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Ovariohysterectomy in Cat as An Alternative Handling of Fetus Mummification Cases

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Abstract

Fetal mummification is a rare and challenging condition in cats that requires immediate intervention to mitigate potential risks to the mother and future pregnancies. This case study presents the diagnosis, treatment, and outcomes of Pawpaw, a cat diagnosed with fetal mummification. Ovariohysterectomy was performed as an alternative treatment method to address the critical condition of the cat. The diagnosis was established based on various factors, including indications, anamnesis, clinical symptoms, clinical examination, clinical findings, and investigative results. Diagnostic confirmation was achieved through blood haematology tests and ultrasound examinations. The therapeutic approach consisted of administering a combination of normal saline fluid therapy, glycerin, ondansetron, ceftriaxone, intramox, doxycycline, acetylcysteine, sakatonic liver, vitamins, ventolin, Tripura, meloxicam, impacting, and furosemide. Anesthesia during the ovariohysterectomy procedure involved the use of atropine sulfate, xylazine, and ketamine. Despite the extensive medical intervention, the cat, Bimbim, succumbed to its critical condition during the surgery. This case study highlights the importance of early diagnosis and prompt intervention in cases of feline fetal mummification. Ovariohysterectomy proved to be a viable alternative treatment option, although the critical condition of the cat posed significant challenges to its successful outcome. Further research and enhanced understanding of fetal mummification in cats are essential to improve the management and prognosis of this condition.

Keywords

Cat, Diagnosis, Fetus Mummification, Fetal mummification, Ovariohysterectomy

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Introduction

The domestic cat, scientifically known as *Felis catus*, is a beloved member of households worldwide, making it one of the most popular pets. Cats come in various forms, including purebred and local cats that result from crossbreeding or living in the wild (De Oliveira *et al*., 2001). From an economic standpoint, cat breeding can be a profitable venture due to the remarkable reproductive potential of these animals.

Female cats, in particular, exhibit impressive reproductive capabilities, often giving birth to litters of one to six kittens in a single reproductive cycle. However, alongside this fertility, cats are susceptible to various reproductive disorders and diseases (Thomson and Britt, 2022). These conditions can not only affect the health of the cats but also their ability to produce healthy offspring, which is critical for breeders and pet owners. Reproductive disorders in cats encompass a range of issues, including infections in the reproductive tract, reproductive tumors, hormonal imbalances, and other disorders (Thomson and Britt, 2022). Among these conditions, fetal mummification is a peculiar and potentially life-threatening phenomenon.

Fetal mummification occurs when a fetus in the uterus dies without becoming contaminated by microorganisms. In such cases, the dead fetus is gradually absorbed by the mother's uterus, leading to a dry and hardened mummified state. Several factors can trigger fetal mummification, including umbilical cord entanglement, uterine torsion, umbilical cord constriction, and genetic abnormalities. This condition manifests through various symptoms, such as the presence of a rigid fetus, anestrus, persistent straining, and anorexia (Affandhy *et al*., 2007).

Diagnosing fetal mummification relies on a comprehensive approach, encompassing indications, reproductive history, clinical symptoms, and physical examinations, supported by various diagnostic tools. These investigative methods include X-ray radiography, ultrasonography (USG), and blood hematology tests (Santana *et al*., 2019).

Ultrasound, in particular, is an invaluable diagnostic aid for fetal mummification, as it can reveal vital signs of lifelessness, such as the absence of fetal movement and a detectable heartbeat. Ultrasound is a versatile tool for detecting various pregnancy abnormalities (Noviana *et al*., 2008). X-ray radiography can provide further insights, revealing the presence of ossified and drying mummified fetuses. Additionally, blood hematology tests serve as essential supportive tools by indicating changes in blood composition related to potential infections or inflammation caused by fetal mummification.

Treating cases of fetal mummification in cats involves two main therapeutic options: pharmacological intervention through the injection of PGF2α to induce uterine contractions and surgical procedures. PGF2α injection is aimed at stimulating uterine contractions to facilitate the expulsion of the mummified fetus naturally. Surgical interventions are usually performed through ovariohysterectomy (OH), a procedure involving the removal of the ovaries, uterine horns, and uterine corpus from the abdominal cavity.

In cases of fetal mummification, the choice of treatment method is critical, as it significantly affects the cat's overall health, reproductive prospects, and well-being. Understanding the implications of these treatment options is crucial for both

veterinarians and cat owners. The ovariohysterectomy method, commonly known as OH, is a particularly important aspect of treating fetal mummification. It can prevent the recurrence of this condition and safeguard the cat from other reproductive diseases such as pyometra, metritis, and endometritis. Therefore, gaining an in-depth understanding of this method is essential for all those involved in feline care and breeding.

