

**Case Report**

**DIAPHRAGMATIC HERNIA OF GRAVID UTERUS AND RIGHT SIDED  
DISPLACEMENT OF HEART IN A DOMESTIC SHORT-HAIRED CAT**

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**ABSTRACT**

Present case report is about very rare condition of gravid uterus herniation into the thoracic cavity and right sided heart displacement in a three year old queen. Cat was presented to obstetrics and gynecology clinic with a history of overdue kitting date. Abdominal cavity was found to have an unusual solid mass in cranial part with little fluid oozing from vulva. Roentgenogram assesment revealed a fetus skeleton in abdomen with two similar skeletons in thoracic cavity and missing a normal diaphragmatic line. Similar findings were recorded on ultrasonography. Midline coeliotomy was done under general gas anesthesia. Diaphragmatic wall had 6 cm left-sided vertically oriented rent in the dorsal aspect with gravid uterine and a 2 cm right-sided vertically oriented in the middle of the diaphragm with liver lobe and gall bladder herniation. Three partially mummified fetuses were recovered. Both diaphragmatic tears were reduced and cat was neutered to avoid future complication. According to available data this is first atypical report in pet practice particularly in feline.

**Key words:** Gravid uterus, Thoracic cavity, Diaphragmatic herniation, Short haired cat, Displaced heart, right sided, Fetuses.

**INTRODUCTION**

Reports regarding mummified fetuses are unusual in small animal practice. According to definition by Noakes (1986) if fetal fluids are reabsorbed after fetal death with persistent Corpus Luteum and retained fetus mass in uterus, it is termed as fetal mummification. Due to sterile nature of this condition, morphology of fetus is also observable with skin covering fetal mass without autolytic changes (Grunert *et al.*, 2005; Linde-Forsberg, 2010). In canine and feline embryonic and fetal mortalities have many causes like abnormalities during developmental and chromosomal disorders, endocrinological problems, bacterial and viral infections, physical injuries, iatrogenic drugs. These causative agents lead to fetal death and resulted in mummified fetus (Planellas *et al.*, 2012). It is pertinent to mention that mummified condition can only be observed in 2<sup>nd</sup> half of canine and feline pregnancy as in 1<sup>st</sup> half whole fetal reabsorption will occur in case of fetal death (Johston *et al.*, 2001a, Alaçam, 2010). In small animals diaphragmatic hernia is observed after abdominal trauma as a result of car or bike accidents. In such sort of accidents abrupt abdominal pressure may leads to tear/s in weaker parts of diaphragm and herniation of abdominal contents into thoracic cavity produces mild conditions to life threatening complications. In case of pregnant animals if uterine parts are also involved then outcome is more dangerous as decreased space for lungs activity and fetus demand during the course of

pregnancy. In diagnosed cases surgical correction is the ultimate solution for this anomaly. Current case report is about a unique case in which history, Clinical diagnosis, Treatment protocol like anesthesia, intraoperative supervision and post operative follow up has been chalked out.

**CASE DESCRIPTION**

A 3-year old domestic short haired female cat was presented to the clinic for evaluation of retching, dyspnea and one week ongoing reddish brown vulvar discharge. Owner was expecting kitting previous week but without any outcome. According to history it has normal pregnancy and queening previously. It was dog-tired with abdominal breathing. History was taken and clinical examinations (inspection, palpation, vaginoscopy) were performed. Haematological examination was analyzed by Abbott Cell-Dyn 3500 hematological analyzer (Gml Inc, Ramsey, Minnesota, USA). Radiographs of thorax and abdomen were taken to lateral and ventrodorsal views. Ultrasonography was done using ultrasound scanner equipment (Siemens Sonoline Prima, Osaka, Japan) with a 5-7.5 MHz linear array transducer. Diaphragmatic hernia of uterus with two fetuses in thorax and one fetus in abdomen was diagnosed in cat. According to history as narrated by owner cat has experienced no accident after last queening and they never left this pet unattended. Overiohysterectomy operation with fetuses and suturing

of diaphragmatic tears by celiotomy were performed under general anesthesia.

