

## Journal of the Hellenic Veterinary Medical Society

Vol 67, No 4 (2016)



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doi: [10.12681/jhvms.15648](https://doi.org/10.12681/jhvms.15648)

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### To cite this article:

DE CESARIS, V., BRESCIANI, C., PARMIGIANI, E., RAVERA, M., VOLTA, A., CANTONI, A. M., & BIGLIARDI, E. (2018). Traumatic uterine rupture in a queen at early stage of pregnancy. *Journal of the Hellenic Veterinary Medical Society*, 67(4), 259–264. <https://doi.org/10.12681/jhvms.15648>

## Traumatic uterine rupture in a queen at early stage of pregnancy

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**ABSTRACT.** The rupture of a pregnant uterus is a rare complication of pregnancy, which can result in the death of the mother and the fetus. This life threatening condition generally occurs during late pregnancy, it can be asymptomatic and scarred uteruses have been reported as incidental findings during abdominal surgery. This clinical case describes a queen with vulvar bleeding during the early stage of pregnancy. Wall laceration of a pregnant uterus was diagnosed by means of an ultrasound examination. During ovariohysterectomy two uterine ruptures, fragments of the great omentum were found sequestering embryonic tissue. Histopathology showed that the uterine wall was torn in the same place where two embryonic implantations were found and residues of embryonic tissue were observed. This clinical case shows that when a traumatic injury is reported, the mandatory abdomen investigations should evaluate the condition of the uterus and determine the early stage of a pregnancy.

**Keywords:** *Pregnancy, queen, trauma, uterine rupture, vaginal hemorrhage*

### INTRODUCTION

As in the case of human beings, uterine ruptures in small animals mainly occur in the second half or in late pregnancy when the uterus is elastic, but the uterine wall is thin and under high pressure from fetus and fluid as during labor (Ayres et al., 2001; Turner, 2002). The main causes of uterine rupture include: trauma, ectopic pregnancy, uterine anomalies such as previous uterine scars due to caesarian sections, torsion, dystocia, oversized fetus and fetal abnormalities, protruding fetal bones, excessive oxytocin administration and traumatic obstetric manipulation (Fischer, 1986; Jackson, 1995). Uterine rupture is considered to be an obstetrical emergency and prognosis depends on the violence of the trauma, the anatomical position and the extent of the rupture, the time elapsed between

trauma, diagnosis and subsequent therapeutic protocol. The diagnostic procedure consists in a general physical examination, blood samples, abdominal x-ray and ultrasonographic examination followed by centesis. When there is evidence of abdominal hemorrhage and/or peritonitis, surgery must be carried out as soon as possible as it is a life-threatening condition. This case report describes a queen with a uterine rupture caused by a car accident during the early stages of pregnancy. To the author's knowledge no other cases of uterine rupture at this stage of pregnancy have been reported.

### CASE HISTORY

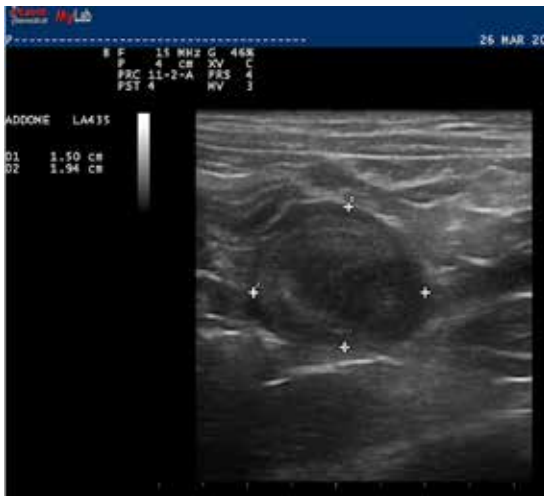
A veterinary practitioner referred an 11-month-old, female domestic shorthair cat weighing 3.5kg to our