This research seeks to shed light on the significance of the ovariohysterectomy (OH) technique as a valuable tool in managing cases of fetal mummification in cats. By providing a comprehensive explanation of the OH method, this study aims to equip future veterinarians with the knowledge and skills necessary to effectively apply this technique in their professional practice. Moreover, this research is instrumental in promoting a deeper understanding of the benefits of ovariohysterectomy as a therapeutic approach for cases of fetal mummification in cats. By offering detailed insights into the procedure, its outcomes, and potential complications, this study empowers veterinarians to make informed decisions when treating affected cats.

Furthermore, the urgency of this research lies in its critical relevance to the welfare and reproductive health of cats. Fetal mummification is a severe condition that necessitates precise and timely intervention. By enhancing the understanding of ovariohysterectomy and its role in managing this condition, veterinarians can provide better care for afflicted cats, reduce the risk of complications, and improve the animals' overall quality of life. In conclusion, this study aims to address the critical need for comprehensive knowledge about the OH technique in the context of managing fetal mummification in cats. By offering a detailed exploration of this method, its implications, and its benefits, this research contributes to a more complete understanding of the management of fetal mummification in cats.

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Materials and Methods

Tool

Caesarean section can be carried out as it doesn't involve any damage to the uterine organs. The surgical tools required for a Caesarean section typically include stethoscopes, thermometers, oxygen cylinders, flashlights or lamps for lighting, clippers, as well as blades, scalpels, anatomical and chirurgical tweezers, needle holders, scissors, tata and tutu clamps, arterial clamps, duk clamps, duk hooks, and nierbaken.

Material

Materials used in ovariohysterectomy (OH) typically include gauze, syringe, 70% alcohol, iodine, physiological NaCl, atropine sulfate, xylazine, ketamine, gentamicin ointment, plaster, as well as 2-0 chromic thread and silk thread.

Methods

Pre-Operation

Pre-surgery is all the preparations that must be prepared before surgery. Pre-operation is divided into three, namely the preparation of animals, equipment, and operators.

Animal Preparation

Before the patient is operated on, the veterinarian confirms the patient's identity, the surgical technique, and the site. The patient is not bathed, considering the patient's condition is terrible, and it is not possible if he has to be bathed because it can make the patient's

condition worse. The patient is then shaved precisely in the area that will be operated on. The shaved area is about 10 cm from each side of the incision. After that, the patient is positioned on the operating table (dorsoventral position because the part to be operated on is the midline). The patient is then fixed by providing padding on either the right or left side so that the patient's position does not change because it can interfere with the operation. Next, the incision area is cleaned using povidone-iodine and poured over sterile gauze from the circular incision area to the outermost edge of the incision. After that, the dug is installed and fixed with the dunk clamp.

Provision of premedication, in this case, was given at the time of animal preparation. Ten minutes after the administration of premedication drugs, which included xylazine, the patient received an additional injection of xylazine to aid in the expulsion of residual food from the stomach.

If the patient loses consciousness, the patient can be prepared for surgery, such as shaving and others. Ketamine injection is given after the patient is ready for surgery.

Figure 1. Animal Preparation.

Equipment Preparation

All equipment used for surgery must be sterilized beforehand. The surgery equipment is sterilized with the sterilizer. The liquid used to sterilize surgical instruments is 70% alcohol. Sterilization of equipment used for the surgery is carried out by spraying 70% alcohol toward each tool.

Figure 2. Preparation of equipment and materials for surgery.

Operator's Preparation

All sterile surgical teams must wear clean clothing when entering the operating room. In addition, all surgical teams are also required to use gloves when handling sterile surgical instruments so as not to contaminate the tools and to wear head coverings for teams who do not wear the hijab. All who enter the operating room must also wear a mask, wear sandals, and minimize conversation while on the operating table. All members of the sterile surgical team also wash their hands and rub their hands with an antiseptic soap. ARM before entering the operating room minimizes contamination during surgery.

Operation

In this particular case, an ovariohysterectomy procedure was carried out with the patient positioned in the caudal midline, maintaining a dorsal or dorsoventral prone posture. The steps for performing the OH operation in this instance are as follows:

The initial incision, approximately 3-5cm long, was made in the skin from the umbilicus towards the caudal region, progressing through the subcutaneous layer and further dissecting the fat beneath it to expose the linea alba using tutu scissors. Subsequently, an incision was made on the linea alba, precisely cutting through the external and internal rectus abdominal muscles until reaching the peritoneum. After breaching the peritoneum, the incision line was extended with blunt scissors. Careful preparation of the falciform ligament attached to the abdominal wall allowed access to the internal organs of the abdominal cavity. The bladder was explored to locate the uterus positioned beneath it, with the aid of a spay hook and a sterile finger. Once the uterus was identified, the uterine branches were traced to each ovary and prepared for removal. This preparation involved cutting various parts, including the ovarian hanger (mesovarium), fallopian tube hanger (mesosalpinx), and uterine hanger (mesometrium).

