
DIAPHRAGMATIC HERNIA IN A TWO-MONTH-OLD KITTEN AND ITS SUCCESSFUL SURGICAL MANAGEMENT

Deny Jennes^{1*}, Sudheesh S. Nair², Soumya Ramankutty², Tamaraiselvi P.³, Shehasina K.A.³, Reji Varghese² and John Martin K. D.⁴

Ph.D. Scholar¹, Assistant Professor², M.V.Sc. Scholar³ and Professor and Head⁴
Department of Veterinary Surgery and Radiology
College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala – 680651
*Corresponding author: denyjennis@gmail.com

ABSTRACT

A two-month-old kitten was presented to TVCC, Mannuthy with dyspnoea and open mouth breathing. Auscultation of the thorax revealed muffled heart sounds. Radiography showed loss of normal diaphragmatic border, obscured cardiac silhouette and displaced gas filled intestinal loops into the thoracic cavity which were suggestive of diaphragmatic hernia. Under inhalant anaesthesia with intermittent positive pressure ventilation, was performed by cranial mid ventral celiotomy from umbilicus to the costo chondral arch. Lobes of liver along with intestinal loops were repositioned into abdominal cavity through diaphragmatic defect and the defect was successfully closed. Abdominal wall and skin were apposed in regular manner. The animal recovered uneventfully.

Keywords: Kitten, diaphragmatic hernia, herniorraphy, intermittent positive pressure ventilation

INTRODUCTION

Diaphragmatic hernia is an internal hernia which can be congenital or acquired during the lifetime and characterised by protrusion of abdominal contents into the thoracic cavity (Fossum *et al.*, 2013). According to Gibson *et al.* (2005) the entrapment of abdominal contents in the thoracic cavity leads to a life-threatening respiratory difficulty in animals. The only treatment option for the condition is a surgical correction (Ergin *et al.*, 2017). Ricco and Graham (2007) stated that the animal with diaphragmatic hernia showed minimal clinical signs like impaired pulmonary function. Thoracic radiographs characterised by discontinuity of diaphragmatic line and presence of abdominal viscera herniated to thorax give confirmatory findings of diaphragmatic hernia.

CASE HISTORY AND OBSERVATIONS

A two-month-old female domestic

shorthair kitten weighing 0.5 kg was presented to Teaching Veterinary Clinical Complex, Mannuthy, Kerala with severe dyspnoea. Animal had a history of a road traffic accident one month back. The animal exhibited severe laboured breathing for past one week. On clinical examination, the rectal temperature was within the normal limit and the mucous membrane appeared pale roseate. On auscultation, muffled heart sounds were audible. Abdominal palpation revealed reduced abdominal contents and the animal looked like a 'wasp waist' appearance due to reduced abdominal contents. The lateral and dorso-ventral



Fig. 1 Animal presented with respiratory distress

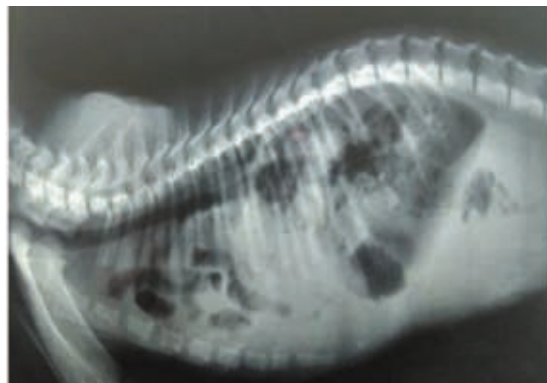


Fig. 2 Thorax – lateral radiograph – before surgery

radiograph of the thorax revealed loss of cardiac silhouette, gas filled intestinal loops in the thoracic cavity and loss of normal diaphragmatic border which were suggestive of traumatic diaphragmatic hernia and it was decided to manage the condition surgically.



