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Case Report - Veterinary Medicine

Ovarian hematoma in mare – case report

[*Hematoma ovariano em égua – relato de caso*]

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ABSTRACT

The aim is to report a case of ovarian hematoma in a female equine, Brazilian Sport Horse breed, 5 years old. The mare was in her third breeding season, with a history of good fertility in previous seasons. During reproductive monitoring, the animal showed regular growth of follicles. In the presence of a dominant follicle (44x39mm) in the right ovary, synthetic prostaglandin was administered. After 24 hours, the right ovary showed an increase in size and sensitivity. On ultrasound, a well-defined echogenic structure (66x54mm) was observed, with a uniform internal appearance. The structure showed gradual growth for 8 days, reaching 71x52mm, when it began its gradual regression and disappeared 14 days after its finding, without any treatment. The mare remained cycling and showed estrus 3 days after the disappearance, containing 2 pre-ovulatory follicles, one in each ovary. Ovulation was induced, culminating in bilateral ovulation. Artificial insemination was performed with frozen semen, at the tip of the left uterine horn, avoiding the compromised ovary. The gestational diagnosis was positive with one embryonic vesicle. Ovarian hematoma is a common finding and does not cause harm to fertility; however, its knowledge is essential for the differential diagnosis.

Keywords: equine, fertility, ultrasound, ovary

RESUMO

O objetivo deste estudo é relatar um caso de hematoma ovariano em um equino fêmea, da raça Brasileiro de Hipismo, com cinco anos de idade. A égua estava em sua terceira estação reprodutiva, com histórico de boa fertilidade nas estações anteriores. Durante a monitorização do desenvolvimento folicular e das condições uterinas, o animal apresentava crescimento regular dos folículos. Na presença de um folículo dominante (44x39mm) no ovário direito, foi administrada prostaglandina sintética. Após 24 horas, o ovário direito aumentou de tamanho e de sensibilidade à palpação. Na ultrassonografia, observou-se uma estrutura ecogênica (66x54mm), bem definida e com aspeto interno uniforme, além de outros folículos médios (~20mm). A estrutura apresentou crescimento gradual durante oito dias, atingindo 71x52mm, quando iniciou sua regressão gradativa e desapareceu 14 dias após sua descoberta, sem qualquer tratamento. A égua permaneceu ciclando e apresentou-se em estro três dias após o desaparecimento, contendo dois folículos pré-ovulatórios, um em cada ovário. A ovulação foi induzida, culminando com ovulação bilateral. A inseminação artificial foi realizada com sêmen congelado, na ponta do corno uterino esquerdo, evitando-se o ovário comprometido. O diagnóstico gestacional foi positivo, com apenas uma vesícula embrionária. O hematoma ovariano é um achado comum e não causa prejuízo à fertilidade, porém seu conhecimento é fundamental para o diagnóstico diferencial.

Palavras-chave: equino, fertilidade, ultrassom, ovário

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INTRODUCTION

The equine ovary is a dynamic organ, with its size subject to alterations due to physiological factors such as age and hormonal influences, as well as external or pathological factors including nutrition, photoperiod, and ovarian tumors (Card, 2011). The most common causes of ovarian enlargement include normal physiological cycles, with the growth of follicles close to ovulation and the presence of a corpus luteum, but also changes such as hemorrhagic anovulatory follicle (HAF), luteinized unruptured follicle (LUF), persistent transitional follicle, granulosa cell tumor, ovarian abscess, and ovarian hematoma (Schlafer *et al*., 2011; Cuervo-Arango; Newcombe, 2012a; Hyatt *et al*., 2017; Tsogtgerel *et al*., 2021; Tommasa *et al*., 2023).

During the reproductive season in horses, monitoring of follicular development is routinely carried out both by transrectal palpation and by ultrasound to determine the moment of ovulation, essential for several factors, such as ensuring that ovulation has occurred, deciding on the ideal moment to mating or artificial insemination, determination of the number of ovulations, differentiation of anovulatory conditions and estimation of embryonic age (Cuervo-Arango and Newcombe, 2012a).

The presence of ovarian abscesses is generally associated with follicular aspiration procedures (Fernandéz-Hernandéz *et al*., 2023). Changes such as HAFs, LUFs, persistent follicles, abscesses and ovarian tumors result in ovulatory failure and compromise fertilization (Cuervo-Arango and Newcombe, 2008, Cuervo-Arango; Newcombe 2012a); while ovarian hematoma is not associated with fertility failure (Cuervo-Arango and Domingo-Ortiz, 2011).