The blood vessels near the ovaries were ligated before removing the ovaries, with double ligations to ensure no bleeding. This process was repeated for both the left and right ovaries. Ligation was also performed at the border between the cervix and the uterine body using 3-0 chromic thread, securing the tissue to prevent any potential release. After ligation, a thorough check ensured there was no bleeding in the ligated area, and any residual blood was cleaned from the abdominal vicinity. The omentum was then repositioned to cover the abdominal surface. Tissues and organs were moistened with physiological NaCl during exploration, and after suturing, Penstrep-400 antibiotic was applied to the animal's muscles. Muscle suturing was conducted with a simple interrupted suture type, while the subcutaneous layer was sutured with the same method, and the skin was closed using an intradermal suture.

All sutures were made using 3-0 chromic thread. To prevent bacterial infection, gentamicin ointment was applied to the wound, which was later sealed using gauze. To prevent the animal from licking the suture marks and potentially reopening them, a protective collar was affixed.

Figure 3. Documentation during OH surgery. (A) Skin incision, (B) subcutaneous and musculus incisions, (C) uterus with a mummified fetus, (D) ovarian artery ligation and mesovarium dexter and sinister sides, (E) ligation of the border between the corpus uteri and cervix uteri, (F) administration of pen strep to the tissue to prevent contamination, (G) simple interrupted suturing of the muscles, followed by simple continuous subcutaneous sutures, (H) intradermal suturing of the skin, (I) closing the suture wound with a bandage.

Results

Signalement

Name of Animal : Pawpaw (Figure 4)
Type Animal : Cat
Breed : Persian mix
Age : ± 2 year
Gender Type : Female
Hair Color : Calico
Body Weight : 3.7 kg
Owner Name : Mas Kukuh

Patient History

Pawpaw was brought to Winadi Vet on August 11, 2021, with lethargy and dyspnea. According to the owner's statement, Pawpaw had been vomiting clear liquids for three days and had decreased appetite. There was no history of diarrhea, and Pawpaw was fed *wet food*. There was a torn wound on the neck, probably after a fight with another cat. The owner did not know Pawpaw's reproductive history, who Pawpaw's mate was, when was Pawpaw's last estrus, and when did Pawpaw become pregnant.

Physical Examination

The results of a physical examination carried out by a veterinarian found that Pawpaw had a fever with a body temperature of 42.2^{o}C, frequency of heartbeat 176 x / minute, 8% dehydration, there was anal gland in the rectum and clean ears. CRT examination results <2, but there was inflammation in the gingiva (gingivitis). Dehydration was assessed by various clinical signs, including skin turgor, mucous membrane moisture, and overall physical condition. There was no vaginal discharge. Based on the physical examination results, the vet found abdominal distention, and Pawpaw seemed to have difficulty breathing.

Figure 4. Pawpaw cat

The veterinarian then examined the abdomen and the results of palpation of the abdomen found a hard formation in Pawpaw's uterus. The doctor then diagnosed that the fetus was palpable in Pawpaw's uterus. According to the doctor's estimate, about 2-3 fetuses were in Pawpaw's abdomen. Pawpaw's udder also looked big, but milk didn't come out when massaged. Abdominal examination results also showed a palpable presence of enlarged kidneys, both dexter and sinister.

Differential Diagnosis

Differential diagnosis is the distinction of specific diseases or conditions presenting a clinical picture similar to several other diseases or disorders. The differential diagnoses in this case include: fetus mummification, dystocia, and fetus maceration.

Mummification of Fetus

Fetal mummification is when a fetus in the uterus dies without contamination by microorganisms; absorption by the uterus occurs so that the fetus becomes dry and hard. Fetal mummification can be caused by twisting of the umbilical cord, uterine torsion,

narrowing of the umbilical cord, or due to genetic abnormalities. Symptoms that can be identified include a hardened/petrified fetus when touched rectally, anestrus, persistent straining, difficulty detecting, and anorexia. Treatment can be done by intramuscular injection of stilbestrol at a dose of 50-80 mg or by injection of PGF2. Handling fetal mummification can also be done surgically (Affandhy *et al*., 2007).