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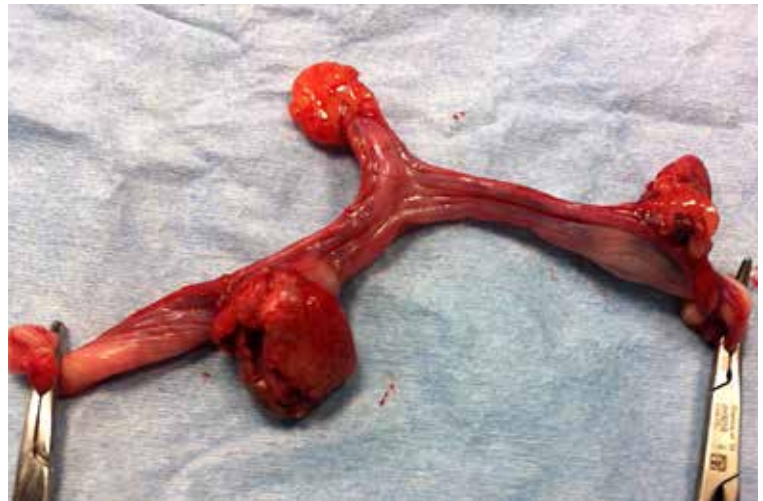
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*Date of initial submission:* 14-09-2015  
*Date of revised submission:* 11-12-2015  
*Date of acceptance:* 08-02-2016

*Ημερομηνία αρχικής υποβολής:* 14-09-2015  
*Ημερομηνία αναθεωρημένης υποβολής:* 11-12-2015  
*Ημερομηνία αποδοχής:* 08-02-2016



**Figure 1:** the ultrasound image shows a transverse section of the uterine horn, the site of implantation of the embryo.



**Figure 2:** the two fetal vesicles, compatible with 15-16 days of pregnancy, appear to be ruptured.

Veterinary Teaching Hospital. The owner had found the queen at the side of the road, she was unable to move hindlimbs and her tail was stained with blood. Her owner usually allowed the cat to go outside despite the fact that she had not been spayed and even when she had been in estrus 3-4 weeks before. He reported that on the day of the injury the queen had been outside for at least 8 hours. During the general physical examination, the cat was slightly lethargic, her mucous membranes were pale, heart and breathing rates were within the normal values, while her rectal temperature was 35.4 °C, below the normal value. She was bleeding from the vulva and unable to move the pelvic limbs. A chest and abdominal radiographic examination showed normal thoracic structures, but decreased detail in the mid-caudal abdomen and an enlarged uterus. Her urinary bladder was visible and moderately distended. Bilateral sacrum-iliac and pubic diastases were also detected. An ultrasound examination showed that the kidneys, spleen, liver and urinary bladder appeared to be normal. A cystocentesis was carried out and physical and chemical analyses confirmed the absence of blood. On the other hand, the uterine horns showed two symmetrical irregularly shaped focal lesions with mixed echogenicity, measuring 2 cm in diameter surrounded by hyperechoic peritoneal fat (Figure1), possibly indicating the sites of embryo implantation. A small amount of free peritoneal fluid was detected. Uterine trauma with a suspicion of

