Case Report

The Use of a Cutting Balloon for Dilation of a Fibrous Esophageal Stricture in a Cat

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Esophageal strictures are uncommon in cats with causes including medications, ingestion of caustic substances, or gastroesophageal reflux under anesthesia. Bougienage and balloon dilation are the main treatments for strictures but have variable success rates. This paper describes the novel use of a cutting balloon for dilation of a fibrous stricture in a cat that was previously refractory to treatment with traditional balloon dilation.

1. Introduction

Esophageal strictures are uncommon in cats and dogs and are generally the consequence of esophagitis caused by gastroesophageal reflux secondary to anesthesia, esophageal foreign bodies, persistent vomiting, or esophageal retention of certain medications such as tetracyclines and clindamycin [1–3]. Strictures occur when the esophagitis extends into the submucosa or muscularis resulting in a fibroproliferative reaction. Clinical signs including regurgitation, ptyalism, and dysphagia typically appear within 7–10 days of the inciting event.

Bougienage and balloon dilation are the most common nonsurgical techniques for treatment of strictures. Balloon dilation has been purported to offer an advantage due to the generation of only radial stretch forces without the concurrent longitudinal shear stress generated by bougienage, but retrospective studies in humans and a recent study in dogs have not shown any difference in clinical outcome [4–6]. The use of perendoscopic multiquadrant electrocautery has been reported for use in annular or recurrent strictures [7, 8]. Using an electrosurgical unit, three to four equidistant incisions are made in the fibrous ring followed by balloon dilation. The created incisions provide weak areas restricting the trauma of dilation to these sites and sparing the rest of the tissue [7]. Melendez et al. [8] noted an apparent benefit in decreasing the number of balloon procedures required using this technique. In this paper, we describe the use of a cutting balloon to create incisions for treatment of a refractory fibrous stricture in a cat.

2. Case Presentation

A 12-year-old female spayed Ragdoll cat was evaluated for a 3-week history of vomiting, retching, and ptyalism. Four weeks prior to presentation, the cat was evaluated at another hospital for periocular erythema and edema. Due to suspected tooth root abscessation, the cat was anesthetized and the left maxillary third premolar extracted. An unknown oral antibiotic was prescribed. One week prior to presentation, the cat was seen at a second hospital for vomiting. Examination identified prolapse of the left third eyelid with mild corneal edema. Results of a biochemistry panel, complete blood count, and total T4 were unremarkable. Bacitracin-neomycin-polymyxin B ophthalmic ointment was prescribed.

Physical examination at initial presentation (day 1) identified a body temperature of 39.9°C, body weight of 2.4 kg, and a body condition score of 3 out of 9. General examination was unremarkable. Ophthalmic examination identified a superficial corneal ulcer in the left eye. Routine topical treatment for the ulcer was prescribed. Initial differentials for the clinical signs included true vomiting due to primary gastrointestinal...
disease or regurgitation due to esophageal disease. Diagnostics on day 1 included abdominal radiographs which revealed diffuse small intestinal adynamic ileus without obstruction and abdominal ultrasound which revealed mildly decreased renal size bilaterally and mineralization of the left adrenal gland.

On day 2, an esophagram was performed fluoroscopically and a focal circumferential area of stricture was noted at the level of C5 (Figure 1). Esophagoscopy (Fujinon EG-270N5 and EG-250WR5 gastroscopes, Fujinon Inc., Wayne, NJ) was performed on day 3 and confirmed a circumferential stricture in the proximal esophagus narrowing the lumen to 2 mm in diameter. Balloon dilation (CRE esophageal balloon dilation catheter, Boston Scientific, Natick, MA) was performed and resulted in a severe, deep esophageal mucosal tear. Thoracic radiographs did not identify evidence of perforation, and the owner declined gastrostomy tube placement. Conservative treatment included partial parenteral nutrition, cefazolin (21.4 mg/kg i.v. q8 h), buprenorphine (0.01 mg/kg p.o. q8 h), famotidine (1 mg/kg IV q12 h), and IV fluids.

On day 8, repeat esophagoscopy revealed the previous tear to be nearly healed and recurrent stricture. The area of stricture was balloon dilated to 6 mm with only mild mucosal tearing. Partial parenteral nutrition was discontinued, and the patient was discharged from the hospital. Home medications included ranitidine (2 mg/kg PO q12 h) and sucralfate suspension (250 mg PO q8 h).

The cat presented on day 12 for reexamination. The owner reported that the cat had done well at home eating a canned food diet mixed with water. No clinical signs were noted. Esophagoscopy revealed complete mucosal healing and recurrent stricture to a lumen diameter of 4 mm. During the examination, a fibrous band of tissue extending approximately 70% of the circumference was noted at the stricture site. The stricture was serially dilated to 8 mm with minimal mucosal tearing. When dilated to 9 mm, a longitudinal, focal, and deep mucosal tear developed with persistence of the fibrous, band and no further dilation was attempted. The cat was discharged with instructions to continue the ranitidine and sucralfate at home.

