Management of a Benign Oesophageal Stricture in a Dog using a Biodegradable Self-Expanding Stent

Simon W. Tappin*, P. Nelissen† and J. A. Solomon*¹

Summary
A three-year-old female neutered Staffordshire bull terrier presented with a progressive two week history of regurgitation following surgery for septic peritonitis. Oesophagoscopy revealed a narrow stricture in the mid-oesophagus. Stricture reformation occurred following repeated endoscopic and fluoroscopic guided balloon dilations, with the addition of intraluminal triamcinolone, on eleven occasions. Following the twelfth balloon dilation, a tubular self-expanding biodegradable polydioxanone stent was placed across the stricture under fluoroscopic guidance and sutured to the oesophageal wall. Initially, the dog made a good recovery, however seven days later, signs of regurgitation returned associated with marked oesophagitis. Regurgitation resolved over the next two weeks following intralesional triamcinolone injections and oral prednisolone, ranitidine, omeprazole and sucralfate. Fluoroscopy four months after placement revealed the stent was no longer present and there was no evidence of stricture. Oesophageal motility was subjectively delayed in this area. The dog was tolerating a soft food diet without regurgitation.

Keywords: Oesophageal stricture; Balloon catheter dilation; Biodegradable self-expanding stent; Dog

Introduction
Classically, oesophageal strictures are managed with dilation either by balloon catheter or bougienage [1]. Although this often relieves clinical signs, the inflammation resulting from dilation often leads to stricture reformation [2]. As a result, resolution of oesophageal strictures often requires repeated dilation [3]. Strategies to reduce the risk of stricture reformation include intraesional triamcinolone injections [4], and in man topical mitomycin-C exposure [5] and placement of luminal metallic and polyester stents [6].

Recently, biodegradable self-expanding stents have been used in humans with benign strictures with encouraging results [7]. The use of self-expanding metallic stents (SEMS) have been described in the management of benign strictures in one cat [8] and a ferret [9], and a biodegradable self-expanding stent has been successfully used in a cat [10] but to the author’s knowledge, this is the first report to describe the successful management of a recurrent oesophageal stricture using a biodegradable polydioxanone stent in a dog.

Case History
A three year old female neutered Staffordshire bull terrier presented with a progressive two week history of regurgitation following surgery for septic peritonitis, secondary to the rupture of a hepatic abscess. The dog had been anaesthetised (induction with propofol and maintained with inhaled isoflurane) and hepatic lobectomy was performed. The abdomen cavity was lavaged and managed with open peritoneal drainage. The dog recovered well and the abdomen was closed 48 hours later, using the same anaesthetic technique. Regurgitation was noted five days later and progressed despite symptomatic treatment for oesophagitis, prompting referral.

On physical examination the dog was in fair body condition (body condition score 3/5, weight 11.4 kg) and the abdominal wound had healed well. The remainder of the clinical examination was unremarkable. Haematology revealed a moderate thrombocytosis (949x10⁹/l, reference interval 200-500); serum biochemistry was within normal limits. Oesophagoscopy revealed an oesophageal stricture approximately 10 cm distal to the upper oesophageal sphincter. The stricture surface was smooth and regular and approximately 3 mm in diameter, measured against open endoscopic biopsy forceps (Figure 1). On the basis of these findings, a presumptive diagnosis of reflux-induced oesophageal stricture was made.

Triamcinolone acetate (Kenalog, 40 mg/ml; Bristol-Myers Squibb) was diluted 1:1 with 0.9% sodium chloride solution and 0.25 ml (5 mg) submucosal injections performed via a 5 mm 23 G injection needle guided through the endoscope working channel at the 12, 3, 6 and 9 o’clock positions around the stricture. The stricture was then dilated using sequential balloon catheters (10 mm, 14 mm and 18 mm). Balloons were inflated with saline to 3 atmospheres for 3 minutes under endoscopic guidance. After dilation, the stricture had dilated well, however, approximately 8 cm of oesophagus was narrowed, with only the final 2 cm of oesophagus appearing normal. Further balloon dilation was performed caudally and a 20 mg of triamcinolone acetate (1:1 dilution as above) was injected in 0.05 ml blebs at multiple sites.

![Figure 1: The oesophageal stricture prior to dilation on day 1.](Image)
The dog recovered well and commenced treatment with oral sucralfate (Antepsin; Chugai), intravenous ranitidine (2 mg/kg q 12 hours Zantac; Glaxo-SmithKline) and intramuscular buprenorphine (0.02 mg/kg q 8 hours Vetergesic; Alstoe Animal Health). The dog tolerated oral feeding 6 hours later. Oesophagoscopy on day 4 revealed that the stricture had narrowed substantially along its length and repeat balloon dilation was performed. The dog again recovered well, however three days later regurgitated shortly after feeding. Fluoroscopic barium swallow revealed recurrence of the stricture along its length (Figure 2). Repeat triamcinolone injections and balloon dilation to 18 mm was performed. Over the following eight weeks the stricture was dilated on a further seven occasions (at intervals of 5-10 days). Triamcinolone was injected every other treatment under endoscopic guidance. On the intervening occasions balloon dilation was performed under fluoroscopy, which revealed that there was now only one area of stricture at the level of the 2nd rib. During this period, the dog continued oral sucralfate and ranitidine, with introduction of prednisolone (0.5 mg/kg q12 hours Prednidale, Dechra Veterinary Products Ltd) after the 5th dilation, which was gradually withdrawn after the 8th dilation due to polydipsia and weight gain. On the last two occasions, 5 ml of 0.1% mitomycin-C solution (Kyowa Hakko Kirin Ltd) was instilled onto a cotton pledget placed across the stricture post-dilation for 5 minutes, once the pledget was removed the oesophagus was lavaged with saline. Three days after the last dilation, the dog was regurgitating again and the owners elected for the placement of a biodegradable self-expanding oesophageal stent. The dog’s stricture was dilated on two occasions whilst the stent was manufactured.