Dystocia

Dystocia is a condition in the first stage of birth (cervical dilatation). The second (fetus expulsion) is longer, making it difficult and impossible for the mother to expel the fetus. Dystocia can be caused by uterine inertia, fetopelvic diaspores, obstruction of the bile duct, and malpresentation of the fetus; there is evidence that signs of life are threatened. Handling cases of dystocia in small animals is usually done by Caesarean section. Caesarean section is an action to stop the period of pregnancy due to dystocia. The indications for Caesarean section are that the fetus is still left in the womb, the mother is unable to push, the fetus is squashed, and the fetus is breech (Sari, 2016).

Fetus Maceration

Maceration of the fetus is a condition in which the fetus is submerged in amniotic fluid for a long time, and there is a bacterial infection so that the fetus's body becomes mush and disintegrates. It is expelled out through the vulva and, only the bones of the fetus are left in the uterus. The leading cause is the bacterium *Trichomonas fetus*, also caused by a fungus. Symptoms that appear include the presence of foul-smelling pus from the vulva, the animal's constant pushing, the body temperature rising (acute events), frequent breathing (gasping), anorexia, palpable bone formations, fluid, and thickening of the uterus. Treatment can be done by removing the fetal bones through surgery and removing the pus with the hormone PGF2 / estrogen (Affandhy *et al*., 2007).

Inspection Support

Investigations carried out, in this case, are intended to assist in confirming the diagnosis and to find out, more specifically, the causes of pain from Pawpaw. The investigation carried out, in this case, is a blood hematology examination.

Blood Hematology Examination

A blood hematology examination will determine the blood panel (complete *blood count)* using *the VetScan Hematology Analyzer* (Abaxis). According to Stockham and Scott (2008), the hematological examination can be used to confirm or determine the presence of abnormalities due to infection with a disease and to know the characteristics of the blood is examined. The results of the hematological examination, in this case, are presented in Table 1.

Table 1. Results of the Pawpaw cat hematology examination

Items	Results	Unit	Normal Range	Notes
White blood cells (WBC)	24,7	10^3/µL	5.5-19.5	H
Lymphocytes	22,4	10^3/µL	0.8-7	H
mid	1	10^3/µL	0-1.9	
Granulocytes (GRA)	1,3	10^3/µL	2,1-15	L
Red blood cells (RBC)	4,8	10^6/µL	4,6-10	
Hemoglobin (HGB)	6,1	g/dL	9,3-15,3	L
MCHC	28,9	g/dL	30-38	L
MCH	12,6	Pg	13-21	L
MCV	43,7	fL	39-52	
RDW-CV (Red Cell Distribution Width)	**13,6**	%	**14-18**	L
RDW-SD	27,9	fL	35-56	L
HCT	20,9	%	28-49	L
Platelets (PLT)	207	10^3/µL	100-514	
MPV	8	fL	5-11,8	
PDW	11,2	fL	10-18	
PCT	0,165	%	0,1-0,5	
P-LCR	18,2	%	13-43	

Ultrasonography

Pawpaw also had a supporting examination in the form of an ultrasound (USG). Ultrasound results show uterine thickening, but no fetus or signs of life are visible.

Figure 5. The results of an ultrasound examination of Pawpaw

Diagnosis

In this case, the diagnosis was based on the clinical symptoms that appeared, clinical findings, and the results of investigations supported by the anamnesis and the signals obtained. Based on the POA results supported by follow-up examinations described above, the diagnosis confirmed for the Pawpaw case is fetal mummification. Based on the results of this diagnosis, the vet then decided to perform surgery as an alternative to handling cases of fetal mummification in Pawpaw.

Prognosis

The prognosis in cases of fetal mummification is fausta. Cats that experience fetal mummification can be saved by handling ovariohysterectomy or hormonal therapy (Vikram *et al*., 2020; Hossain *et al*., 2021).

Treatment

In addition to surgical treatment, Pawpaw was given several drug therapies to restore its condition. Some of the drugs given to Pawpaw can be seen in Table 2 below.

Table 2. Drugs Given to Pawpaw

Drugs Name	Indication	Dose	Route	Volume
Glucortin	Anti-inflammatory	0.01-0.16 mg/kg BW	IM, SC	0.185ml
Ondansetron 2mg/ml	Anti-emetic	0.5mg/kg BW q6h	IV, IM	0.9ml TID
Ceftriaxone	Antibiotics	25-50 mg/kg BW	IV	0.9ml
Intramox	Antibiotics	0.1ml/kg BW per three days	IM/SC	0.37ml
Doxycycline	Antibiotics	5-10 mg/kg BW	PO	1/3 caps
Acetylcysteine		70mg/head (BID)	PO	1/3 caps
Sakatonic liver			PO	2cc
Vitamin		20 ml	infusion	
Ventolin		10 drops + 1 ml NS	Nebu	
Atropine sulfate	Premedication	0.01ml/kg BW	SC	0.037ml
Xylazine	Anesthesia	0.1ml/kg BW	IM	0.37ml
Ketamine	Anesthesia	0.1ml/kg BW	IM	0.37ml