On day 23, the cat presented for reexamination. The owner noted that the cat did well at home for 7 days after balloon dilation but began gagging and drooling on the 8th day. Esophagoscopy showed the same appearance to the stricture as on day 12 with the same results noted after balloon dilation to 9 mm. The owner was instructed to continue ranitidine and sucralfate upon discharge. At followup by telephone on day 29, the owner reported that the cat was eating the canned food with water well at home with no clinical signs. Esophagoscopy showed mild stricture recurrence with a lumen diameter of approximately 7 mm (Figure 3). The CB was used to dilate the stricture as before followed by dilation with a balloon catheter to approximately 11 mm with mild, superficial, and diffuse mucosal tearing. The cat was discharged with instructions to continue the sucralfate for 4 weeks. Further esophagoscopic evaluation was declined by the owner due to financial constraints. At telephone followup on days 90 and 143, the owner reported that the cat was eating a canned food diet mixed with a small volume of water well and no clinical signs were reported.

The cat presented for unrelated issues one year later. No clinical signs of esophageal disease had recurred, and the cat was eating a canned food diet with a small volume of water added. Esophagoscopy was repeated. At the site of previous stricture, there remained a band of fibrous tissue involving approximately 50% of the circumference. The lumen diameter was estimated to be 9 mm. The rest of the esophagus appeared normal.

3. Discussion

The CB was first designed by Barath et al. in 1991 as a novel approach to angioplasty and features three to four atherotomes, or microsurgical blades, that are fixed at equidistant...
Figure 2: Endoscopic appearance of the esophageal stricture at re-examination on day 53 after 4 previous dilations. A band of fibrous tissue is present at the site of stricture extending from 7 o'clock to 2 o'clock resulting in a lumen diameter of 4 mm (a). After initial dilation with an 8 mm cutting balloon, multiple defects (white arrowheads) are noted in the fibrous band, now at 3 o'clock to 9 o'clock (b). Subsequent serial dilations with conventional dilation balloons resulted in further disruption of the fibrous band at these defects (c) and more diffuse mucosal tearing resulting in a lumen diameter of 10 mm (d).

In 2004, Wilkinson and MacKinlay described the use of a CB in the dilation of a chronic esophageal stricture caused by ingestion of a caustic substance in a 14-year-old boy [16]. During the first two attempts to dilate to 8 mm with a conventional balloon, wasting of the balloon could not be abolished. On the third attempt, the stricture was dilated to 8 mm using a CB which required several inflations of the balloon with rotation and retraction/advancement of the deflated balloon to completely abolish wasting. Over a six-month period, the stricture was serially dilated to 20 mm using conventional balloons without complications.

Recently, the use of CBs in valvuloplasty for severe subaortic stenosis in dogs was reported [17]. To the authors’ knowledge, the use of CBs in esophageal strictures in cats or dogs has not been reported. The cat in this paper had a partial annular fibrotic ring. During initial dilation attempts with a conventional balloon catheter, a focal deep mucosal tear occurred without disruption of the annular ring limiting the degree of dilation that could be achieved and resulting in recurrence of the stricture within 14 days. The use of the CB resulted in the scoring of the fibrotic ring at multiple sites. Subsequent dilation with a conventional balloon caused breakdown of the fibrotic ring at the sites of scoring. This resulted in milder mucosal tearing that was distributed around the circumference of the lesion allowing for dilation of the stricture to a larger diameter. The procedure was...
considered successful as the cat was noted to be free of clinical signs one year after the last procedure and eating a normal canned food diet.

It is possible that the improved outcome in this case was due to the repeated dilations alone. However, after the 2nd and 3rd dilations, the fibrotic ring persisted and resulted in a focal deep mucosal tear during dilation. After initial dilation with the CB, this fibrotic ring was disrupted allowing for radial stretch of the stricture around the circumference of the lesion, resulting in dilation to a larger diameter using conventional balloons. Better owner compliance with medications may also have contributed to the improved outcome.

A limiting factor for the use of CBs in esophageal strictures may be cost. The CB used in this case costs $866 but was donated after a one-time use for valvuloplasty in a dog. Prior to first use in this case, the CB was cleaned and gas sterilized. The atherotomes were still sharp enough to score the lesion during both dilations, but it is unknown what effect repeat sterilizations or use may have. It is possible that a CB may be used for multiple procedures which would help reduce the cost per procedure. In addition, if use of a CB can reduce the total number of dilations that need to be performed, then the total cost of treatment may be reduced.

In conclusion, the use of a CB for esophageal stricture has only been reported once in the human literature and has not been reported in the veterinary literature. This paper illustrates the potential benefits of CB in dilation of recurrent strictures associated with a fibrotic band that is resistant to dilation by conventional balloon catheters. Further evaluation to determine if the use of CBs can reduce the need for repeat dilations should be considered.

Conflict of Interests

The authors declare that there is no conflict of interests with respect to their authorship or publication of this paper. There was no financial support provided.

References