Fig. 3 Thorax–dorso ventral view–before surgery

TREATMENT AND DISCUSSION

Prepared the ventral abdomen for aseptic surgery. Preoperatively the animal was treated with inj. tramadol hydrochloride at a dose rate of 2 mg/kg body weight intramuscularly. The animal was pre-oxygenated with 100% oxygen for 30 minutes through the anaesthetic chamber. The induction of anaesthesia was done with isoflurane using customized anaesthetic chamber. The maintenance of anaesthesia was performed with isoflurane at 1% with oxygen as carrier gas through

the endotracheal tube. The intermittent positive pressure ventilation was maintained throughout the surgery. Positioned the animal in dorsal recumbency and a cranial mid-ventral celiotomy from the umbilicus to costo-chondral arch was made through the linea alba. After accessing the abdominal cavity, gently retracted the hernial contents and identified the defect in the diaphragm. The parts of the small intestine and entire liver were herniated into the thoracic cavity. The defect was present in the left muscular part of the diaphragm and it was a circumferential tear. The diaphragmatic defect was closed via simple continuous suture pattern using polyglactin 910 size 2-0. The negative pressure in the thoracic cavity was reestablished by the removal of air from the thoracic cavity through the suction created by a scalp vein and syringe before the complete closure of the defect.

The abdominal incision was closed via simple continuous manner. Skin incision was also apposed using nylon in



Fig. 4 Induction of anaesthesia through the anaesthetic chamber

horizontal mattress suture pattern. Due to the chronic nature of the defect the repositioned abdominal contents exerted excessive pressure too much pressure during skin closure. After extubation of the endotracheal tube, oxygen was given to the kitten through the face mask for 15 minutes.

Postoperatively the animal was treated with inj. ceftiofur at a dose rate of

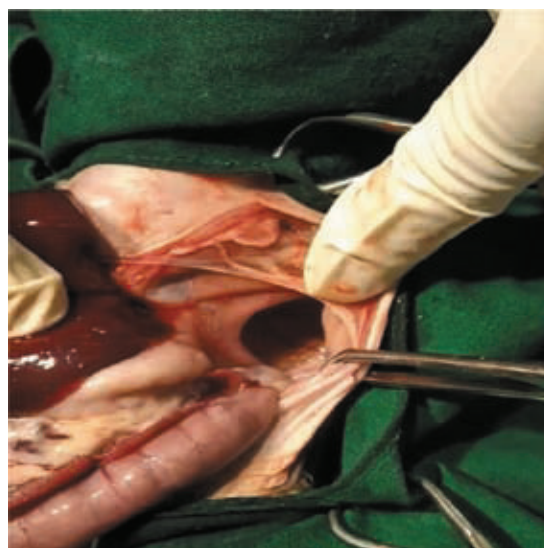


Fig. 5 Identification of the diaphragmatic defect

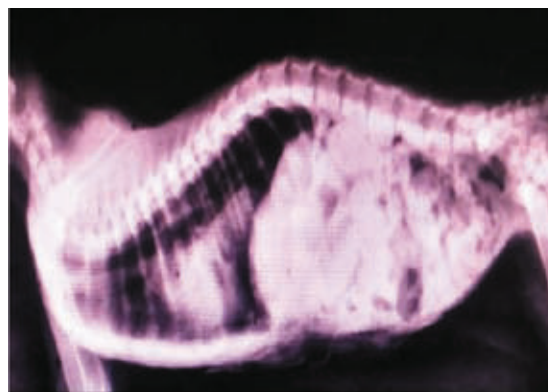


Fig. 6 Thorax – lateral radiograph after surgical correction

1.1 mg/kg body weight subcutaneously for seven days, meloxicam drops orally at a dose rate of 0.2 mg/kg body weight for three days and oral B-complex vitamins. The animal had an uneventful recovery. The sutures were removed after 10th postoperative day.

Traumatic diaphragmatic hernia occurs due to the external blunt trauma to the abdomen and thereby increased pressure in the abdominal organs. The high abdominal pressure combined with open glottis will lead to the deflation of the lungs and increased pressure gradient across the diaphragm and thereby rupture (Worth and Machon, 2005). The most commonly herniated organ was liver (Schmiedt *et al.*, 2003) followed by stomach (Gibson *et al.*, 2005). The herniated contents in the thoracic cavity interfere with the lung inflation and thereby reduce the functional residual capacity (Wilson, 1992). Vesal and Parizi (2012) stated that the objectives of surgical management of the diaphragmatic hernia include restoration of the herniated organs from the thoracic cavity and re-establish the negative pressure of the thoracic cavity and normal function of lungs and diaphragm. Anaesthetic management of the animal with diaphragmatic hernia was equally important as surgical management. It includes detailed pre-anaesthetic evaluation, pre-oxygenation, fast anaesthesia induction,

patent airway and maintain intermittent positive pressure ventilation during surgery and provide oxygen during recovery period (Vesal and Parizi, 2012)

