Improve Veterinary Education

Diagnostic Imaging in Vomiting and Regurgitation in Dogs and Cats

This handout reviews imaging strategies for vomiting and regurgitation in dogs and cats, focusing on when to use radiography, ultrasound, contrast oesophagrams, swallowing studies and endoscopy, and how each modality guides diagnosis and treatment.

Overview of Available Imaging Modalities

Diagnostic imaging in patients presenting with vomiting or regurgitation relies on several complementary tools. The most widely available modality is radiography, including thoracic radiographs for regurgitation and abdominal radiographs for vomiting, which are accessible in most clinical settings. Abdominal ultrasound is also a valuable modality, although it is more technician-dependent, with diagnostic yield influenced by the experience and skill of the sonographer. Swallowing studies require specialised equipment, typically videofluoroscopy or fluoroscopy using C-arms. Endoscopy constitutes another key modality, offering both diagnostic and therapeutic capabilities, particularly for oesophageal and upper gastrointestinal disorders.

Radiography as the First-Line Diagnostic Tool

Radiographs constitute the first-line diagnostic investigation for the majority of dogs and cats with vomiting or regurgitation. This prioritisation reflects both practical access—most clinics have radiographic capability—and the relative reliability and repeatability of radiographic technique compared with more operator-dependent modalities. Determining the optimal number of views remains debated. In general, three thoracic views are considered ideal, while two cervical views are typically sufficient. For abdominal radiographs, three views may be obtained in some hospitals to ensure all potentially necessary projections are available, although two views are sufficient in specific clinical situations.

In cases of gastric dilatation-volvulus (GDV), two views are selected strategically. A standard view is obtained alongside a right lateral view, because on the right lateral projection the pylorus is positioned dorsally, allowing gas to accumulate there and creating the characteristic “double-bubble” appearance. Conversely, when pyloric obstruction is suspected, including suspicion of a pyloric foreign body, a left lateral view is preferred because the pylorus lies ventrally and is more likely to contain fluid, improving visualisation of intraluminal material.

Thoracic Radiography in Regurgitation

In patients with regurgitation, thoracic radiographs are the appropriate starting point. One common radiographic finding is generalised oesophageal dilatation, in which the oesophagus is visibly distended throughout the thorax. Such cases provide strong support for a diagnosis of megaoesophagus, and repeated exposure to typical presentations improves clinician recognition of the pattern.

If generalised oesophageal dilatation is not present, thoracic radiographs may instead demonstrate an obstructive pattern consistent with an oesophageal foreign body. Some foreign bodies are conspicuous, such as large pieces of bone lodged just caudal to the larynx and near the upper oesophageal sphincter, where removal may be technically challenging. Other objects may be less immediately obvious but still appreciable, including large rawhide pieces, skewers, or hooks, each producing an obstructive pattern within the oesophagus.

When clinical signs are strongly consistent with regurgitation but thoracic radiographs appear normal, a contrast oesophagram is recommended and is feasible in many general practices. The aim is to identify lesions not apparent on survey radiographs, including strictures, masses, radiolucent foreign bodies, and vascular ring anomalies. Two principal contrast options are described. Barium is widely available, inexpensive, and can be administered as a liquid mixture or combined with food; it may be delivered by syringe. If perforation is a concern, or aspiration risk is significant, a water-soluble iodinated contrast agent is preferred, with iohexol specifically recommended because it is not toxic if leakage occurs outside the gastrointestinal tract.

Illustrative contrast studies include a patient in which contrast highlights a pronounced diverticulum, and a case in which a hairball produces a fuzzy contrast appearance, consistent with contrast permeating the structure and outlining its margins. Contrast studies also demonstrate vascular ring anomalies; for example, a dog with otherwise normal survey radiographs but regurgitation may show a typical pattern of contrast interruption at the level of the heart base, consistent with persistent right aortic arch, with contrast then visualised in the stomach beyond the obstruction. A further case demonstrates that chronic regurgitation may be misinterpreted initially as vomiting during work-up, and a partial oesophageal foreign body may only become apparent when contrast reveals focal uptake; subsequent endoscopic evaluation confirms partial obstruction.