**Clinical and Laboratory Findings:** Clinical examination revealed that heart rate, respiration rate, mucous membrane colour, capillary refill time and temperature were all within normal ranges on presentation but retching and laboured breathing were noticed with little movement of queen in examination room. Hematological examination revealed an decreased Mean Corpuscular Volume (MCV) (30 fL; normal range 37.7-50 fL) and Mean Corpuscular Haemoglobin (MCH) (10.8 pg; normal range 12.3-17.2 pg). The remaining haematological findings like urea, creatinine, ALT, glucose and total protein were within normal ranges (Plumb 2008).

**Radiographic Findings:** Radiographic diagnosis was carried out by plain radiography. Radiographs of the thorax and abdomen (left lateral and dorsoventral recumbency) were taken on the conscious patient after stabilization. Cranial displacement of the liver, displacement of the stomach and/or intestinal loops into the thorax and loss of the ventral part of the diaphragmatic line were the radiographic findings. A lateral thoracic radiograph showed the trachea to be deviated dorsally, and revealed two fetal skeletons located in the thorax, as caudal as the level of the third rib from diaphragmatic reference point. The cardiac silhouette was obscured by a structure of increased tissue density. The ventrodorsal view showed the trachea and heart to be markedly deviated to the right, and that the left lung was not visible. Heart was visible in the right hemi thorax. Well mineralized fetal skeletons were visible in the left hemithorax, as was one skeleton on the right side of the abdominal cavity (Fig. 1). There was also gas-filled bowel loops on the right abdomen.

**Ultrasonographic Findings:** Fetal parts were observed in the left hemithorax on ultrasonography performed through intercostal spaces. Some parts of liver, stomach,

spleen and intestines were also visible in the thorax. Diaphragmatic out line was missing in the ultrasonogram.

**Anesthesia:** The cat was anaesthetized (induction with propofol [Propofol<sup>®</sup> %1; Fresenius Kabi, 7 mg/kg IV] and gas anaesthesia [Isoflurane-USP<sup>®</sup>; Adelka, in 100% O<sub>2</sub>, 2l/min via an endotracheal tube] with positive pressure ventilation when needed) and underwent a midline celiotomy. General anesthesia was maintained with isoflurane and oxygen. Postoperative analgesia was provided via a tolfenamic acid, (Tolfine<sup>®</sup>; Vetaquinol-Novakim, 4 mg/kg SC).

**Surgical Intervention:** The cat was anaesthetized and prepared for midline coeliotomy. Surgical exploration revealed a 6 cm left-sided vertically oriented rent in the dorsal aspect of the diaphragm and a 2 cm right-sided vertically oriented in the middle of the diaphragm. The margins of this tear appeared thick and fibrous, suggestive of a chronic, traumatic acquired diaphragmatic rupture. Left medial and left lateral liver lobes, left cornu uteri with two fetuses (Fig 2) and most of the small intestine were located in the left hemithorax. Right lateral liver lobe and gall bladder were settled in the right hemithorax (Fig 3). The pylorus and the duodenum were displaced cranially towards the diaphragmatic tear. Left uterine horn with two fetuses was taken abdomen from the thoracic cavity. Ovariohysterectomy with fetuses was performed as described by Stone (2003) with a request of the owner. The displaced viscera were taken to the abdominal cavity and arranged in their correct anatomic position. The diaphragmatic tears were sutured in simple continues pattern with polyglactin 910, 3/0 (Coated Vicryl<sup>®</sup>, Ethicon) using no tension. The linea alba was closed with simple interrupted sutures (polyglactin 910, 3/0, Coated Vicryl<sup>®</sup>, Ethicon) with some tension due to the reduction of the abdominal organs. No complications were observed during surgery, and recovery from anaesthesia was uneventful.



**Fig. 1. Roentogram showing location of fetuses and displaced heart. Bold arrow indicating vertebral column in thoracic cavity. Twisted arrow sign showing second vertebral column and arrow head showing vertebral column in abdominal cavity. Arrow pointer showing right sided displaced heart**