The diagnosis of the condition can be based on the clinical signs of the animal, radiography, barium contrast radiography, ultrasonography, computed tomography (CT) scans and magnetic resonance imaging (MRI) (Slensky, 2009). According to Nyland and Mattoon (1995), abdominal ultrasonography is able to diagnose the discontinuity of the hyperechoic border of the diaphragm and protrusion of abdominal organs into the thoracic cavity. The thoracic radiograph of the affected animal revealed the loss of diaphragmatic border, fluid and air-filled intestinal loops in the thorax, obscured cardiac silhouette and loss of normal lung fields. The absence of abdominal viscera was also noticed in the abdominal radiograph of the animal with diaphragmatic hernia (Gokulakrishnan *et al.*, 2020). All these radiographic signs were evident in the present case. After surgical correction of the hernia, the main possible post-operative complications include re-herniation, hydrothorax, pneumothorax, hemothorax, shock and cardiac arrhythmias (Garson *et al.*, 1980).

CONCLUSION

Diaphragmatic hernia is a common

clinical condition in cats that occurs mostly due to motor vehicle accidents. Due to the rupture of the diaphragm and loss of negative pressure in the thoracic cavity, the surgical correction of the condition was very much risky. Here we reported a successful surgical correction of traumatic diaphragmatic hernia in a kitten.

ACKNOWLEDGEMENT

The authors were thankful to the Dean, CVAS, Mannuthy, TVCC and Department of Veterinary Surgery and Radiology for providing the required facilities for the fulfilment of the work.

REFERENCES

- Ergin, I., Sen, Y., Senel, O. O., Temiz, S. and Bumin, A. 2017. Evaluation of perioperative survival rate after diaphragmatic hernia in cats. *J. Vet. Med.* **7**: 52-54.
- Fossum, T. W., Dewey, C.W., Horn, C.V., Johnson, L.A., MacPhail, C.M., Radlinsky, M.G., Schulz, K. S., and Willard, M.D. 2013. *Small Animal Surgery*, 4th Ed., Elsevier, St. Louis.
- Garson H, Dodman N. and Baker G. 1980. Diaphragmatic hernia. Analysis of fifty-six cases in dogs and cats. *J. Small Anim. Pract.* **9**: 379-385.
- Gibson, T. W., Brisson, B. A. and Sears, W. 2005. Perioperative survival rates after surgery for diaphragmatic hernia in dogs and cats: 92 cases (1990–2002). *J. Am. Vet. Med. Assoc.* **227**: 105-109.
- Gokulakrishnan, M., Mohamed Ali, G. and Sonia. 2020. Surgical Management of Traumatic Diaphragmatic Hernia in a Pup. *Int. J. Curr. Microbiol. App. Sci.* **9**: 1-4.
- Nyland, T. G. and Mattoon, J. S. 1995. Ultrasonography of the general abdomen. In: *Veterinary Diagnostic Ultrasound*. WB Saunders, Philadelphia: p. 48–50.
- Ricco, C. H. and Graham, L. 2007. Undiagnosed diaphragmatic hernia-the importance of preanesthetic evaluation. *Can. Vet. J.* **48**: 615-618.
- Schmiedt, C., Tobias, K. and Stevenson, M. 2003. Traumatic diaphragmatic hernia in cats: 34 cases (1991- 2001). *JAVMA*. **222**: 1237-1240.
- Slensky, K. 2009. Thoracic trauma. In: Silverstein, D and Hopper, K (Eds.), *Small animal critical care medicine*. (1st Edn.), St. Louis, Saunders Elsevier. pp: 662-667.
- Vesal, N. and Meimandi Parizi, P. 2012. Anesthetic management of diaphragmatic hernia repair in a dog:

- a case report and literature review of anesthetic techniques. *Iran. J. Vet. Res.* **13**:156-160.
- Wilson, D. V. 1992. Anesthesia for patients with diaphragmatic hernia and severe dyspnea. *Vet. Clin. North Am. Small Anim. Pract.* **22**: 456-459.
- Worth, A. J. and Machon, R. G. 2005. Traumatic diaphragmatic herniation: Pathophysiology and management. *Compend. Contin. Educ. Pract. Vet.* **27**:178–190.