pISSN 1598-298X / eISSN 2384-0749
J Vet Clin 35(5) : 237-239 (2018)
http://dx.doi.org/10.17555/jvc.2018.10.35.5.237

Journal of Veterinary Clinics
www.ksvc.or.kr

Diaphragmatic Hernia in a Two-month Old Cat

Sang-hun Park and Joo-Myoung Lee[1]

Department of Veterinary Medicine, College of Veterinary Medicine, Jeju National University, Jeju 63243, Korea

(Received: August 17, 2018 / Accepted: October 18, 2018)

Abstract : A 2 months old female Korean domestic shorthair cat weighing 1.2 kg was come to hospital because of respiratory discomfort and lethargy. Heart sounds was more intense and clear on the right side than the left. On radiographic views, loss of the normal diaphragm line, undistinguishable shadow of heart, shadow of gas-containing intestines could be observed in thoracic cavity. Diaphragmatic herniorrhaphy was performed by using propofol 8 mg/kg IV and isoflurane without any complication. On 7th day after the operation, almost all the clinical signs and radiographs including diaphragmatic line, cardiac silhouette, liver and small intestines were turned to normal.

Key words **:** diaphragmatic hernia, herniorrhaphy, cat.

Introduction

Trauma is the most common cause of diaphragmatic hernia in dogs and cats. The 85% of the cases were traumatic in origin and 5%~10% were congenital, and the rest were of unknown cause. Automobiles are the chief source of trauma, with kicks, falls, and fights reported less frequently (1-4). Injury to the diaphragmatic can be either direct or indirect in origin, but indirect injuries through a blunt force is more frequently (5,6). Application of force to the abdominal cavity with the glottis opened increases the peritoneal-to-pleural gradient, and herniation of viscera can occur immediately after the diaphragm rupture (6).

Although no pathognomonic sign have been identified for diaphragmatic hernia, respiratory sign predominate, and 38% of affected animals have dyspnea and exercise intolerance. Beside vomiting, dysphagia, diarrhea, lethargy, and constipation can be seen (7).

Surgical hernia reduction is necessary to restore normal physiological respiratory function with normal diaphragm reconstruction (8).

Here is a case report of traumatic-suspected diaphragmatic hernia in a two-month-old Korean domestic shorthair cat, and provide a comprehensive explanation of the diagnosis including blood tests and radiography, and surgical treatment.

Case

A 2-month-old intact female Korean Domestic Short-hair cat was came to the hospital, having mild dyspnea and lethargy. Body weight was 1.2 kg and the owner adopted the cat two days before visiting hospital, so the patient's history which can be related was unidentified.

[1]Corresponding author.
E-mail : dol82@jejunu.ac.kr

Heart sounds were clearly audible on the right side and muffled on the left side. The CBC showed a leukocytosis (white blood cells 29.8×10^9/L; reference range, 4.87 to 20.10 $\times 10^9$/L). This result seems to due to inflammatory reactions in the herniated lesion.

On radiographic views, the line of the diaphragm disappeared. The shadow of gas containing intestines was observed in the thoracic cavity and the abdominal cavity, most of organs could not be identified. So it was difficult to distinguish the cardiac shadow, but dorsally shifted lung and trachea can be found (Fig 1-A). Urination, defecation and appetite were normal.

Cefazolin sodium (30 mg/kg) was given intravenously 30 minute before induction. General induction was performed with propofol 8 mg/kg IV. The patient was maintained on a isoflurane via intermittent positive pressure ventilation (IPPV). The patient was positioned in dorsal recumbency. Respiratory, electro-cardiogram, SpO_2 and temperature was monitored during operation.

A midline incision was initially made from the xiphoid to a point midway between the umbilicus and pubis. The falciform ligament was excised to improve exposure of the hernia. A portion of liver and a significant portion of small intestine were retracted from the thoracic cavity.

The whole diaphragm was examinated thoroughly. The diaphragm was repaired using 3-0 monofilament polyglyconate (MAXON, Covidien, USA) in a simple continuous pattern. Negative pressure within the thoracic cavity was reestablished using a feeding tube. The linea alba and the subcutaneous tissue of the abdomen was closed routinely using 3-0 MAXON in a simple interrupted pattern. The skin was closed using 3-0 monofilament nylon (Blue Nylon, Ailee, Korea) in a simple interrupted pattern.

On 7th day after the operation, almost all the clinical signs and radiographs including diaphragmatic line, cardiac silhouette, liver and small intestines were turned to normal (Fig 1-B).