In situations where perforation is suspected and surgical management is anticipated, contrast choice and technique become critical. Following removal of an oesophageal foreign body, one patient developed a clear pneumothorax under anaesthesia and appeared tachypnoeic even

while anaesthetised. In that context, an 8-French Mila tube was used to administer a small volume of contrast, and iodinated contrast was selected due to high suspicion of perforation; the patient was then referred for surgical repair.

Abdominal Radiography in Vomiting

For vomiting patients, abdominal radiographs are emphasised as an excellent screening tool before progressing to ultrasound. Mechanical obstructions on abdominal radiographs are commonly categorised as pyloric outflow obstruction, small intestinal obstruction, or linear foreign body obstruction. Pyloric outflow obstruction may present as a distended stomach associated with a focal obstructive process, whereas small intestinal obstruction may involve segmental distension, and linear foreign bodies may produce characteristic patterns including plication.

Examples include an intestinal obstruction attributed to a rock, with an additional smaller foreign body visible elsewhere. Another case involves a vomiting cat in which the small intestines appear largely empty; the bladder and colon are visible, while a gastric foreign body is identified within the stomach near the pyloric region. Although the foreign body is not producing a complete outflow obstruction, its location is associated with clinical signs of chronic vomiting.

Linear foreign bodies may be conspicuous on ultrasound but can also be appreciable radiographically. In affected cats, the abdomen may appear relatively “empty” with multiple intestinal loops bunched together, supporting a diagnosis of plication secondary to a linear foreign body. Such cases are described as requiring surgical intervention. It is also emphasised that not every foreign body is directly visible on radiographs; nevertheless, many produce an obstructive pattern that can raise suspicion, including the appearance of two distinct bowel populations and gas dilatation patterns that may create confusion with colonic gas. Close assessment may support suspicion of an obstructing foreign body, and subsequent ultrasound may reveal the causative lesion more clearly.

Radiographs may also reveal non-obstructive causes or complications relevant to vomiting, such as abdominal masses. When an abdominal mass is identified on survey radiographs, ultrasound is preferred for more accurate localisation, organ attribution, and evaluation of lesion characteristics, including features such as cavitation and evidence suggestive of rupture. Thoracic radiographs are recommended following identification of an abdominal mass to assess for metastatic disease; one example described an abdominal mass that was ultimately hepatic in origin.

Radiography can also identify life-threatening findings requiring emergency intervention. A patient is described with abdominal effusion and free gas, with radiographic evidence of gas bubbles, free abdominal gas, decreased serosal definition, and abdominal fluid consistent with ascites; these findings are characterised as concerning for perforation and may warrant emergency exploratory laparotomy even during overnight hours. Despite the substantial information obtainable from radiographs, such cases may still require additional imaging—particularly abdominal ultrasound—to better define pathology and guide management.

Ultrasound as a Complementary Modality

Ultrasound and radiography are presented as complementary rather than competing tools. Radiographs are considered superior for regurgitation cases, but in vomiting patients the combination of radiographs and ultrasound is often required to detect foreign bodies and other abdominal conditions. Ultrasound is described as better for identifying intestinal masses, evaluating the degree of luminal occlusion caused by concentric or circumferential lesions, and assessing abdominal fluid and fluid-filled intestinal loops as indicators of obstruction.

In illustrative examples, radiographs may demonstrate an abnormal intestinal gas pattern and suggest obstruction, while ultrasound then identifies the foreign body with greater clarity, including the acoustic shadowing typically associated with mineralised or dense material. A clear obstructive pattern can be correlated between modalities, reinforcing diagnostic confidence.