**Stent placement**

Under anaesthesia, the stricture was dilated to 18 mm under both endoscopic and fluoroscopic guidance. A tubular self-expanding polydioxanone stent (internal diameter 25 mm × 135 mm, ends flared to 31 mm, Infiniti medical, Menlo Park, CA, USA, Figure 3) was placed within the oesophagus under fluoroscopic guidance, using a custom made delivery device. Prior to complete deployment, the stent was sutured to the oesophageal wall using three simple interrupted 4 metric polydioxanone (PDS II, Ethicon: Johnson & Johnson) sutures, one ventrally and one on each lateral aspect, via a midline cervical approach. Oesophagoscopy revealed the stricture in the middle of the stent which was well opposed to the wall (Figure 4). Radiographs revealed the stent well positioned (Figure 5). The dog made a good recovery and oral sucralfate and ranitidine were continued. The dog ate well six hours after the procedure, with no sign of discomfort or regurgitation.

**Follow up**

Seven days later, the dog presented regurgitating. Oesophagoscopy revealed a marked oesophagitis and hyperplastic response (Figure 6). Triamcinolone (1:1 dilution, 20 mg total dose) was injected in 0.05 ml blebs into the most inflamed areas. Oral omeprazole (1 mg/kg, q24 hours: Losec, AstraZeneca) and prednisolone (1mg/kg q12 hours) were commenced. This reduced the frequency of the regurgitation, which gradually improved. Two weeks later, the regurgitation had resolved with oesophagoscopy revealing modest improvement (Figure 7). Two weeks later the omeprazole, sucralfate, ranitidine and prednisolone were sequentially withdrawn.

Four months after stent placement, the dog was eating soft food well with no regurgitation. Follow up fluoroscopy revealed that the stent radio-opaque markers were no longer visible. A barium swallow revealed that oesophageal motility was subjectively delayed, but the stricture was no longer visible (Figure 8). At the time of writing (eight...
months after stent placement), the dog was tolerating a soft diet without further episodes of regurgitation.

Discussion

Oesophageal stents have been used to treat a variety of oesophageal pathology including malignancies, benign strictures and fistula formation [6]. The use of both covered and open SEMS’s and polyester stents can be frustrating due to a high rate of complications [11]. Complications include stent migration, hyperplastic granulomatous reaction, fistula formation and impaction [6]. As a result of this, self-expanding biodegradable has been developed for use in benign strictures, with reasonably promising results [7]. Biodegradable stents allow oesophageal remodelling around the fixed platform of the stent, but dissolve in 10-12 weeks, before the development of complications [12]. Veterinary experience in the placement of oesophageal stents for benign oesophageal strictures is limited, although short term success has been documented after placement of a SEMS in a cat [8] and good long term success after the placement of a biodegradable stent in a cat [10].

This case report documents the successful management of a recurrent benign oesophageal stricture in a dog using a self-expanding biodegradable polydioxanone stent. Stent placement was considered a suitable option in this case as the traditional approach of repeated balloon dilation, combined with triamcinolone injections and mitomycin-C administration had not led to resolution of the stricture.

Stent migration can occur after placement and was documented in the cat subsequent to SEMS placement [8] and is reported with Ployfelx stents in up to 62% of people [11]. In this case, the stent was custom made allowing dual flared ends to be incorporated, which can reduce the risk of stent migration [13]. Given the high risk of migration and the relative size of the stent, three anchoring sutures were used to secure the stent.

Hyperplastic tissue ingrowth is common sequelae to oesophageal stent placement in man with reactions seen in up to 50% of SEMS placed [14]. Mucosal hyperplasia leading to clinically significant stenosis was also reported after SEMS placement in a cat [8]. In man, tissue hyperplasia is also expected with biodegradable stents, this is usually mild as the stent biodegrades before the reaction become severe, although rarely it has been reported to be severe enough to cause obstruction of the stent [15]. Clinically significant mucosal hyperplasia was not reported by after the placement of a biodegradable self-expanding stent in a cat [10]. In man, effective gastro-protection, local resection, oral and intralesional steroids are used to control hyperplastic tissue [16] and appeared effective in this case.

Although associated with possible complications, placement of a self-expanding biodegradable polydioxanone stent may be a feasible option in the management of recurrent benign canine oesophageal strictures, refractory to repeated dilation.

Acknowledgements

The authors would like to thank Paddy Marshal MRCVS for referring the case.

Conflicts of Interest

The authors declare that Jeffery Solomon is a managing partner of Infiniti Medical who manufactured the stent used in this case report.

References

in addition to endoscopic balloon dilation in a dog with benign oesophageal strictures. J Small Anim Pract 50: 550-553.


Submit your next manuscript and get advantages of SciTechnol submissions
- 50 journals
- 21 days rapid review process
- 1000 Editorial team
- 2 Million Readers
- More than 5000 Reviews
- Publication immediately after acceptance
- Quality and quick editorial review processing

Submit your next manuscript at www.scitechnol.com/submission

Author Affiliations
1. Dick White Referrals, The Six Mile Bottom Veterinary Specialist Centre, UK
2. Infiniti Medical, 525 Middlefield Road, Suite 150, Menlo Park, CA 94025, USA