Signalment and History
Angel, a 5-year-old, spayed, mixed-breed dog, presented to Iowa State University Veterinary Medical Center emergency service with an esophageal obstruction. She had presented earlier that day to her referring veterinarian with a 2-day history of gagging and regurgitation that began after she ate a piece of chicken. At that time, a barium study revealed an esophageal obstruction. Blindly passing a stomach tube into the esophagus was unsuccessful at advancing the object into the stomach. Angel had no other pertinent medical history.

Physical Examination and Initial Diagnostics
On physical examination, Angel was bright and alert but apprehensive. Her temperature was 102.5°F, her pulse was 140 bpm, and she was panting. She weighed 13 lb (5.9 kg) and had a body condition score of 6/9. Angel’s initial list of conditions included anorexia, gagging, regurgitation, and esophageal obstruction. The initial differential diagnosis included esophageal foreign body, stricture, and neoplasia. Angel’s prognosis was guarded, depending on the diagnosis and the condition of the esophagus. A complete blood count (TABLE 1) revealed leukocytosis (i.e., 18.98 × 10^3 cells/µL), neutrophilia (i.e., 13.86 × 10^3 cells/µL), and monocytosis (i.e., 3.8 × 10^3 cells/µL). These results correlate with stress, inflammation, or infection. A serum chemistry profile (TABLE 1) revealed hypokalemia (i.e., 3.8 mEq/L) and a low bicarbonate concentration (i.e., 14.3 mEq/L), possibly due to metabolic losses. An increased alkaline phosphatase concentration (i.e., 173 IU/L) and an alanine aminotransferase concentration of 110 IU/L may have indicated early signs of hepatic insult due to anorexia. Hypercholesterolemia (i.e., 300 mg/dL) may have indicated pancreatitis or hypothyroidism. Thoracic radiography revealed a soft tissue opacity (2.5 × 1.5 cm) in the distal esophagus.

It was decided to anesthetize Angel for endoscopy to assess the esophageal obstruction. Angel was premedicated with butorphanol (1.2 mg [0.2 mg/kg] IV), and anesthe-
Food was withheld for 24 hours to allow a temporary gastropexy seal to develop. (See the PEG tube procedure as described in reference 1.) Angel was placed in intensive care overnight and given Normosol-R (Abbott Laboratories; 10 mL/h IV) with 10 mEq/L of potassium chloride. Buprenorphine (0.05 mg [0.01 mg/kg] IV q8h) was administered to help control pain.

**Daily Assessment and Rechecks**

The next day, Angel remained stable (i.e., temperature: 101.7°F; pulse: 80 bpm; respirations: 40 breaths/min). Her basal energy requirement was calculated to be 247 kcal/d, so she would be fed 118 mL/d of Eukanuba Max Cal slurry. Tube feedings were initiated without incident. At the first feeding, Angel received 27 mL of the high-calorie commercial slurry. Angel began receiving sucralfate (500 mg [85 mg/kg] PO q8h) as an esophageal protectant, famotidine (2 mg [0.5 mg/kg] via PEG tube q12h) to reduce acid production, and metoclopramide (1 mg [0.2 mg/kg] via PEG tube) before feedings to increase gastrointestinal motility. Buprenorphine was discontinued, and she began receiving tramadol (20 mg [4 mg/kg] via PEG tube q8h) instead.

Later that day, Angel was discharged to her owners with instructions to watch for possible complications of esophagitis (i.e., regurgitation, anorexia, ptyalism) and to continue administering the medications and feeding Eukanuba Max Cal slurry (39 mL three times daily, flushing the PEG tube with 10 mL of lukewarm water before and after each feeding). The owners were also instructed to monitor Angel for regurgitation and vomiting.

When Angel returned to the medical center 1 week later, she was doing well. No regurgitation had been noted, so it was decided to begin to wean her off of tube feedings at home. All previously prescribed medications were continued.

Seventeen days after the endoscopy, Angel presented with a 3-day history of regurgitation and ptyalism after...
receiving medications and feedings orally and via PEG tube. The results of a serum chemistry profile were within normal limits, except for a low total bilirubin level of 0.07 mg/dL and an anion gap of 23 mEq/L (TABLE 1). Thoracic radiography revealed no evidence of aspiration pneumonia, pneumothorax, or megaesophagus. Angel was placed in intensive care for overnight monitoring, and endoscopy was scheduled for the next day to check for possible esophageal stricture. Administration of sucralfate, famotidine, and metoclopramide was continued.

The next day, Angel was anesthetized, and endoscopy revealed a 2-mm diameter stricture in the distal third of the esophagus (FIGURE 4). The stricture appeared as an irregular circular narrowing of the esophagus (FIGURE 5). Balloon dilation was recommended because it is safe and effective for applying radial forces to expand stricture sites. A 10-mm diameter, 6-cm long balloon dilator was used (FIGURE 6). With the aid of an endoscope, the uninsufflated balloon catheter was positioned over the center of the stricture. The balloon was slowly distended with water while the hydraulic pressure was monitored with a manometer (FIGURE 7). A maximal dilation of 3 atm (atmosphere, standard) was maintained for 3 minutes, and then the balloon was deflated. This process was repeated three times consecutively. After the procedure, mucosal hemorrhage was present (FIGURE 8), and the stricture site had a 10-mm diameter (FIGURE 9).

