Research Article

Fetus Beyond the Uterus: Abdominal Ectopic Pregnancy in a Domestic Cat

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Abstract | Ectopic pregnancy is a rare reproductive disorder in female cats, characterized by extrauterine development of the fetus. A three-year-old cat was sent to us due to a palpable hard lump in the belly. Radiography revealed a spherical mineralized object within the abdomen, identified as a mummified fetus. Following laparotomy, the fetus was discovered to be adhered to the mesentery and encased in a layer of adipose tissue. The uterus was intact, with no indications of abnormalities. The mummified fetus was subsequently extracted carefully from the abdominal cavity through laparotomy. Following post-operative care, the cat recovered completely and continued its regular life. This case highlights that, although rare, ectopic pregnancy can occur and should be considered as a differential diagnosis for feline abdominal masses in female cats.

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Introduction

Cats are considered essential family members and are among the most widely tamed companion animals in the world. Domestic cats actively engaged in their own domestication since they and humans created a mutually beneficial relationship based on cooperation and tolerance (Bellwood, 2023). Some remarkable reproductive behaviors are exhibited by female cats, who are also referred to as "Queens." They are sexually active at approximately 9 months of age, although this can vary from 4 to 18 months. They are capable of producing 3 to 4 litters annually, with each litter containing an average of 4 kittens (Goericke-Pesch *et al*., 2014; Kustritz, 2006).

Ectopic pregnancy is one of the several complications that can occur during a queen's gestation. Extrauterine pregnancy (EUP) or ectopic pregnancy is a condition in which the fetus develops outside the uterus. There are two categories: primary and secondary. Primary ectopic uterine pregnancy (EUP) occurs when a fertilized egg implants in the abdominal cavity rather than progressing through the fallopian tubes. The whole gestation transpires outside the uterus. During secondary ectopic uterine pregnancy, the growing embryo or fetus is displaced into the abdominal cavity as a result of uterine rupture. The

pregnancy initiated in the uterus is subsequently sustained in the extrauterine environment (Nack, 2000). Ectopic pregnancy in animals predominantly occurs in primates, such as monkeys. The likelihood of a ectopic pregnancy in non-primate animals is quite minimal (Jerome and Hendrickx, 1982). While embryonic mummification and retention, both in utero and ex utero, have been documented in felines, the precise prevalence remains unclear and is thought to be minimal (Lefebvre, 2015). In ectopic pregnancy mostly the fetus is mummified and a mummified fetus may persist within the animal for several months. The clinical diagnosis of a mummified fetus often happens incidentally, but symptoms such as lethargy, fever, and anorexia may occasionally manifest (Planellas *et al.*, 2012).

This case study aimed to diagnose an extrauterine pregnancy in a 3-years old unspayed female indigenous cat using abdominal radiography (X-ray), followed by an exploratory laparotomy to examine the tissue and excise the fetal mass.

Case description

A three-years old queen was presented to our clinic (Pet Point Gazipur) with a history of delivering three healthy kittens three months prior. The cat exhibited no indications of disease or abnormal behavior. The owners reported a palpable hard lump in the abdomen. The cat was previously sent to another clinic for an ovariohysterectomy, where the issue was subsequently diagnosed by the surgeon. He then referred the patient to our clinic for further diagnosis. Following the initial physical examination, we performed an X-ray to find out the cause of the lump. Radiographic data revealed the presence of a mummified fetus within the abdominal cavity (Figure 1). Following diagnostic confirmation, we proceeded with an emergency surgery.

Surgical procedure

The queen was anesthetized with a mixture of ketamine HCl and xylazine HCl before undergoing an ovariohysterectomy. Atropine sulfate was administered as a premedication at a dosage of 0.065 mg per kilogram of body weight. Xylazine HCl was administered for sedation at a dosage of 0.5 mg/kg of body weight. Ketamine HCl was administered as the induction drug at a dose of 17 mg/kg of body weight. For maintenance, half of the first dosage of ketamine HCl was administered.