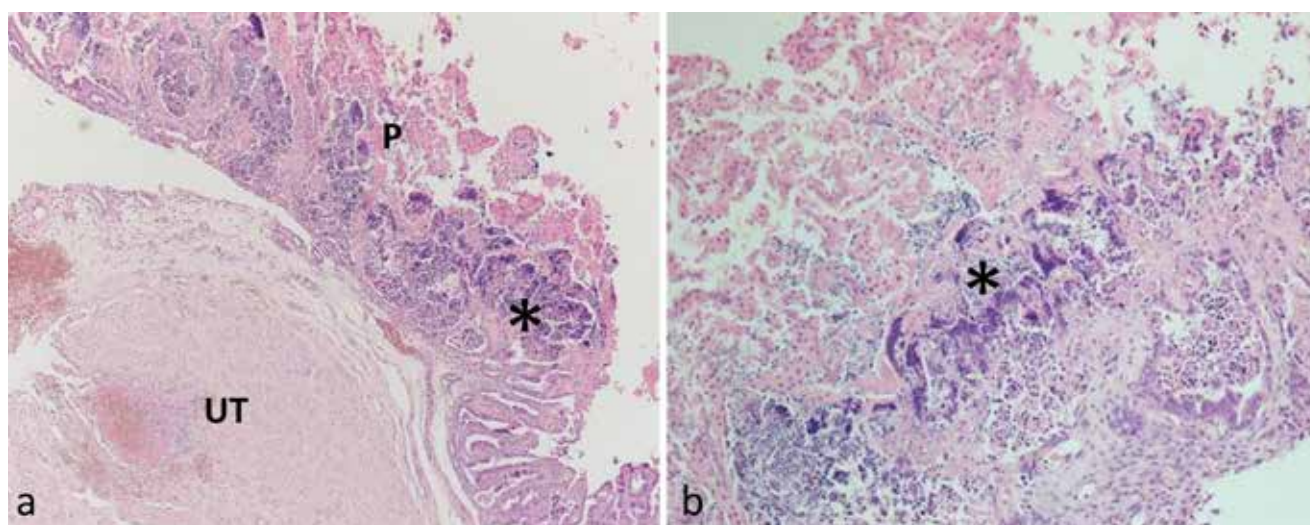
wall laceration in the sites of embryo implantation and focal peritonitis along with sacro-iliac and pubic diastases was diagnosed. Haematological screening revealed anemia (RBC  $4.27 \times 10^6 \mu\text{l}$ , reference range  $5.0\text{--}10.0 \times 10^6 \mu\text{l}$ ; Hgb 6.13 g/dl, reference range 9-15 g/dl; Hct 20.2 %, reference range 30-45 %; PLT  $32 \times 10^3 \mu\text{l}$ , reference range  $250\text{--}750 \times 10^3 \mu\text{l}$ ) and leucocytosis ( $21.2 \times 10^3 \mu\text{l}$ , reference range  $6.0\text{--}17.0 \times 10^3 \mu\text{l}$ ) with neutrophilia ( $17.8 \times 10^3 \mu\text{l}$ , reference range  $3\text{--}12.7 \times 10^3 \mu\text{l}$ ). A maintenance fluid therapy was started by administering Ringer's lactate (50 ml/kg/die IV) through a venous catheter placed in the cephalic vein (24G). Enrofloxacin (5 mg/kg, Valemas® 5%; ATI), amoxicillin clavulanate (25 mg/kg, Synulox®; Pfizer) and prednisolone (0.1 mg/kg, Novosterol®; Ceva Salute Animale) were administered and the albumin levels were monitored as it decreases in the presence of peritonitis. The patient was put in intensive therapy and the following day the queen was in an acceptable clinical condition to undergo anesthesia and surgery. The patient was sedated with a mixture of ketamine (5 mg/kg, Imalgene® 1000; Meril Italia) and dexmedetomidine (25 mcg/kg, Dexdomitor®; Orion Corporation) by intramuscular administration. The general anesthesia was induced with propofol (2 mg/kg Rapinovet®; Schering-Plough) and maintained with 1.5-2% isoflurane (ISOFLOR®, Esteve) in oxygen. A celiotomy was performed and a small amount of serum-hemorrhagic fluid was found. An examination of the abdominal cav-

ity revealed 6 necrotic end/or hemorrhagic fragments of peritoneal adipose tissue “free” in the cavity which were removed and the peritoneum showed signs of severe congestion. Following the ovariohysterectomy, the genital tract was accurately examined and two lacerations were found on the uterine wall (Figure 2) with two embryonic vesicles in which there was no sign of embryos. The ovaries, uterus and fragments of omentum were promptly fixed by immersion in 4% buffered formalin solution for 48 hours; after dehydration and paraffin embedding, 5- $\mu$ m-thick histological sections were obtained which were subsequently stained with hematoxylin-eosin. Four days after hospitalization the queen started to move her hind limbs and a week later she was able to stand and walk. The patient was discharged ten days after the first admission and antibiotic therapy was continued as follows: enrofloxacin (5 mg/kg, Baytril Flavour®), amoxicillin clavulanate (25 mg/kg, Synulox®; Pfizer) until the subsequent clinical assessment. A week later, an abdominal ultrasound examination confirmed the absence of peritonitis or any pathological condition. The histological preparations of both embryonic vesicles enabled us to detect a typical placental structure characterized by a junctional zone, in which we observed pleated lamellae lined by at times multinucleated trophoblastic cells. In the placental structure it was possible to distinguish residues of yolk sac and allantois. In accordance with what had previously been observed by Zambelli et al. (2002),

