

EVALUATION OF PERIOPERATIVE SURVIVAL RATE AFTER DIAPHRAGMATIC HERNIA IN CATS

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Summary

The purpose of this study was to evaluate factors such as analgesia, anaesthesia, surgery and postoperative care for survival rate in diaphragmatic hernia in cats. Fifty eight cats with different age, sex and body weights, brought to the clinic with complaints of dyspnea were evaluated In this study. Diagnosis of hernia was done by radiography and/or ultrasonography. Surgery was performed in all animals for standard diaphragmatic herniorrhapy. Survival rates following surgical treatment of diaphragmatic hernia was 87.9% in cats. Three cats with congenital hernia and 4 cats with chronic diaphragmatic hernia have died. According to the findings, using pressure controlled ventilation and applying 2cm H₂O PEEP during anesthesia procedures of diaphragmatic hernia surgery, and scheduling preemptive analgesia, continued with adequate use of analgesics for a few days could improve prognosis. But extended surgical procedures and longer anesthesia duration may result with higher mortality rate.

Keywords: *Cat, diaphragma, hernia, survival rate*

Introduction

Diaphragmatic hernia is a rupture or a hole in the diaphragm that allows the abdominal organs such as liver, stomach or intestines to chest cavity. It may be either a congenital abnormality or the result of a trauma, especially car accident and fall from height in cats. When the abdominal organs herniate through the rupture, they put pressure upon the lungs and heart. Surgical correction is the only treatment in diaphragmatic hernias. If the cat has had a recent trauma, its condition must be stabilized before surgery. In diaphragmatic hernias, the risk is not only depends on the size and location of the hernia, but also numerous factors affect the survival rate in prognosis. Anesthesia and analgesia, time from trauma to surgery, time of surgical intervention, pre- and postoperative care are significant in mortality rates in cats.

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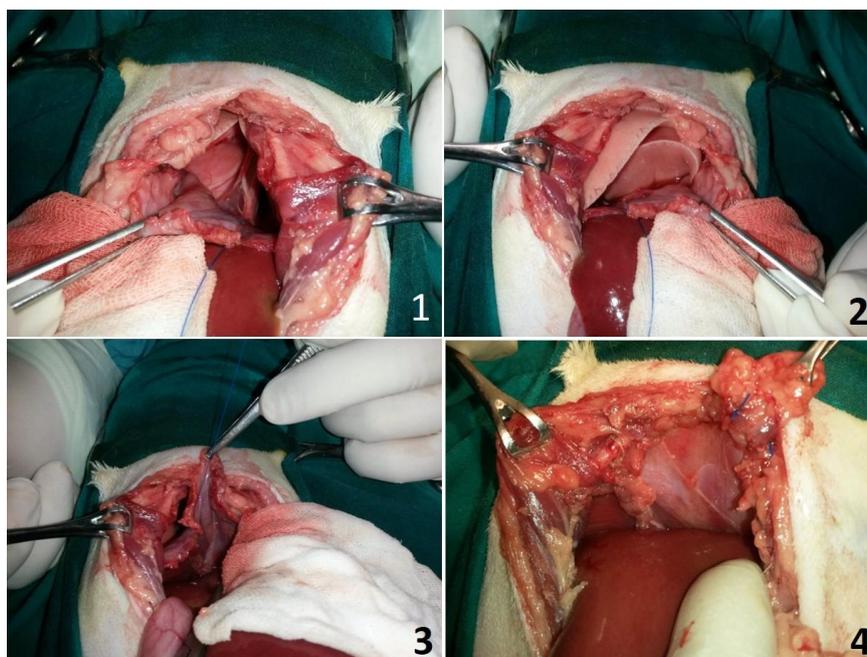
Materials and Methods

In this study, 58 cats with different age, sex, breed and body weights were brought to the clinics with complaints of dyspnea, tachypnea, exercise intolerance and lethargy. In 58 cats, 27 were stray cats, so the exact time of trauma was unclear, and no history of traumatic event could be reported by the owner. Diagnosis of hernia was done by radiography and/or ultrasonography. All cats underwent surgery. Surgical treatment was performed when the cats' general condition were stable. Before the operation, 100% oxygen was given to the cats by mask for 30 minutes and infusion pump was set to infuse lactated ringers solution at a rate of 10 ml/kg/hr. Prednisolon was injected 1 mg/kg IV intraoperatively. Operating table was positioned in 45 degree reverse Trendelenburg from the beginning of premedication, till the end of operation.

All animals received preemptive analgesia with morphine HCl, general anaesthesia with propofol (4 mg/kg, IV) and isoflurane (by using cuffed endotracheal tubes), setting the ventilator to "pressure controlled ventilation" mode with an inspiratory pressure value of 10 cm H₂O, with respiratory rates of 16 breaths/minute. PEEP (positive end-expiratory pressure) mode was activated and was set to 2 cm H₂O for recruitment maneuver and to prevent atelectasis. All cats recovered from anesthesia in the intensive care unit, received fluids, analgesics, oxygen and were monitored for hypothermia, pain and dyspnea. Analgesics were administered 6 and 12 hours after surgery in all cats.