Ovarian hematoma is characterized by excessive hemorrhage in the follicular lumen that occurs after ovulation and is considered one of the most common causes of increased ovarian size during the reproductive period of mares (Card, 2011; Cuervo-Arango and Domingo-Ortiz, 2011; Hyatt *et al*., 2017). It can happen spontaneously, or its formation can be induced using non-steroidal anti-inflammatory drugs (NSAIDs), as these drugs inhibit prostaglandins secretion (PGE and PGF), which play an essential role in the ovulation process (Cuervo-Arango and Domingo-Ortiz, 2011).

Exaggerated ovarian enlargements can lead to increased visceral tension and cause discomfort during palpation in some mares, which have demonstrated reactivity during manipulation of the organ (Card, 2011; Tommasa *et al*., 2023). Eventually, the structure may enlarge so much as to cause significant pain and colic (Hyatt *et al*., 2017; Tsogtgerel *et al*., 2021; Tommasa *et al*., 2023), which may lead to rupture of vessels that can culminate in hemoperitoneum. (Beachler *et al*., 2014; Tommasa *et al*., 2023).

Routine diagnostic tests to define the cause of ovarian enlargement include palpation and transrectal ultrasound. Hematomas, HAFs and granulosa cell tumors form images with similar characteristics in ultrasound evaluation, causing doubts at the time of diagnosis (Cuervo-Arango and Newcombe, 2012a; Tsogtgerel *et al*., 2021; Tommasa *et al*., 2023). Therefore, complementary exams are used, such as hormonal assessments, endometrial or gonadal biopsies, exploratory laparoscopy, with histopathological evaluation of the abnormal ovarian tissue being the definitive diagnosis (Card, 2011; Tsogtgerel *et al*., 2021), but which are not always indicated.

Ovarian hematoma is normally self-limiting, and the tissue reorganizes itself within weeks or even months. Even though the structure is observed by ultrasound, after the loss of its endocrine function, it does not cause negative effects on the mare's cyclicity and fertility (Card, 2011; Hyatt *et al*., 2017).

In view of the above, the goal is to report a case of ovarian hematoma in a mare, diagnosed during the breeding season.

CASE REPORT

A 5-year-old female Brazilian Sport Horse, weighting 480kg, belonging to the City Hall of the University of São Paulo "Fernando Costa" Campus in Pirassununga/SP, was used as a broodmare in the horse breeding sector, whose reproductive history and clinical findings will be described below.

The female started reproducing at three years of age, in her first reproductive season, and was able to get pregnant easily, requiring only one artificial insemination (AI) with fresh semen. In summary, follicular development and uterine conditions were monitored and in the presence of two pre-ovulatory follicles, one measuring 39x37mm and the other 30x36mm, and uterine morphoechogenicity 3 (on a scale of 1 to 4, with 1 referring to the absence of endometrial edema and 4 referring to the intense presence of uterine edema), ovulation was induced with 750µg of deslorelin acetate (Sincrorrelin®, Ouro Fino). AI was performed pre-ovulation, 12 hours after induction, with fresh semen. The mare had double ovulation in the left ovary and was initially twin pregnancy. After 345 days of a healthy pregnancy, the mare gave birth to her first foal, with no history of complications.

In the second breeding season, approximately 20 days after parturition, her reproductive follow-up began. During this season, only one follicle ovulated, she was inseminated with frozen semen and became pregnant with just one service. In summary, follicular development and uterine conditions were monitored and in the presence of a 34x30mm follicle with morphoechogenicity 3 (1-4), ovulation was induced with 250 µg of histrelin acetate (Strelin®, Botupharma). AI was performed immediately post-ovulation with cryopreserved semen. 345 days after her second healthy pregnancy, she gave birth to her second foal, with no complications in the puerperium and good uterine involution.

The third reproductive season began later, when the mare underwent her first evaluation for reproductive purposes 40 days after giving birth, with no noticeable changes. During the monitoring of follicle development and daily uterine conditions, for post-ovulation AI with cryopreserved semen, it was observed that the mare showed regular follicle growth. Five days after the first assessment, during routine follow-up, she had a dominant follicle in the left ovary measuring approximately 38mm in diameter and another pre-ovulatory follicle in the right ovary measuring 44x39mm, as well as medium (20 to 30mm) and small (≤15mm) follicles in both ovaries. On transrectal palpation, the uterus showed 2/3 tonus (1-4, with 1 referring to firmer tone and 4 the most relaxed tone) and ultrasound showed a score of 3 (1-4) for uterine morphoechogenicity. To induce ovulation, 5mg of dinoprost tromethamine (Lutalyse®, Zoetis) was administered IM. On the following day, transrectal palpation revealed that the right ovary had increased in size compared to the previous assessment and the animal showed painful sensitivity upon palpation of the organ. The transrectal ultrasound evaluation of the altered ovary revealed a well-defined echogenic structure with a uniform internal aspect, measuring approximately 66x54mm and other medium-sized follicles that were being pressed by the structure, suggestive of an ovarian hematoma (Figure 1 and 2). The mare had no history of taking anti-inflammatory drugs during this period, she was healthy, without any changes in the other systems of the body; therefore, it is believed that the hematoma occurred spontaneously.