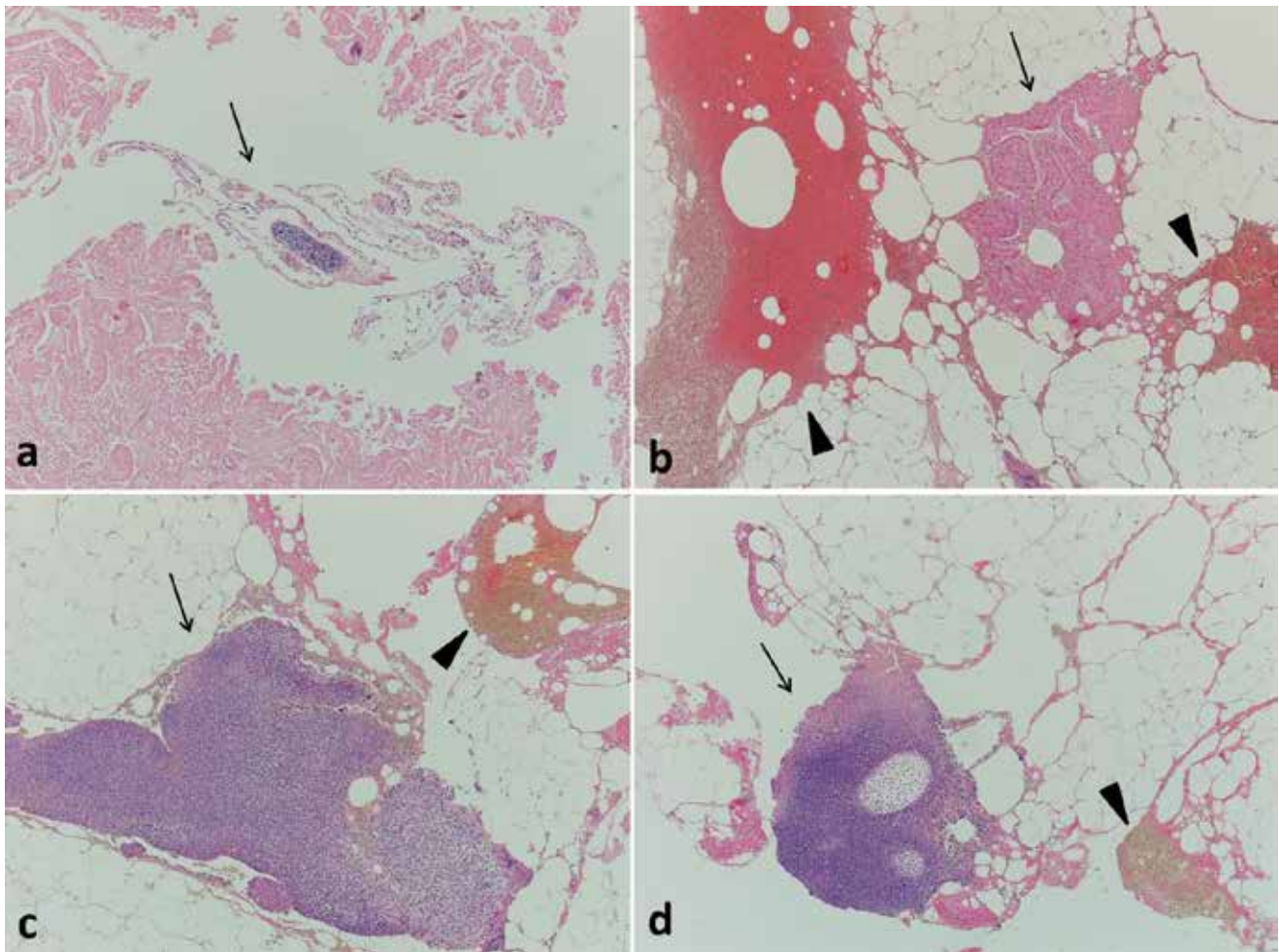
this finding enabled us to confirm that pregnancy had started approximately 15 days earlier. The placentas were partly detached from the endometrial glands and showed widespread ischemic necrosis (Figure 3). In one vesicle, the residues of embryonic membranes (amnion, yolk sac, chorion allantois) and gaps filled with embryonic blood cells were detected. The uterine wall was ruptured in the sites where the two embryonic vesicles were found. Histological sections of fragments from the omentum showed the presence of hemorrhagic areas and fragments of embryo between the adipocytes, with round areas similar to cartilaginous gemmules and placenta inside (Figure 4). In order to improve the accuracy of the pregnancy due date, the histological appearance of embryo fragments were compared to an intact feline embryo at 16-18 days of gestation based on Knospe staging (2002) (Figure 5). The histological comparison between the two embryos (Figure 4d, 5) clearly showed the presence of similar embryological structures, therefore we were able to estimate that the queen was 15-16 days pregnant.