Ultrasound findings of obstruction are described in procedural detail. A distended gastric fundus may be filled with fluid, with a measurement provided of 2.4 cm wall-to-wall. Small intestinal loops may also become fluid-filled rather than empty, and fluid may be seen moving or “tracing” back and forth. By following abnormal fluid segments, the operator may identify a focal lesion; one example notes a 1.2 cm gastric foreign body producing pronounced acoustic shadowing and a complete intestinal obstruction pattern. Ultrasound has the additional advantage of allowing assessment of subtle foreign body movement. This makes it important to document the intestinal segment involved, because a foreign body in the distal jejunum may move following rehydration, and reassessment may be informative. In reporting, localisation to the lower quadrant abdomen and specification of mid or distal jejunum are described as useful for subsequent comparison.

Another example describes two bowel populations, with markedly distended small intestinal loops proximal to an obstruction and comparatively empty loops distal to it, implying an intraluminal foreign body between these regions. Plication is described as readily evident on ultrasound, with linear foreign bodies often becoming lodged either at the base of the tongue in

cats or within the stomach. In such cases, ultrasound may reveal a strongly shadowing gastric foreign body along with bunched, plicated intestines.

Intussusception is presented as another classic ultrasound finding. It may be visible even when using smaller handheld ultrasound machines available in emergency or smaller clinic settings. The appearance is described as a double loop or layered intestinal configuration in affected patients. Surgical intervention is typically required in dogs, and although cats can develop intussusception, it is described as being encountered more frequently in dogs in the speaker's experience.

Ultrasound is also emphasised for identifying and characterising gastrointestinal masses. A gastric mass may be associated with conspicuous changes in surrounding mesentery, described as markedly hyperechoic. A distal duodenal mass is also described, and ultrasound-guided sampling is presented as an advantage in selected cases, permitting aspiration to clarify diagnosis. Although surgery remains necessary for many masses, the ability to define the lesion and obtain a sample may influence planning, particularly when a mass is not obstructive or ruptured and chemotherapy is a potential management option.

Other tumours may present with vomiting due to rupture and haemorrhage, including splenic masses. One example described a lesion that proved benign, with histopathology reporting extramedullary haematopoiesis and nodular hyperplasia associated with a ruptured haematoma.

In chronic vomiting patients, ultrasound is described as useful for evaluating intestinal thickening. Multiple small intestinal segments may show a markedly thickened muscularis layer, with an example ileal measurement of 3.5 mm compared with a cited normal threshold of less than 3.2 mm. Despite thickening, preservation of wall layering may still be visible. Ultrasound is also valuable for assessing lymph nodes; one example notes a 1.4 cm lymph node in the same patient. That patient subsequently underwent endoscopy and was diagnosed with small cell lymphoma.

Swallowing Studies and Videofluoroscopy

Swallowing studies are described as valuable but limited in availability due to equipment requirements. Videofluoroscopy is identified as the gold standard swallowing study modality and is likened in some respects to a C-arm, though it allows movement as the patient swallows, enabling real-time assessment. C-arms are referenced as equipment commonly used in orthopaedic surgery and in catheter laboratories for cardiac procedures, illustrating the

specialised context of fluoroscopic capability. Indications for videofluoroscopy include chronic gastro-oesophageal reflux disorders and suspected oesophageal motility disorders, where visualisation of bolus movement from mouth to stomach is desired. Swallowing studies are also described as potentially helpful for assessing hiatal hernias.

Endoscopy: Diagnostic and Therapeutic Roles

Endoscopy is described as more widely available than videofluoroscopy and is particularly valuable for evaluation of oesophageal disease. It enables diagnosis of oesophageal strictures, oesophagitis, and oesophageal masses, and it is presented as a modality that often combines diagnosis with treatment. For oesophageal strictures, endoscopy supports evaluation and management, and for foreign bodies it enables removal in appropriate cases. Gastric foreign bodies that are not obstructive are frequently removable endoscopically. The likelihood of successful removal is stated as high, with over 90% of gastric foreign bodies being removable by endoscopy in the speaker's experience. Proximal intestinal foreign bodies may also be accessible if located in the duodenum, but success rates are described as lower than for gastric foreign bodies. In the proximal duodenum, removal success is estimated around 50%, potentially increasing to approximately 75% depending on the material and the ability to grasp it, with cloth-like objects noted as particularly challenging.