Discussion

Pawpaw came to Winadi Vet with lethargy and dyspnea. According to the owner's statement, Pawpaw had been vomiting clear liquids for three consecutive days. On the day Pawpaw was taken to the clinic, Pawpaw vomited clear liquid once. There was no history of diarrhea, and Pawpaw was fed *net food*. On Pawpaw's neck, there was an open wound like a tear, possibly after a fight with another cat. The owner did not know Pawpaw's reproductive history, who Pawpaw's mate was, and when was Pawpaw's last estrus. Based on the history of the disease given by the owner, the veterinarian then carried out a follow-up examination in the form of a clinical examination to find out more about the causes of Pawpaw's illness. A clinical examination of the cat was carried out with the paramedics on duty. The result was that Pawpaw had a high fever because body temperature reached 42.2^{o}C (normal cat temperature above 38.5^{o}C, 8% dehydration, there was anal gland in the rectum, and the ears looked clean. CRT

examination results > 2, and there was inflammation in the gingiva (gingivitis). When examining the reproductive tract (vagina), there were no abnormalities, either swelling, discoloration, abnormal formations, discharge, or discharge in the vagina.

Based on the comprehensive physical examination, the vet suspected an abnormality in the abdominal region. This was because Pawpaw's abdomen appears distended, and Pawpaw appeared to have difficulty breathing. The vet then palpated the abdomen and found a complex, fetal-like formation around the abdomen on the ventral side, more caudally. Most likely, the formation was proper in Pawpaw's uterus. Based on these results, the doctor gave an initial diagnosis that Pawpaw was pregnant, and a fetus was palpable on the abdomen. According to the doctor's estimate, about 2-3 fetuses were in Pawpaw's abdomen. However, the accuracy of the diagnosis based on physical examination in the form of abdominal palpation could not be ascertained and still required further diagnosis in the form of radiological imaging tools such as ultrasound and other examinations such as blood hematology to ensure any abnormalities in Pawpaw. In addition to the palpable presence of the fetus, abdominal examination results also showed palpably enlarged kidneys, both dexter and sinister. Based on the history and clinical examination results described above, a problem-oriented approach (POA) can be made in the Pawpaw case to assist veterinarians in diagnosing. Pawpaw's problem-oriented approach (POA) is as follows (Figure 6):

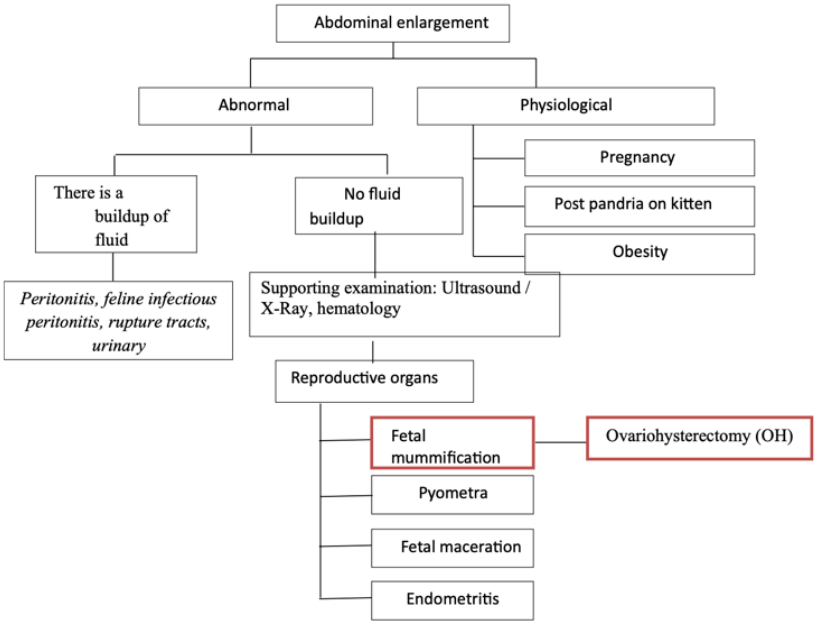

Figure 6. Problem-oriented approach (POA) abdominal enlargement in

Based on the POA above, confirmation of the diagnosis in the case of Pawpaw is based on clinical findings supported by evidence and anamnesis and the results of investigations. The