## DISCUSSION

The rupture of the gravid uterus has been reported in humans, domestic mammals such as mares, cattle, bitches and cats (Selk Ghaffari et al., 2007) and also in wild species such as African Green Monkeys, guinea



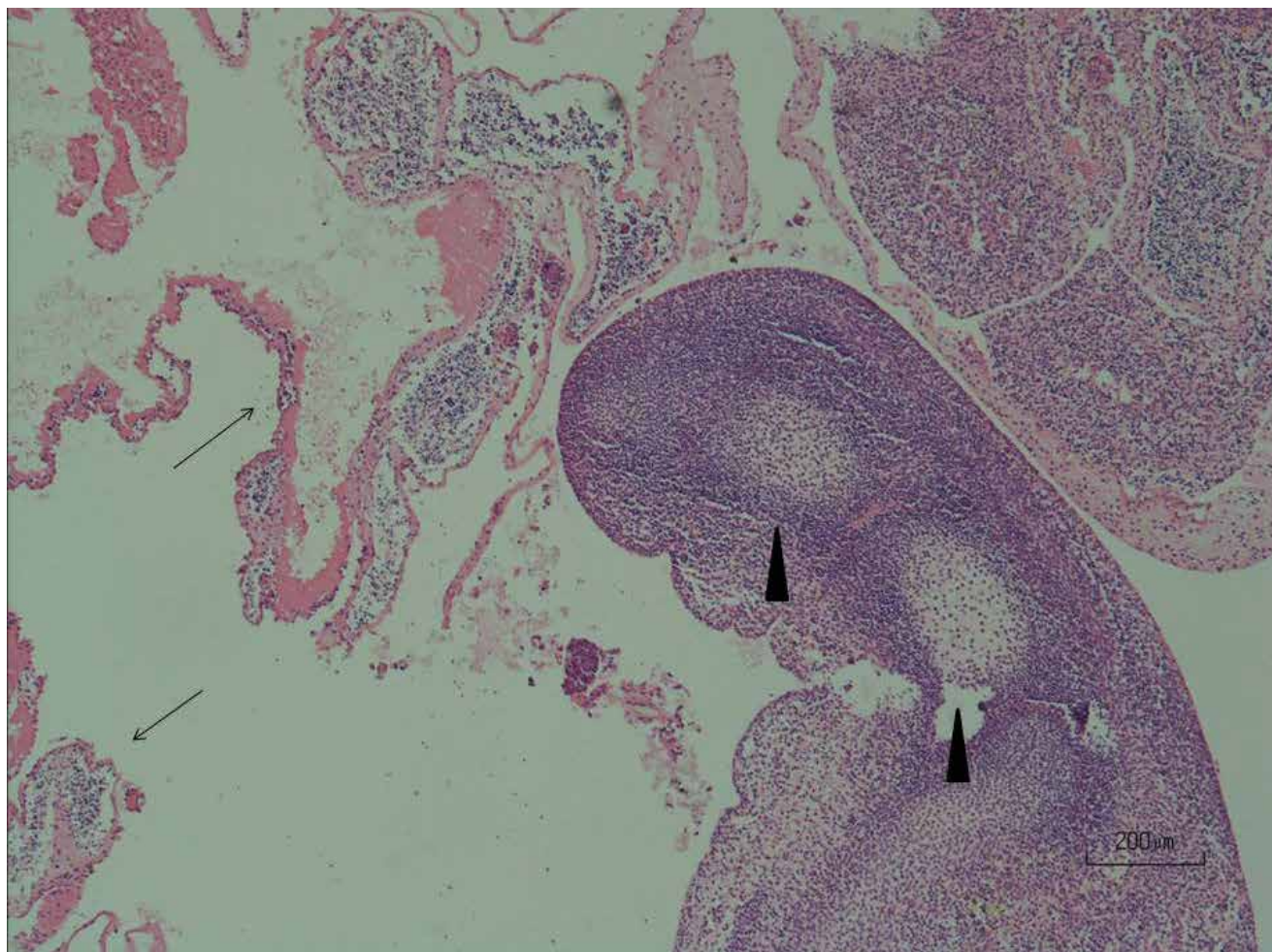
**Figure 3:** a) Histological sections of the embryonic vesicles: the placental structures are detached from the uterine wall (UT). H-E, 4x. a,b) The placentas are in partly detached from the endometrial glands and show widespread ischemic necrosis (\*). H-E, 10x.