Surgical repair of hernia was typically performed by entering abdominal cavity along the ventral midline, retracting the abdominal organs back into the abdomen, and suturing the rupture in the diaphragm (Figure 1). With the use of a 3 way stop cock and 60 cc syringe, air was evacuated from the thorax until a negative pressure was obtained.

Figure 1. Surgical repair of diaphragmatic hernia. Rupture of diaphragm (1, 2, 3) was sutured (4) with continuous suturing with 2/0 polypropylene material.



Results

In the study, dyspnea was the most frequently reported clinical sign among cats. All cats with diaphragmatic hernia received surgical treatment within 24 hours of admission to the hospital. In 58 cats, 51 were discharged alive after surgery. Three cats with congenital hernia and 4 cats with chronic diaphragmatic hernia have died intraoperatively or immediately after surgery. These cats had symptoms for approximately one year. In cats with chronic hernia, liver severely adhered to thorax wall, diaphragma muscles and heart surroundings. The mostly herniated organ was liver (44.8%), with various adhesion degrees of the lobes; followed by the herniation of small intestines, omentum, stomach, pancreas, spleen and large intestines. Except 4 cats with chronic hernia, liver lobes adhesions were not severe and removed easily.

The most common postoperative complication was tachypnea. In 7 cats mild pneumothorax was seen in radiograms but the animals have well-tolerated this situation. The perioperative survival rates following surgical treatment of acute and chronic diaphragmatic hernia was 87.9%.

Discussion

Several factors including age, respiratory rate, multiple concurrent injuries, duration of surgery and anaesthesia, herniated organs defects had significant associations with mortality rate in cats with diaphragmatic hernias (Garson et al., 1980). Stabilizing animals prior to anaesthesia and surgery may reduce the mortality rates due to complications from dehydration, hypovolemic and distributive shock, and hypoxemia. However, some studies have shown no significant impact of early surgical intervention on perioperative mortality rate (Garson et al., 1980; Gibson et al., 2005). In this study, all animals were stabilized prior to surgery. Use of corticosteroids and analgesics may

not be associated with mortality rate directly, but it is important for the animals' stabilizations. The high perioperative survival rate in this study may be a result of anesthetic protocols and intensive care during the process. Preanesthetic oxygenation, preemptive analgesia, balanced anesthesia and postoperative supportive care improved survival in our study.

Liver is the most frequently herniated organ in cats with traumatic diaphragmatic hernia. But presence of the liver within the thorax is not associated with high mortality rate (Schmiedt et al., 2003). Similar to previous studies, liver was most frequently found within the thorax cavity in this study. The second organ was stomach. Herniation of stomach was usually detected during surgery (Gibson et al., 2005). In the study, gastric dilation was just noted in 4 cats and they were discharged without any problems.

It is possible that increased duration of surgery and general anaesthesia can lead to an increase in mortality (Legallet et al., 2017) In congenital and chronic diaphragmatic hernias with severe liver adhesions, duration of surgery and anaesthesia were long according to acute hernias or hernias with mild adhesions. Although duration of anaesthesia alone does not affect the mortality rate, it may also be a factor. Cats with more severe adhesions, bleedings and intrathoracic trauma may have been slower to recover from anaesthesia and this also increased mortality in these cats.

After surgery, pneumothorax, hydrothorax, hemothorax, reherniation, shock, and cardiac arrhythmias might be seen as major complications (Garson et al., 1980) The most common postoperative complications in our study were tachypnea and pneumothorax.

References

1. Garson H, Dodman N, Baker G. Diaphragmatic hernia. Analysis of fifty-six cases in dogs and cats. *J Small Anim Pract*, 1980; 9: 379-385.
2. Gibson T, Brisson B, Sears W. Perioperative survival rates after surgery for diaphragmatic hernia in dogs and cats: 92 cases (1990-2002). *JAVMA*, 2005; 227 (1): 105-109.
3. Fossum T. Surgery of the lower respiratory system: Pleural cavity and diaphragm. In: *Small Animal Surgery*, Mosby, Missouri. 1997.
4. Legallet C, Mankin K, Selmic L. Prognostic indicators for perioperative survival after diaphragmatic herniorrhaphy in cats and dogs: 96 cases (2001-2013). *BMC Veterinary Research*, 2017; 13:16.
5. Schmiedt C, Tobias K, Stevenson M. Traumatic diaphragmatic hernia in cats: 34 cases (1991-2001). *JAVMA*, 2003; 222 (9): 1237-1240.