owner did not realize that Pawpaw was pregnant and did not know the cat's reproductive history. Abdominal distention was only realized when the vet conducted a clinical examination of the cat. According to Batan (2017), abdominal enlargement can be divided into two types: abdominal enlargement accompanied by fluid accumulation and abdominal enlargement without fluid. Abdominal enlargement due to fluid can be caused due to inflammation, infectious diseases, metabolic disorders, a degenerative condition, and neoplastic, while abdominal enlargement without the presence of fluid can be physiological changes, such as abdominal enlargement after eating or in pregnant animals, as well as abnormal conditions related to organomegaly (Batan, 2017), as worms can also contribute to such variations. The results of the examination by a veterinarian on Pawpaw did not find any fluid accumulation in the abdomen, so the cause of abdominal distention in Pawpaw was likely due to organomegaly or physiological conditions such as pregnancy. The provisional diagnosis was increasingly supported by a physical examination in the form of abdominal palpation, where results of abdominal palpation found a fetus-like formation, to be precise, in the cat's uterus. All the data and information found in this case could not be used to confirm a definite diagnosis of the cat. Therefore, the veterinarian then performed a follow-up examination in the form of a blood hematological examination and an ultrasound examination (USG) to see any abnormalities/abnormalities to support confirming a definite diagnosis of the cat.

A blood hematological examination is performed to confirm or determine the presence of a hematological disorder due to a disease or infection (Stockham & Scott, 2008). The results of the hematological examination in Pawpaw can be seen in Table 1.

Based on the results of the hematological examination, it can be seen that the cat has an increased white blood cell (WBC) / leukocytosis value from the normal range, where the results of the WBC examination are 24.7 x 10^3/µL, while the normal range of WBC values in cats is 5.5- 19.5 x 10^3/µL. Leukocytes consist of neutrophils, eosinophils, basophils, monocytes and lymphocytes. An increase in the value of leukocytes/leukocytosis can indicate an infectious process in the animal's body / the body's response to disease (Kartika *et al*., 2020). Some of the causes of a complete increase in the number of leukocytes are as follows (Latimer, 2011):

a. The proper reaction of the normal bone marrow is like this:
    1. External stimulation: an infection caused by some bacteria, viruses, or fungi, presence of inflammation (tissue necrosis, infarction, burns, arthritis).
    2. Allergen reactions to drugs (corticosteroids, lithium, beta agonist).
    3. Trauma (splenectomy), hemolytic anemia, and malignant leukemoid (abnormal blood).
b. Effects of primary bone marrow disorders (acute leukemia, chronic leukemia, myeloproliferative disorders.

In addition to the increase in leukocytes, Pawpaw's hematology results also showed an increase in the value of lymphocytes/lymphocytosis. Lymphocytes can distinguish foreign objects from their tissue because they have receptors on the cell surface. Lymphocytes play an essential role in the body's immune response to fight.

In viral infection and bacterial infection, an increase in the absolute lymphocyte count (lymphocytosis) can occur in infection due to viruses, bacterial diseases, and hormonal disturbances. Viral infections that can increase the lymphocyte count include infectious mononucleosis, hepatitis, parotitis, measles, viral pneumonia, multiple myeloma, and adrenocortical hypofunction. Apart from a viral infection, an increase in lymphocyte values can also be caused because the body is trying to fight against the effects of a foreign body (Giyartika and Keman, 2020).

Pawpaw also experienced granulocytopenia or decreased granulocyte values in the blood test results. Pawpaw's granulocytes were only 1.3x10^3/µL (normal range 2.1-15 x 10^3/µL). Granulocytes in the bloodstream are divided into two groups. First, the Circulating Granulocyte pool (CGP). These granulocytes flow along in the circulation and marginating granulocyte pool, namely granulocytes that are on the edges, attached to the walls of blood vessels and ready to leave the blood vessels when needed (Isnarni and Sulistyani, 2010). Decreased granulocyte count/granulocytopenia indicates non-regenerative anemia. This result is supported by other variables, where the HGB, HCT, MCH, and MCHC values (Table 4.1) also decreased, which indicated that Pawpaw had anemia. However, Pawpaws anemia level was not very significant. Anemia in Pawpaw could be caused by the cat lacking nutritional intake due to refusal to eat or anorexia.