**Figure 4:** a) Embryonic vesicle: residues of embryonic membranes. H&E, 4x. b) Omentum: displacement of placental fragments (arrow) into omental adipose tissue and hemorrhagic areas (arrowhead). H&E, 10x. c, d) Omentum: presence of hemorrhagic areas between the adipocytes, (arrowhead) and debris (or fragments) of embryonic tissues (arrow). H&E, 10x.

pigs and buffaloes (Kunstryr and Naumann, 1980; Plesker et al., 2003; Manokaran, 2012). In humans, the incidence of the rupture of the pregnant uterus is 0.03-0.04%, and although it is an infrequent complication of pregnancy, it can lead to maternal or fetal mortality or serious morbidity (Ayres et al., 2001; Turner, 2002). In literature there have been various definitions for uterine rupture (Garnet, 1964; Singh and Sandhi, 2000), yet the most reasonable definition was given in human medicine as: “complete separation of the wall of the pregnant uterus, with or without expulsion of the fetus, which endangered the life of the mother and/or fetus” (Plauchè et al., 1984). It is such an important complication of pregnancy that all cases should be individually reviewed and subjected to local audit (Turner, 2002). In feline literature, two

cases of traumatic uterine rupture associated with body wall hernias have been reported and both were full-term pregnancies (Lucas et al., 2003; Selk Ghaffari et al., 2007). A case of distal uterine rupture (near the vagina) that led to complete uterine prolapse (Bigliardi et al., 2014) was also reported. It has been observed that the rupture of parts of the uterus is asymptomatic in cat. In veterinary practice celiotomy is indicated for removing the fetuses and damaged tissues, followed by ovariohysterectomy and abdominal flushing. A sample of peritoneal fluid should also be taken for bacterial culture along with antibiotic prophylaxis (Davidson, 2013). A secondary ectopic pregnancy has also sometimes been observed with the continuing development of a fetus in the abdominal cavity (Johnsons, 1986; Root Kustriz, 2006). Moreover, the rupture of this



**Figure 5:** Histological sections of the intact embryo: residues of embryonic membranes (arrow) and cartilaginous gemmules (arrowhead). H&E, 4x.

organ is seldom diagnosed in cats, especially if there no evidence of pregnancy (first half of pregnancy or unexpected pregnancy) (Lucas et al., 2003). If the rupture occurs during the early stage of pregnancy, most feline fetuses become mummified when they are expelled into the abdomen (Lucas et al., 2003). In felines, mummified fetuses can be accidentally found during elective ovariohysterectomy (Chivers, 1971; Ryer and Ryer, 1979; DeGeer, 1987; Godfrey, 1997). Trauma was nearly always thought to be the cause in all the cases reported even if the nature of the trauma was not evident. The case described in this report clearly demonstrates that a severe trauma (i.e. car accident) can lead to the rupture of the uterine wall even in a very early stage of pregnancy (15-16 days). Moreover it proves that even if the uterus is not enlarged by fetuses

and placentas, the site of embryo attachments to the wall of the uterus represent points of minor resistance to injury of this organ. However in our case there was a clear symptom: the queen was bleeding from the vulva. The histological examination enabled us to determine the presence of the two embryos.

## CONCLUDING REMARKS

This clinical case proves that whenever there is a traumatic injury in a patient's history during the abdomen investigations health care practitioners should carefully check for spleen, liver, and intestinal trauma as well as adverse uterine conditions in order to determine early pregnancy. ■

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