The structure remained in the ovary for eight days (Figure 3), reaching 71x52mm, when it began to regress, gradually disappearing completely fourteen days after the finding. The mare continued to cycle while the hematoma was present. In the same ovary, a follicle developed then progressed to ovulation and corpus luteum formation, but it was decided not to be used this cycle, thinking that the hematoma could be compromising the architecture of the ovulation fossa. In the left ovary, folliculogenesis was occurring normally, but monitoring was carried out quickly due to the animal's discomfort during the manipulation for evaluation. As a result, priority was given to monitoring the hematoma. Reproductive assessment and follicular development monitoring continued, and the animal had dominant and growing follicles in both ovaries, without any treatment.

Given the possibility and the ideal conditions for this, three days after complete regression of the hematoma, in the presence of two pre-ovulatory follicles (one measuring 34x42mm in the left ovary and the other 31x34mm in the right ovary), along with uterine morphoechogenicity 3, ovulation was induced with 750µg of deslorelin acetate (Sincrorrelin®, Ouro Fino, IM), resulting in double ovulation. AI with frozen semen was carried out immediately after ovulation, and in view of the double ovulation, it was decided to divert the pipette and deposit the semen at the tip of the left uterine horn, avoiding the ovary previously compromised by the hematoma. AI

was performed 19 days after the ovarian hematoma appeared. After 14 days of AI, a transrectal ultrasound was used to diagnose pregnancy, which was positive with a single embryonic vesicle. Three days after the first pregnancy diagnosis, a new assessment was carried out to rule out the possibility of a twin pregnancy, as the mare had ovulated twice, confirming the presence of just one embryo.

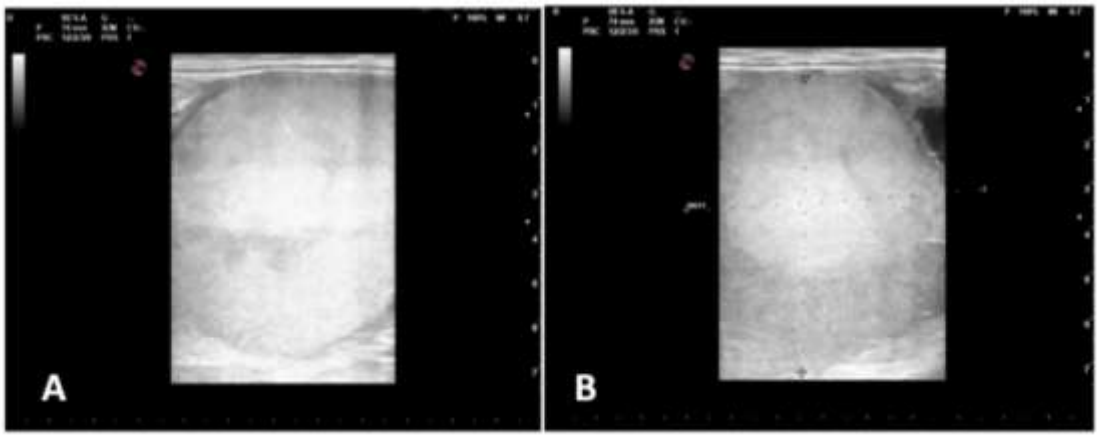

Figure 1. Ultrasound images of the mare's right ovary, showing the presence of a well-defined echogenic structure with a uniform internal appearance, suggestive of an ovarian hematoma. A: Image taken 24 hours after administration of dinoprost tromethamine (Lutalyse®, Zoetis), the structure was approximately 63x54mm. B: Image taken 72 hours after PGF2α, the structure was approximately 66x65mm.

Figure 2. Ultrasound image of the mare's right ovary, showing the presence of a follicle near to the ovarian hematoma, which was pressed and later developed into ovulation. *Hematoma.

Figure 3 - Ultrasound image of the mare's right ovary, showing the evolution of the ovarian hematoma, 5 days after diagnosis. Thin arrow: hyperechogenic filaments, suggestive of fibrin. Thick arrow: follicles slightly compressed by the hematoma.

DISCUSSION

According to Ginther *et al*. (2007), the incidence of ovulatory failure during estrous cycles is approximately 5% at the beginning and 20% at the end of the ovulatory season. The presence of abnormal structures in the ovaries, associated with ovulation failure, may be related to senility (>20 years of age), stress, hormonal therapies, diseases such as Cushing's syndrome, or occur spontaneously, without any associated factor. In this report, it is believed that the hematoma's formation occurred spontaneously, since the animal was young and did not manifest any other changes other than the increase in ovarian size and sensitivity. Furthermore, the mare had a history of good fertility, with no difficulties in getting pregnant. Since the beginning of her reproductive life, she had regular cycles with no reports of ovarian changes.