Fig. 2. Arrow showing diaphragmatic tear with herniated gravid uterus in cat

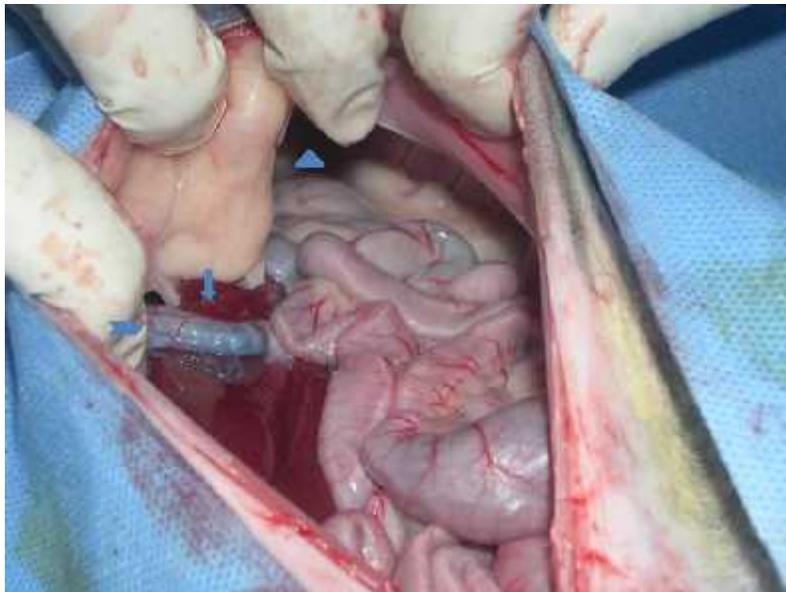


Fig. 3. Parts of gallbladder (➡) and liver (⬇) can be seen in thoracic cavity 2<sup>nd</sup> opening. Diaphragmatic opening (▲) after removal of gravid horn



Fig. 4. Recovered partial mummified fetuses after surgical intervention.

## DISCUSSION

About 85% of total diaphragmatic hernia cases are of traumatic origin and 15% cases belong to congenital and idiopathic origin. Unlike humans, where right side of diaphragm is protected by liver, canine and feline has both sided liver contact without any marked protective effect (Wilson and Hayes, 1986). Mummified fetuses are accidentally observed during neutring interventions (Planellas *et al.*, 2012). In rare cases clinical signs are evident (Voorwald *et al.*, 2012). Partial mummified fetuses in thoracic cavity and abdominal cavity is perhaps the first report of its kind. In such cases surgical reduction with stable pulmonary function is treatment of choice (Slensky, 2009) and it always needs controlled ventilation as pleural cavity is exposed. After correction proper follow-up was observed to minimize the chances of major postoperative complications like pneumothorax and Re-expansion pulmonary edema (RPE) in present case (Fossum, 2007).

In postoperative ventrodorsal and lateral plain radiographs, diaphragmatic line was evident with presence of free pleural air within the chest cavity. Heart was elevated from the sternum. Findings of the pneumothorax were decreased step by step on the control radiographs. Unlike findings of maceration or mummification (Jubb *et al.*, 1985) size of fetuses was same with different extent of maceration and mummification. In present case radiography and ultrasound findings were comparable with another case report (Acar *et al.*, 2013). Due to chronic in nature and adhesions in diaphragmatic tears other involved organ parts need much care to separate and reduce from herniated space. Heart was pressed to such an extent that it was occupying same place in opposite side of thoracic cavity and perhaps its displaced orientation plunged queen in great distress. In another report by Planellas *et al.* (2012) one mummified fetus was found in same breed. One possible assumption in that case was reduced circulation in herniated gravid uterus because of avulsion of the ovarian pedicle or an abnormal placental contact leading death and ultimately mummification. In our case, on contrary, all dead fetuses were of normal size.

In a nutshell this, probably first, case report is an evident of successful judgment and treatment protocol of feline pregnancy in thoracic cavity with right sided displaced heart due to chronic diaphragmatic hernia. In canines plentiful data are available but in feline this is the first report in which two partially mummified fetuses were recovered from thoracic cavity and one from abdominal cavity respectively. These changes also indicate that fetuses were normal during the course of pregnancy but got ascending infection and subsequently lytic changes at cervical dilation at the end of pregnancy. Purpose of this case report is to share the findings of this rare case with practitioner community in small animal practice. Owners

of pets should be encouraged and advised for pregnancy evaluation so that such cases, if diagnosed, may be handled at the earliest. At the same time best treatment regimen is neutring to avoid any future complication in affected animals.

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