, leading to a red out. However, the pyloric opening can often be made out as a darker, star-like area. Keeping this in the centre of the field of view (which will require constant readjustment), the endoscope is gently advanced while intermittently insufflating, which should allow the pylorus to dilate and the endoscope to pass into the duodenum. Once in the duodenum, insufflation should reveal the duodenal lumen. The cranial duodenal flexure may cause continued red out after negotiating the pylorus. Further passage of the endoscope, with intermittent insufflation and gentle tip deflection, will achieve a luminal view.

In difficult cases, glucagon has been suggested to relax the pylorus, but with good technique this is rarely needed. If pyloric intubation is difficult, due to the position of the pylorus or continuous peristaltic waves, closed biopsy forceps can be used to fix the endoscope relative to the pyloric opening, and act as a guide wire for intubation. If passage is not successful, then blind biopsies can be taken through the pylorus, but care should be taken as the lack of visualisation may lead to repeated biopsies being taken from the same site. If biopsies are taken in this way, the number

should be limited to two to three biopsies to prevent duodenal damage.

The duodenal mucosa has a slightly different appearance in cats and dogs. In dogs, the mucosa appears salmon pink to red in colour, with a granular surface that is often described as similar to crushed velvet. In cats, the mucosa is paler and smoother. The surface may have a yellowish appearance if bile is present. Peyer's patches can often be seen in the canine duodenum (Figure 18), and care should be taken not to biopsy these areas, as the lymphoid tissue in these areas may suggest the presence of a lymphoproliferative disease to the pathologist. When significant duodenal pathology is present, the mucosa becomes irregular and friable, and bleeding can occur. It is very difficult to quantify duodenal pathology from its appearance, as gross findings do not correlate well with histopathology. Therefore, biopsies should always be taken, even if the mucosa appears normal.

Once in the duodenum, passage of the endoscope is relatively easy, and it should be advanced as far as possible. In most patients, the proximal duodenal flexure can be reached. Biopsies are taken from this point, and the endoscope is gradually removed to allow assessment of the mucosa and further biopsies to be taken as the endoscope is withdrawn.

Biopsies can be taken in a number of ways, but the best biopsies are taken with the forceps perpendicular to the lumen. To achieve this, the endoscope is positioned in the lumen, the forceps are positioned and opened, retracted back to the tip of the endoscope and the tip deflected to face the duodenal wall. The forceps are then extended and biopsies are collected.

Biopsies can also be taken from the mucosa facing the endoscope at flexures or after the passage of a peristaltic wave. At least six good-quality biopsies should be submitted to a pathologist who has experience of interpreting endoscopic biopsies.

As the endoscope is withdrawn, the duodenal papillae can be seen. The more distal minor papilla is seen in most dogs – but not cats – in the 12 o'clock position. The more proximal major duodenal papilla is seen in a nine o'clock position; this is the opening of the common bile duct and the major pancreatic duct (Figure 19). Figures 20 to 22 show duodenal problems.

Post-procedure management

Normally, recovery from upper gastrointestinal endoscopy is uneventful and complications are rare (Table 2). To facilitate this, it is important to remove all the air from the stomach at the end of the procedure – firstly to help patient recovery, but also to reduce the risk of gastric dilatation/volvulus, respiratory compromise and reduced venous return. Once the patient can swallow, a one-off treatment with sucralfate is usually provided to aid the healing of gastric biopsy sites. Although post-biopsy bleeding can appear marked endoscopically (Figure 23), this is rarely significant and these sites normally heal very quickly (Figure 24). Patients are usually discharged the same day, pending biopsy results.

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Further reading

- Bexfield N (2007). Gastrointestinal endoscopy in the dog and cat: part one – upper gastrointestinal tract, *UK Vet* **12**(7): 59-67.
- Hall E J (2008). Flexible endoscopy: upper gastrointestinal tract, *BSAVA Manual of Canine and Feline Endoscopy and Endosurgery*, BSAVA, UK.
- Guilford W G (2005). Upper gastrointestinal endoscopy. In: McCarthy T C (ed), *Veterinary Endoscopy for the Small Animal Practitioner*, Elsevier Saunders, Missouri.