What was interesting about the case was that the hematoma appeared after the application of a synthetic analog of prostaglandin F2α (dinoprost tromethamine). The injection was carried out to induce ovulation; since prostaglandins are essential for triggering the cascade of events that degrade the extracellular matrix of the follicles and promote contraction of the follicle wall, leading to follicle rupture and ovulation (Cuervo-Arango; Newcombe, 2012b).

PGF2α can be used for various purposes such as lysis of the corpus luteum, synchronization of estrus, treatment of mares with endometritis or lactational anestrus and to stimulate follicular growth and ovulation, especially in transitional mares, as it has an indirect action on the release of GnRH and, consequently, LH and FSH (Faria; Gradela, 2010). As the mare in this report initially had a pre-ovulatory follicle, it was decided to use PGF2α as an ovulation inducer.

There is a conflict over the definitions of the conditions. For Hyatt *et al*. (2017), ovulation occurs in the hematoma and in the HAF, as the name suggests, there is no release of the oocyte. While Ginther *et al*. (2007) and McCue (2011) treat HAFs and ovarian hematomas as synonyms, differentiating in the images between HAFs with echogenic filaments crossing the follicular lumen, HAFs filled with non-coagulated blood and HAFs completely infiltrated with echogenic material. In this report, it is not possible to

associate the structure found in the ovary with the occurrence or not of ovulation, since the mare was not inseminated in the cycle referring to the finding; although Card (2011) stated that the hematoma has the same endocrine function (progesterone production) as the corpus luteum (CL). We chose not to use the cycle because it associates the increase in ovarian volume with a change in the organ's architecture (Card, 2011), which could prevent the oocyte from passing through the ovulation fossa.

Despite the similar characteristics found on palpation and transrectal ultrasound, and the different descriptions given by the authors, there are other characteristics that help to conclude the diagnosis. The clinical signs found in this case are similar to those described by Card (2011), in which the animal only showed discomfort when handling the ovary, which was therefore always carried out very carefully. The ultrasound characteristics of HAFs, hematomas and granulosa cell tumors are very similar, but a classic sign in the presence of a tumor is stallion-like behavior or nymphomania (Card, 2011), and the most frequent sign is anestrus, which was not observed in the mare in this report, as she continued to show follicular growth and even ovulation. According to Hyatt *et al*. (2017), HAFs cause a long period of behavioral anestrus and a prolonged interovulatory interval. The animal in this study continued cycling normally, showing follicular growth and ovulated concomitantly with the presence of the hematoma, as well as showing fertile ovulation shortly after its disappearance.

Ovarian enlargement caused by supplementary corpora lutea, which are structures that cause ovarian enlargement during pregnancy (Card, 2011), was ruled out as a differential diagnosis, because the animal was not pregnant and the morphological aspect of the structure. The hypothesis of persistent transitional follicles can also be ruled out as the finding did not occur during a transitional period (beginning or end of the season). As well as ovarian abscess, as the animal did not undergo the follicular aspiration procedure (Fernandéz-Hernandéz *et al*., 2023).

Equine follicular fluid has an anticoagulant similar to heparin (Ginther *et al*., 2007; McCue, 2011), which is why on ultrasound, a normal follicle has an anechoic antrum. HAF has an anechoic lumen combined with fibrin filaments (echogenic) that cross the follicular lumen, due to hemorrhage (McCue, 2011), while hematoma has echogenic fluid (blood clot) and over time may contain fibrin filaments that cross the lumen (Hyatt *et al*., 2017).

Based on the similarity of the clinical and ultrasound findings with the literature, as well as the spontaneous resolution in a short period of time and the absence of behavioral and fertility alterations, it was not necessary to carry out other tests such as biopsy and hormone dosage in order to make a conclusive diagnosis of ovarian hematoma.

The use of ovulation inducers, such as deslorelin, increases the likelihood of multiple ovulations, especially in the presence of two follicles with similar sizes (Farias *et al*., 2016), associated with the higher incidence of double ovulation in the Brazilian Equestrian breed (Greco *et al*., 2009), these facts may explain the double ovulation that occurred with the animal in this report. The risk of twin pregnancy in horses is known and intervention must always be taken to interrupt it. As the mare only had one embryo, there was no need for interventions such as crushing one of the vesicles or abortion.

CONCLUSION

Thus, it can be concluded that ovarian hematoma is a common finding during the reproductive season and does not cause significant damage to the animal's reproductive health; however, it can cause a delay in the reproductive program, in the case reported, the delay was 14 days. However, knowledge of its structure and possible differential diagnoses is essential.

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