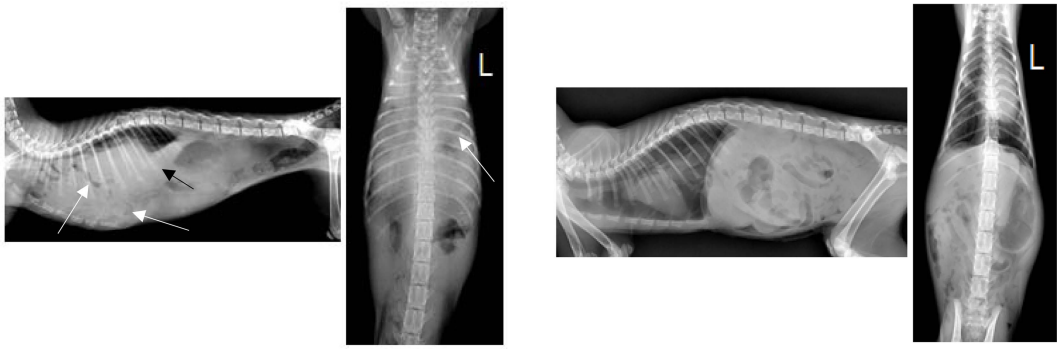

Fig 1. Lateral and ventrodorsal view of thoracic and abdominal radiograph of this case. A, the preoperative radiograph. Heart silhouette is undistinguishable, and loss of diaphragmatic line (black arrow), gas contained intestines (white arrow) are observed. B, the postoperative radiograph. The heart silhouette, diaphragmatic line and location of the organs that was herniated is normal.

Discussion

Diaphragmatic hernia usually occurs in small animals, and can occur as a result of congenital or traumatic injuries. Congenital pleuroperitoneal hernias are seldom diagnosed in small animals because many affected animals die at birth or shortly thereafter (9). In congenital pleuroperitoneal hernia, the location of hernia is dorsolateral part (15,16). But, in traumatic diaphragmatic hernia, most frequent results are circumferential tears (59%) and radial tears (18%) in cat (17). In this case, the patient could not be diagnosed accurately because it was so young and had few history. But it is considered to be a traumatic diaphragmatic hernia, because the survival rate of congenital diaphragmatic hernia was so low and the location of the hernia was not the dorsolateral part, although evidence of trauma were not found on physical examination, radiographs, and direct observation during surgery.

If the pleural effusion is in the thoracic cavity, less herniation of the peritoneal organs, or no air shadow is in the herniated peritoneum, chest radiography alone may be difficult to diagnose accurately. Therefore a contrast study or ultrasonography are helpful to definite diagnosis (9-11). In this operation case, the diaphragmatic hernia could be diagnosed by confirming the intestinal air shadow entering the thoracic cavity.

Prior to induction of anesthesia, it is necessary to avoid all respiratory depressants such as xylazine, medetomidine, dexmedetomidine and so on. If the patient has normal cardiac function, it is possible to give propofol for induction. In case of marked cardiac compromise, etomidate is prefered for induction. For the maintenance of anesthesia, isoflurane or sevoflurane are adequate choices (9). In this operation case, the propofol was used for induction, because the patient's respiratory function was good before surgery. The propofol recommendation in cat induction is 4~6 mg/kg IV according to FDA, but in this operation, propofol 8 mg/kg IV without any other premedication was used with excellent respiratory outputs. And isoflurane was used for the maintenance.

Approximately 15% of animals die before presentation for anesthesia and surgical correction of traumatic diaphragmatic hernias. The preoperative deaths result from hypoventilation, compression of the lungs by abdominal viscera, shock, multiorgan failure, and cardiac dysrhythmias (1,4,17). The post operative survival rate of traumatic diaphragmatic hernia after discharge is 82% to 89% in recent case series (12,18,19).

The most common complication after surgical repair of diaphragmatic hernias is pneumothorax, especially if the hernia is chronic and adhesions are present. Re-expansion pulmonary edema may occur in lungs that have been chronically collapsed (12,13). In addition, dyspnea, pleural effusion, hemothorax, gastric torsion, shock, hemorrhage, and arrhythmia can be seen for complication (4,9,14). In this case, diaphragmatic herniorrhaphy was performed without any complication.

Thoracic wall pain after thoracotomy or sternotomy causes significant hypoventilation and is relieved by a combination of local and systemic analgesia. Therapeutic antibiotics are unnecessary unless the liver has been herniated or injured or a hollow abdominal viscus is perforated (20). This patient was prescribed meloxicam for analgesia, cephalosporin for therapeutic antibiotic, and famotidine for gastric protection to ulcer caused by NSAIDs.

The patient visited again a week later to examine the complication, but nothing wrong in physical examination and radiography.

Conclusion

A 2 months old Korean domestic shorthair female cat with diaphragmatic hernia had some signs such as mild dyspnea, clear cardiac sound on the right thoracic wall and muffled sound on the left side. And it showed the loss of the diaphragmatic line and the shadow of tubular air-filled intestinal loops on radiography.

During operation with 8 mg/kg propofol IV and isoflurane, liver, stomach and small intestine were found in the thoracic cavity through the larger diaphragm defect. So these viscera was repositioned to the abdomen, and herniorrhaphy was performed.

In kitten with diaphragmatic hernia, good prognosis can be expected if appropriate surgical measures are taken before severe clinical complications exhibit, and single dose of 8 mg/kg propofol IV for kitten induction is possible anesthetic option in herniorrhapy.

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