In addition to a blood hematology examination, the cat underwent an ultrasound examination. The ultrasound examination results did not show a clear picture. The ultrasound picture only showed a thickening of the uterine wall, thus further convincing the vet that the cat was pregnant, but the fetus was dead. This is known from the examination results during rectal palpation, palpable fetal formation, but it had hardened. Based on these results, the veterinarian decided to perform surgery to treat the case through the ovariohysterectomy technique described in 3.2. Surgery was considered because, according to the results of a hematological examination, Pawpaw had average platelet / PCT values, and the cat's anemia was not too severe. The surgical procedure was chosen to detect a foreign object's presence in Pawpaw's body. This action was taken immediately because it was feared that an infection would occur if it were delayed, making Pawpaw's condition worse. The surgery was performed using a laparotomy technique by an incision in the ventral abdomen/midline rather than the flank because accessing the abdominal cavity through the midline offers better exposure and facilitates organ access and manipulation. The cat received anesthesia with a premedication of Ketamine-xylazine 0.1 ml/kg and Atropine sulfate 0.01 ml/kg. The cat was then positioned dorsally, lying down so that the ventral abdomen could be completely exposed. The incision was made 3-5 cm below the umbilicus by opening several layers, including skin, subcutaneous, and musculus (rectus abdominis externus and rectus abdominal internet). After all the layers were exposed, the operator then explored the abdominal cavity to look for the uterus, which is located below the bladder (lateral). The uterus was then found, and it was observed that the uterus had distended significantly, and it was seen that the uterus was bluish, and the blood vessels looked significantly enlarged. The uterus was then removed from the abdominal cavity to facilitate OH's actions to remove the ovaries. The action

of OH begins with the ligation of the ovarian vessels near the ovaries. The attachment is done twice so that the ligation is strong enough and there is no bleeding. Next, a cut is made just below the ovary. This was done on both sides, namely the left and dexter ovaries. The following OH procedure is to do a ligase at the boundary between the cervix and the uterine body. Ligation at the border of the cervix and corpus uteri was performed once with a 3-0 chromic suture. At the time of ligation, the needle is attached first to the uterine tissue and then further ligated to anticipate that the hook will not be released. After the ligation, cut the area near the ligation, which is the part closest to the uterine cornua. The corpus uterus should be clamped with an arterial clamp to avoid bleeding before cutting.

The uterus and ovaries can be removed, and the tissue attached to the body can be released back into the abdominal cavity. Before closing the abdominal cavity, flushing with NaCl was done first to clean the cavity, and pen strep was given to prevent secondary infection. The abdominal cavity is closed by linking the incision in the musculus, subacute, or skin. The type of suture used is simple interrupted, simple continuous, and intra-dermal using 3-0 chromic thread. The stitch marks are then cleaned, given gentamicin ointment, and wrapped in sterile gauze to prevent infection in the Pawpaw cat. The uterus was surgically removed, and a fetus was found that had died and was slightly hardened, so confirmation of the diagnosis was mummification.

Mummification of the fetus is one of the essential gestational disorders in domestic species in which the fetus dies and, together with the remains of the fetus, remains in the uterus for a longer duration than a normal pregnancy. Multiparous and polyvocal species, such as pigs, show a higher incidence of mummification. In addition, several other species have been reported, including cattle, buffalo, goats, sheep, horses, dogs, and cats. The shrinkage of the uterus and fetus occurs gradually with the absorption of the placenta and fetal (amniotic) fluid that mummifies in the uterus. The cervix remains tightly closed in this condition. Mummification keeps the uterus quiescent due to the production of progesterone.

Sustainable animals usually show symptoms of anestrus due to a persistent corpus luteum that produces progesterone (Vikram *et al*., 2020).

The causes of fetal death and mummification are various and impossible to determine because the time of fetal death is unknown. Autolysis followed by mummification of the fetus and membranes creates difficulty in determining the causative agent. Common causes of fetal mummification are genetic or chromosomal abnormalities, placental defects, infectious agents, abnormal hormone concentrations, and drugs. Torsion of the fetal center causing compression followed by fetal hypoxia can sometimes be the cause of fetal mummification. Infectious agents appear to be primarily responsible for the mummification of the fetus in dogs and cats. The mummification process usually involves complex bacterial or viral analysis, biopsy, and chromosome analysis (Vikram *et al*., 2020).

The mummification of the fetus occurs gradually over weeks to months and depends on the age of the fetus at that time. Mummification is usually only suspected after the average gestation period when the child fails to form. As the process of mummifying the fetus continues, the uterine wall will shrink and cover the mummy that is formed. The uterus's

duration determines the mummy's appearance; the longer the period, the drier, tighter, and rougher the fetus will be. The longer the duration, the thicker the uterine wall and the animal will show anestrus due to the persistent presence of progesterone in the corpus luteum. Sonographically the uterine wall will be thickened, and no anechoic fluid, no fetal heart imprint, slightly echogenic areas, and hyperechoic bone will be seen. Diagnosis of mummification in cats is quite tricky. The presence of mummification can be determined based on the history of the disease, the results of examinations using radiographic imaging, and surgery (Vikram *et al*., 2020).