Figure 1: *X-ray of the cat showing round mineralized structure (red circle) in the abdomen.*

Following induction, the incision site was trimmed, shaved, and disinfected. The incision location was a ventral midline incision on the linea alba, located caudal to the umbilicus. Once the abdomen was opened up, the uterus horns were found primarily. However, the uterine horn had a typical morphology and was rather normal in size. There was no evidence of the fetus inside of the uterus. Upon identifying the uterine horns, the uterus and ovaries were excised after the ligation of the principal blood arteries using catgut 2-0 (Trugut®, Healthium Medtech Limited, India) and vicryl 2-0 (Trusynth®, Healthium Medtech Limited, India). After completing the ovariohysterectomy in a typical pattern, the abdominal cavity was explored for the presence of the mummified fetus. At first there was presence of a hard fat covered structure caudal to the liver, tangled in between the mesenteries. Upon further inspection, it was revealed that the mummified fetus was attached and covered by the fats (Figure 2). The remainders of the fetus were just bony structures with no clear outlines. It was confirmed as the fetus when the skull of the fetus was detected along with its legs. Then the fats were separated slowly and carefully from the fetus to avoid any significant hemorrhage. After removing the fats, the fetus was discarded from

the body. Then the muscular layer was sutured in a simple continuous pattern, while the skin was closed using a simple interrupted technique.

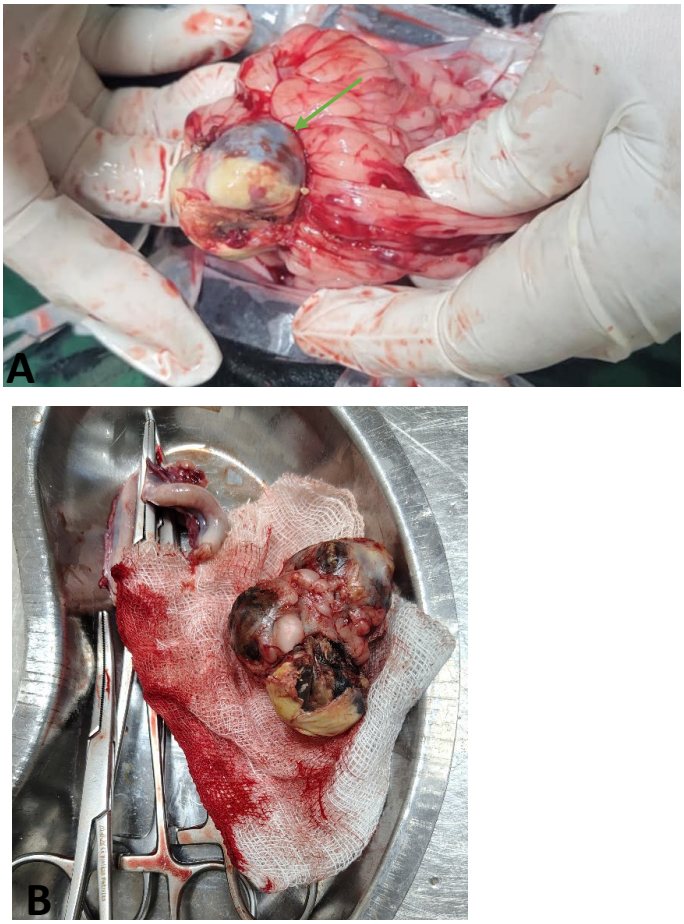

Figure 2: *The mummified fetus in the abdominal cavity. (A) Green arrow shows that the fetus was covered by a layer of fat. (B) Yellow arrow shows the normal uterus after ovariohysterectomy.*

Post operative management

After completing the surgery, the heart rate, blood oxygen level, respiratory rate was observed for an hour. The cat recovered completely from surgery after 6 hours. The cat received standardized post-operative care, including administration of appropriate medications. The postoperative medications comprise the antibiotic ceftriaxone at 25 mg/kg body weight administered intramuscularly once daily for 5 days (Inj. Topcef vet®, Navana Pharmaceuticals Ltd., Bangladesh), the anti-inflammatory tolfenamic acid at 4 mg/kg body weight administered intramuscularly once daily for 3 days (Inj. Tufnil vet®, Eskayef Pharmaceuticals Ltd., Bangladesh), the topical antiseptic povidone iodine for dressing (Sol. Povin vet®, Opsonin Pharma Ltd., Bangladesh), and the local antibiotic Neomycin Sulfate combined with Bacitracin Zinc (Pow. Nebanol®, Square Pharmaceuticals PLC, Bangladesh).