Endoscopy is also described as useful for diagnosing inflammatory bowel disease, removing gastric polyps via snaring during the same procedure, and obtaining biopsies for neoplasia in a minimally invasive manner.

Practical Considerations for Endoscopy in Vomiting Patients

Before performing endoscopy for foreign body retrieval, fasting is emphasised as essential. A foreign body in a stomach full of food is described as markedly time-consuming, as the clinician may spend prolonged periods rotating the patient and lavaging the stomach to find the object. By contrast, the same procedure in a fasted patient may take approximately five minutes. Fasting is also critical for diagnostic endoscopy, because food in the stomach may impede passage into the small intestine. A twelve-hour fast is described as standard for diagnostic endoscopy, and efforts are made to ensure the stomach is as empty as possible for foreign body cases. If food remains present, clinicians may wait several hours and repeat radiographs to confirm gastric emptying progression before proceeding.

In chronic vomiting patients, it is advised that non-gastrointestinal causes be excluded before endoscopy, with Addison's disease cited as a classic example of an extra-gastrointestinal cause of vomiting that should be ruled out to avoid unnecessary invasive procedures.

Endoscopic images are described to illustrate disease appearance, including foreign bodies such as hairballs and towels. Oesophageal strictures are depicted as narrowing to a small lumen; oesophagitis may be focal, and it is noted that concern for clinically significant stricture increases when a full circumferential, "360-degree" lesion is present. Severe gastric masses may appear grossly abnormal; when encountered, the clinician attempts to obtain as many biopsies as possible and may use a snare to remove and cauterise larger pieces to improve representativeness. One such case was diagnosed as gastric carcinoma in a small dog.

Endoscopy is also presented as a diagnostic modality in challenging chronic vomiting cases. One cat with chronic vomiting and no diarrhoea underwent endoscopy, with the small intestinal mucosa appearing markedly abnormal. Normally visible villi were largely absent, creating uncertainty during the procedure about whether the scope was within the intestine or stomach due to the degree of abnormality. Biopsies in that case returned a diagnosis of intermediate-grade lymphoma.

Conclusion and Take-Home Message

Diagnostic imaging in vomiting and regurgitation should be approached stepwise. Radiographs form the first-line tool, with thoracic radiographs prioritised for regurgitation and abdominal radiographs for vomiting. Ultrasound is then used to complement radiographic findings, particularly for foreign body detection, assessment of obstruction, and evaluation of masses and abdominal fluid. Where indicated and available, swallowing studies using videofluoroscopy support assessment of oesophageal motility and related disorders. Endoscopy provides both diagnostic clarity and therapeutic opportunity, particularly in oesophageal disease and foreign body management, and should be performed with attention to fasting status and appropriate exclusion of extra-gastrointestinal causes in chronic vomiting patients.

Verification Summary

All major concepts from the source lecture have been retained in the original sequence: the overview of imaging modalities; radiography as first-line imaging; view selection and GDV/pyloric positioning; thoracic radiography findings in regurgitation with contrast oesophagram options and examples; abdominal radiography patterns in vomiting including obstruction categories, linear foreign bodies, masses, and perforation indicators; ultrasound

advantages with obstruction measurements, localisation, intussusception, masses, sampling, and chronic enteropathy findings; swallowing studies and videofluoroscopy indications; endoscopy indications, success expectations, procedural tips, and illustrative endoscopic disease examples.

Potential transcript-term corrections applied due to clear technical context were: “small HOCUS machines” interpreted as “small handheld ultrasound machines”; “Mala tube” rendered as “Mila tube”; “extracellular haematopoiesis” rendered as “extramedullary haematopoiesis”; “noll hyperplasia” rendered as “nodular hyperplasia”.