The surgery was performed using atropine sulfate premedication. Atropine is an anticholinergic that works by blocking acetylcholine's effects on muscarinic receptors. Atropine is the drug of choice that can be used to increase heart rate and reduce respiration and gastrointestinal secretions. The anesthetic used was a combination of xylazine and ketamine. Xylazine is an adrenergic agonist used primarily for anesthetics and analgesic-adrenergic agonists. The side effects of using xylazine are sedation and ataxia, cardiac depression, heart block, and hypotension at high doses. Ketamine is an anesthetic drug whose mechanism of action is unknown, but its effect appears as a dissociative agent. Ketamine has little analgesic activity. In some metabolic animals its elimination is fast. Using ketamine can cause pain during IM injection, tremors, and convulsive seizures, and increase cardiac output compared to other anesthetics (Weintarsih *et al*., 2017).

Some of the treatments given to cats are meant to be supportive. Pawpaw was given antibiotic therapy to treat an infection in its body. Some of the antibiotics given were intramox-150 LA, doxycycline, and ceftriaxone. Intramox is a type of long-acting antibiotic which is bactericidal and works by inhibiting bacterial cell wall synthesis. It is effective against gram + and gram- bacteria. At the same time, doxycycline is a tetracycline class of antibiotics with a broad spectrum. Doxycycline is an antibiotic that inhibits bacterial protein synthesis by binding to the 30S ribosomal subunit and preventing the link between the aminoacyl-tRNA and the bacterial ribosome. Ceftriaxone is a third-generation cephalosporin antibiotic that has a broad spectrum. Ceftriaxone is sensitive against gram + and - bacteria but less active than the first generation against gram-positive cocci. Ceftriaxone has a long half-life of around eight hours (Weintarsih *et al*., 2017). Administering antibiotics to cats is also intended to help overcome secondary infections.

Glucortin-20 is an anti-inflammatory drug that contains dexamethasone 2 mg. This drug works by changing DNA transcription, thereby changing cell metabolism, which causes a decrease in the inflammatory response. Dexamethasone has a prolonged action duration but is unsuitable for long-term use at high doses. This drug can also be used for anaphylaxis due to chemotherapy. Dexamethasone is 7.5 times more effective than prednisolone (0.15 mg dexamethasone is equivalent to 1 mg prednisolone (Ramsey, 2011). Giving glycerin injections to cats is intended to reduce the inflammatory effect due to the mummification of the fetus. Glucortin should not be given to pregnant animals, patients with kidney failure, and diabetes mellitus (Ramsey, 2011).

Ondansetron is an anti-emetic drug that is used to treat stress for several reasons, for example, drugs such as metoclopramide.

Contraindications to ondansetron are intestinal obstruction (Ramsey, 2011). Pawpaw was given a section for vomiting three days in a row. The administration of acetylcysteine to Pawpaw was carried out because, during the examination, a thick discharge was found from the nose, so it was hoped that the administration of acetylcysteine can help overcome the discharge contained in Pawpaw's respiratory organs. In addition to acetylcysteine, a nebula was also used to remove secretions in the respiratory organs. Sakatonic liver was administered to Pawpaw to address mild anemia before surgical procedures. This medication is prescribed to elevate the cat's red blood cell count, effectively improving their overall blood health. Anemia, characterized by a reduced number of red blood cells or a decrease in their ability to carry oxygen, can compromise the cat's well-being and hinder their capacity to withstand surgical stress. By treating mild anemia with Sakatonic liver prior to surgery, the aim is to enhance the cat's blood profile and ensure a more robust response to the physiological demands of the surgical procedure, ultimately improving their chances of a successful recovery.

Conclusion

Pawpaw the cat was diagnosed with fetal mummification and underwent an ovariohysterectomy as an alternative treatment. The diagnosis was based on indications, anamnesis, clinical symptoms, examination, and test results. Confirmatory investigations included blood hematology tests and ultrasound. The treatment consisted of various medications and therapies. Unfortunately, the cat did not survive, likely due to a combination of factors such as the critical condition, possible errors in the timing of the surgery, and potential anesthetic dosage errors. These factors, together with the late-stage intervention, may have contributed to the outcome.

Approval of Ethical Commission

This case report did not require ethical clearance.

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Author's Contribution

CEAP and WS involved in the interpretation and collecting of data and editing of the manuscript. ES involved in writing and preparing the final version of the manuscript. CEAP was responsible for collecting data and submitting the manuscript. All authors reviewed the paper and approved the final version of the manuscript.

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Data Availability Statement

The data are available with the correspondence author and can be achieved on request.

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