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Management of diaphragmatic hernia in cats: a review of four cases

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Diaphragmatic hernia (DH) is the displacement of abdominal viscera into the thoracic cavity through a defect in diaphragm (Slatter, 2003). The most common etiology of DH was identified as automobile accidents (Boudrieau, 1987). Right sided DH was more frequently encountered when compared to left side (Wilson *et al.*, 1971). In this paper four cases of DH and their surgical management in domestic short haired cats are discussed.

Four domestic short hair cats (3 M and 1 F; aged 1-2 yr; and body weight 1.5-4 kg) were presented with the history of anorexia, reduced water intake, elbow abducted posture and open mouth breathing. All the four cats had a history of road traffic accident. The animals were stabilized with antibiotics, analgesics and fluids. Examination of physiological parameters revealed tachypnoea, tachycardia and normal rectal temperature. On auscultation, muffled heart sounds were appreciable. Based on history and clinical examination, the cases were tentatively diagnosed as DH. Orthogonal radiographic views of the thorax revealed loss of normal line of diaphragm and increased intrathoracic density masking the cardiac shadow indicative of displacement of abdominal organs into the thoracic cavity, which confirmed DH (Fig. 1).

All the cats were preoxygenated by delivering 100% oxygen through a face mask. Preoperatively the cats were administered with ceftriaxone (25 mg/kg body wt, i.v.) and meloxicam (0.2 mg/kg body wt, s.c.). General anaesthesia was induced by tiletamine HCl and zolazepam HCl (1:1) combination (12 mg/kg body wt, i.m.). In all the animals, intubation was done and anaesthesia was maintained with isoflurane 1-2% in oxygen. Intermittent positive pressure ventilation (IPPV) was provided in all four cases.

The entire ventral abdomen and caudal half of thorax was prepared aseptically. A ventral midline incision was made starting from xiphoid to pubis. The location of the hernia defect was on the right diaphragm in 2 cases, left diaphragm in one case and at the centre of diaphragm in another case. In 2 cases,

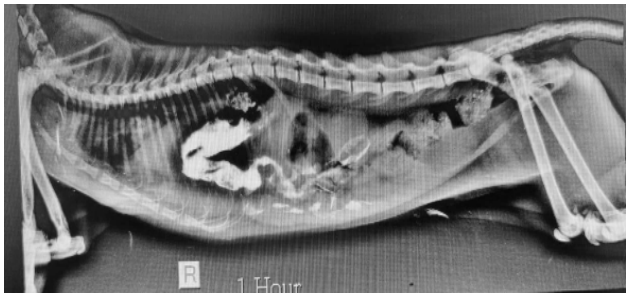

Fig. 1: Pre-operative radiograph of a cat showing displacement of abdominal organs into thoracic cavity

the hernial contents were small intestines, in one case spleen, liver and stomach, and in another case liver, stomach and small intestines were present. The hernial contents were identified and gently reduced into the abdominal cavity (Fig. 2). The edges of the defects were identified and herniorrhaphy was performed in simple continuous suture pattern using polyglactin No. 2-0. Cat No.4 had a circumcostal tear along with a central tear near to the hiatus. The central tear was repaired and the ventral border was sutured to the intercostal muscles to reconstruct the contour of the diaphragm as far as possible. Negative pressure in the thoracic cavity was established by repeatedly sucking out air using a syringe attached to scalp vein tube introduced into the thoracic cavity through the defect and simultaneous inflation of the lungs by compression of the reservoir bag before tightening the last suture. The cats were maintained on oxygen supplied through the endotracheal tube until they regained spontaneous respiration with satisfactory SpO_2. The abdominal incision was closed in simple continuous suture pattern using polyglactin No. 2-0. The skin was apposed using nylon with horizontal Mattress sutures.

Postoperative radiographs revealed the reconstructed diaphragmatic line and normal lung field except in the second and fourth cat in which radiographic signs of pneumothorax were evident (Fig. 3). Postoperatively ceftriaxone (25 mg/kg body

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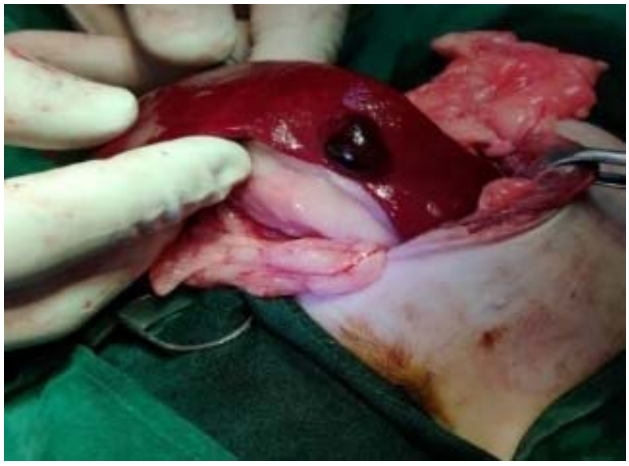

Fig. 2: Retrieving the herniated organs.

Fig. 3: Postoperative radiograph of cat.

wt, i.v.) twice daily for seven days and meloxicam (0.2 mg/kg body wt, s.c.), once daily for three days were administered. On the 10th postoperative day the skin sutures were removed.

A forceful blow would result in a rapid increase of intra-abdominal pressure, which along with the failure of glottis to open caused DH in acute blunt trauma (Levine, 1987). In the present case road traffic accident was the main cause as also reported by Boudrieau (1987). According to Sullivan and Lee (1989), radiography was the imaging technique of choice where there was loss of the cupula and absence of cardiac shadow, which indicated diaphragmatic hernia. In our study all the four cases were confirmatively diagnosed as DH with the help of radiographs.

Sullivan and Reid (1990) stated that size and location of the diaphragmatic tear would determine which organs get herniated. Right sided tears most commonly involved small intestine and pancreas, while the left sided tears commonly included liver, stomach, small intestine and spleen, among which liver was most commonly herniated organ. Similar observations were also made in the present study.

Compression of thoracic organs as well as pulmonary atelectasis occurred in DH, which in turn resulted in significant loss of functional lung capacity (Levine, 1987). Respiratory dysfunction (dyspnoea and cyanosis), and enteric signs (vomiting, haematemesis and anorexia) were the common clinical signs (Garson *et al.*, 1980). In the present study all the animals showed open mouth breathing and respiratory difficulty during presentation and required manual ventilation during the surgical procedure. Despite attaining spontaneous ventilation postoperatively, it was imperative to monitor the SpO_2 levels until it was stable.

The pneumothorax observed in two cats might be due to insufficient removal of air from the thoracic cavity or due to the over inflation of the lungs during IPPV. Despite that both the cats had an uneventful clinical recovery. In a case of acute traumatic DH and postoperative pneumothorax in a mongrel puppy, Anoop *et al.* (2017) have gradually decompressed pneumothorax by thoracocentesis at the 7th intercostal space.

Preoperative stabilization, timely herniorrhaphy with IPPV, re-establishment of negative pressure in the thoracic cavity, postoperative monitoring of respiration and supportive therapy are critical in the management of diaphragmatic hernia in cats.

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