Discussion and Conclusion

In felines, pregnancy loss may take place at any phase of gestation, indicated by embryonic or fetal resorption, abortion of fetuses, stillbirth, and/or fetal mummification. Fetal mummification in cats may result from a range of causes. The cause of fetal mummification can vary from infectious causes like Feline Panleukopenia Virus, Feline Leukemia Virus, Feline Rhinotracheitis Virus, Feline Infectious Peritonitis Virus, etc. to non-infectious causes like trauma leading to uterine rupture, exogenous drugs, Uterine torsion, etc. (Lefebvre, 2015; Vikram *et al.*, 2020).

In extrauterine pregnancy generally, the fetuses are enveloped by the omentum, with the fetal membranes adhering at a specific location; nevertheless, they subsequently perish shortly thereafter. Post-mortem alterations may include dehydration, distortion, and reduction in size of fetuses, breakdown of fetal membranes, and adherence of the fetus to the adjacent tissues. The mummification process inhibits autolysis by dehydration and oxygen deprivation. Despite the existence of such cases in the literature, inquiries on the specific causes and processes behind this illness in animals remain predominantly unresolved (Zheng *et al.*, 2018; Ivanova *et al.*, 2019; Orekhova *et al.*, 2024).

Fetal mummification is a rare incident in cats. Peas (2020), reported an incident of intrauterine fetal mummification in a cat, where the fetuses were dried up inside of the uterus. Extrauterine fetal mummifications are rarer than intrauterine ones. A case of ectopic pregnancy and fetal mummification was recorded due to trauma during pregnancy (Johnston *et al.*, 1983). Similar to this present study, Rosset *et al.* (2011), also reported an incident of feline abdominal fetal mummification and surgical correction was required to remove the fetus. In a case report by Planellas *et al.* (2012), surgery was performed on a queen to extracted a mummified fetus from the thoracic cavity. Ectopic pregnancy due to trauma was reported by Mirsepehr *et al.* (2015), where 3 fetuses were found in the abdominal cavity.

In this study, the fetus that was found had a grown skull and spine. Fetal ossification in felines typically occurs between 35 and 39 days post-conception

(Boyd, 1971). The existence of fetal ossification in this instance indicates that the uterine herniation occurred at a later stage of gestation. It is speculated that the cat experienced a normal pregnancy during the initial gestation; but, owing to trauma or injury, its uterus ruptured, resulting in a fetus being displaced into the abdomen, where it subsequently perished and became mummified.

By showing that an extrauterine mummified fetus can remain asymptomatic for months after normal parturition, this case contributes to the limited research on feline abdominal ectopic pregnancy, a rare reproductive condition. The absence of clinical signs apart from an abdominal mass emphasizes the importance of considering ectopic pregnancy in the differential diagnosis of abdominal swellings in queens with a recent reproductive history. Furthermore, the concurrent decision to perform ovariohysterectomy alongside fetal removal highlights a practical surgical approach that ensures both immediate resolution and prevention of future reproductive risks.

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Novelty Statement

This case report describes a rare instance of abdominal ectopic pregnancy with fetal mummification in a domestic cat, highlighting an uncommon reproductive disease in felines. The research offers novel therapeutic insights into the limited research about extrauterine pregnancies in felines by illustrating effective surgical intervention with simultaneous ovariohysterectomy and excision of the mummified fetus. It emphasizes the need of including ectopic pregnancy as a differential diagnosis for abdominal tumors in queens.

Author's Contribution

Md. Tasmir Rayan Labib prepared and wrote the manuscript. Md. Mohay Menul Haque Padmo critically reviewed and revised the manuscript. Both authors approved the final version for submission.

Generative AI and AI-assisted technology statement

Generative AI technologies were not employed for data collection, analysis, or interpretation. AI-assisted approaches, such as grammar and language editing tools, were employed to enhance the manuscript's readability and comprehensibility. The writers reviewed and sanctioned all aspects.

Conflict of interest

The authors have declared no conflict of interest.

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