The owners were told that two or three balloon procedures every 2 or 3 days for at least three or four times would likely be needed. This regimen helps prevent scar formation that could lead to severe restenosis of the esophagus. For each procedure, it is recommended to progressively increase the dilation of the stricture. After each procedure, Angel would be monitored for possible complications, such as esophageal perforation and stricture. Administration of prednisolone (5 mg [1 mg/kg] via PEG tube q24h) was initiated to help decrease esophageal inflammation. The influence of glucocorticoids on restenosis of strictures is under debate, but these drugs have not been shown to have adverse effects related to the esophageal condition. Angel was discharged to her owners with supportive care instructions.

A few days later, she returned for esophagoscopy and balloon dilation. Endoscopy revealed a 3- to 4-mm stricture approximately 1.5 cm from the lower esophageal sphincter (FIGURE 10). This stricture was in the same location as the previous one. Dilating the stricture could dilate the lower esophageal sphincter, increasing acid reflux into the esophagus. The stricture was dilated as previously described, but the balloon was insufflated to 6 atm to achieve greater stricture dilation. After the procedure, the stricture site had an approximately 10-mm diameter. Gastroesophageal reflux was visualized during the procedure. The owners elected to hospitalize Angel until the next balloon dilation, which was scheduled for 2 days later.

Angel remained bright, alert, and responsive, and her vital signs were within normal ranges. She continued to receive the previously mentioned medications. Medical therapy can be used to treat inflammatory disease in conjunction with mechanical dilation. The third endoscopy showed restructuring of the stricture, with an approximately 8-mm diameter (FIGURE 11). The stricture was ballooned using an 18-mm diameter, 5.5-cm long balloon dilator. The balloon was insufflated to 3 atm for 3 minutes for three consecutive times. The stricture site had an approximately 10-mm diameter after the procedure. Reflux was again noted during the procedure.

Angel was discharged to her owners, who were informed that ballooning might be needed again, depending on clinical signs of regurgitation. Angel’s prognosis for survival
was good, but normal esophageal function could not be guaranteed.

Angel returned 13 days later with vomiting and regurgitation. On physical examination, she was bright, alert, and responsive. Her temperature was 101.0°F, pulse was 90 bpm, and respirations were 36 breaths/min. She weighed 11.44 lb (5.2 kg) and had a body condition score of 4/9. She was anesthetized, and esophagoscopy revealed recurrence of the stricture, at which the esophagus measured 8 mm in diameter (FIGURE 12). It was ballooned using a 19-mm diameter, 5.5-cm long balloon. The insufflation was 5 atm for 3 minutes for three consecutive times. The stricture site had a 10- to 15-mm diameter after the procedure (FIGURE 13). Gastroesophageal reflux was again noted during the procedure, so it was decided to adjust Angel’s medications. Angel would continue receiving tramadol and sucralfate, but metoclopramide and famotidine were discontinued. Cisapride (3 mg [0.5 mg/kg] via PEG tube q8h) was initiated to help prevent gastroesophageal reflux and aid gastrointestinal motility. Omeprazole (5 mg [1 mg/kg] PO q24h) was initiated to reduce acid production and help decrease esophageal irritation due to reflux.

Angel was discharged to her owners with instructions to monitor for signs of recurrence and to slowly wean her off of PEG tube feedings. Angel presented 3½ weeks later because of complications with her PEG tube, which she had partially chewed. It was decided to completely remove the tube. Angel was placed in right lateral recumbency, and the tube was removed in a routine manner with no complications. She had been regurgitating after eating larger kibbles at home, so esophagoscopy and ballooning were recommended; however, the owners elected to continue supportive care instead. Amoxicillin–clavulanate (62.5 mg [10 mg/kg] PO q12h for 10 days) was initiated to treat minor irritation around the previous PEG tube site. Angel was discharged, and the owners were instructed to return if clinical signs persisted.

**Outcome**

Angel continues to do well receiving her medications and...
does not regurgitate when eating soft food. This may be partly due to the location of the stricture. Ballooning the stricture may have caused dilation of the lower esophageal sphincter, resulting in acid reflux into the esophagus, which can delay resolution of clinical signs. It is also possible that there is a residual, incomplete esophageal stricture.

Esophageal strictures are very common following esophagitis and esophageal trauma. They can occur in dogs and cats. The main clinical sign is regurgitation, but anorexia is also seen. The smaller the area of esophagus involved and the sooner corrective measures are performed, the better the prognosis. Animals requiring repeated ballooning have a guarded prognosis. A long-term gastrostomy tube may be helpful in allowing the esophagus time to heal, as in Angel’s case. The veterinary team in this case quickly removed the esophageal foreign body (after identifying it) and identified possible complications for the owners to monitor. Owner compliance and knowledge were very important in the success of this case.

References