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Resolution of two cases of ovarian abscesses in mares subjected to ovum pick up

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Abstract

Background: Currently, for in vitro embryo production in live mares, immature oocytes are retrieved by transvaginal follicular aspiration or ovum pick up (OPU). Occasionally, ovarian abscesses have been described after OPU, but no current consensus exists on how to treat this condition.

Objectives: To describe diagnosis and successful treatment of ovarian abscesses in two mares subjected to OPU.

Study design: Case report.

Methods: Case records were reviewed and summarised.

Results: In the first case, a pony mare showed tachypnoea, tachycardia, high temperature, leukocytosis, left hindlimb lameness and slight increase in concentration of serum amyloid A. Ultrasonography revealed an increase in the size of the left ovary and two well defined structures suggestive of ovarian abscess. A left ovariectomy by standing laparoscopy was the treatment of choice: the diagnosis was confirmed, and bacterial culture produced heavy growth of *Streptococcus equi Zooepidemicus*. In the second mare, an abnormal structure was observed in the left ovary in a routine transrectal ultrasonographic exam in the absence of any clinical signs or abnormal blood parameters. A medical approach was chosen and a sample of the purulent material was aspirated with a transvaginal ultrasound-guided approach. The sample yielded a heavy growth of *Streptococcus equi Zooepidemicus* after culture. Treatment was initiated with rifampicin and trimethoprim—sulfadiazine based on the antibiogram results and the abscess completely resolved after 40 days.

Main limitations: Limited to two cases.

Conclusions: Ovarian abscesses in mares can be successfully treated both surgically and medically.

KEYWORDS
abscess, horse, OPU, ovary

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1 | INTRODUCTION

Currently, the only clinically successful method for in vitro embryo production in mares is intracytoplasmic sperm injection which requires oocyte retrieval from live or deceased mares. In live mares, oocytes are recovered by transvaginal follicular aspiration, also known as ovum pick up (OPU).[1] OPU was first described 30 years ago[2] and is the most practical, efficient and repeatable technique for oocyte recovery in live mares.[3]

The prevalence of complications is low ranging from mild (rectal or vaginal bleeding[4]) to severe clinical scenarios (such as arterial puncture[5] or peritonitis[6] leading to the mare's death). Hence, OPU should be considered as an invasive procedure, in which the mare's health can be seriously compromised.[7] Oocyte aspiration in horses is a method in which a transvaginal ultrasound transducer is placed inside the mare's vagina and the ovaries are manipulated transrectally to bring them into contact with the tip of the probe. Once the ovary is closely positioned against the probe, a 12G or 14G needle is passed through the probe canal, penetrating the vaginal wall and the ovary to reach the desired follicle which will be flushed repeatedly.[8] Hence, OPU requires vigorous rectal and ovarian manipulation followed by the passage of a moderate calibre needle into the abdominal cavity of the mare.

Ovarian abscesses have been described as a potential complication of OPU[1,2] whereas primary abscessation in mares is uncommon.[9] Only three cases of ovarian abscesses resulting from OPU have been reported in mares.[4,9,10] Unfortunately, in the reports by Velez et al.[4] and Ramirez et al.[10] the mares were euthanised and Bøgh et al.[9] do not describe a subsequent successful treatment.

In other species, ovarian abscesses are successfully treated medically or surgically.[11] Although the incidence of ovarian abscessation after OPU in mares is low, no report describes how to manage this complication. Here, we describe the diagnosis and successful treatment of ovarian abscesses in two mares subjected to OPU. In the first case a surgical treatment was chosen and in the second a successful medical treatment is described.

2 | MATERIAL, METHODS AND RESULTS

The two mares were included in a periodic OPU programme at the Veterinary Clinical Hospital of the University of Extremadura (VCH-UEx; Cáceres, Spain); both mares had been included in the experimental programme for over 12 months. In the usual OPU protocol, no prophylactic antibiotic treatment was administered.[12] During the procedure, mares underwent sedation with detomidine hydrochloride (Domidine®, Eurovet Animal Health BV, 0.01 mg/kg iv) and butorphanol tartrate (Dolorex®, MSD Animal Health, 0.01 mg/kg iv). N-butylscopolammonium bromide (Buscopan®, Boehringer Ingelheim, 0.3 mg/kg iv) was administered to reduce gastrointestinal peristalsis and relax the rectum. After aseptic preparation, the urethra was catheterised using a 25 CH catheter (Hauptner®, Solingen), and then the transvaginal probe was inserted into the vagina. The ovary was then manipulated and fixed by rectal palpation against the vaginal wall. A 12-G double-lumen needle, connected to a prewarmed collection bottle, was guided by a sterile channel through the transvaginal probe into the antral follicles and the whole process was visualised using a VividQ Ultrasound (General Electrics). Follicular content was aspirated using a vacuum pump (Cook® Vacum Pump, K-MAR-5200). All visible follicles were punctured, aspirated, and flushed six times with prewarmed flushing medium (Equiplus®, Minitube) with a different volume depending upon the follicle size. When the follicles were collapsing, the follicular wall was scraped by rotating the needle.

After OPU, a post-operative single dose of flunixin meglumine was administered (Flunixin Injectable Norbrook®, 50 mg/mL) at 1.1 mg/kg iv. The mares were monitored overnight until the next day if no discomfort was observed or as required if any complications were present.

2.1 | Case 1

In a 4-year-old pony mare, 1-day post-OPU procedure (without complications), physical examination revealed tachypnoea, tachycardia and high temperature (39.5°C). Initial haematological evaluation revealed leucocytosis (total white blood cell count $18.98 \times 10^3/\mu L$; reference range [rr] $6–12 \times 10^3/\mu L$) and neutrophilia (neutrophils $16.64 \times 10^3/\mu L$; rr $2.1–9 \times 10^3/\mu L$). Blood biochemistry was unremarkable. Transrectally, a hard non-painful structure was palpated in the left ovary and ultrasonography of the reproductive tract revealed two well delimited structures of approximately 2×2 cm, enclosed within a hyperechoic wall. The structures were surrounded by heterogenous ovarian stroma and contained a trabecular pattern in combination with more organised areas in the same ovary (Figure 1). The right ovary was normal on palpation and ultrasound.

The pony mare was treated with flunixin meglumine (Flunixin Injectable Norbrook®, 50 mg/mL; 1.1 mg/kg for 3 days followed 0.5 mg/kg, po, q12h) and trimethoprim—sulfadiazine (Equibactin® 333 mg + 67 mg, Dechra; 30 mg/kg po q12h) for 6 days. An intensive monitoring plan was established based on general physical examination every 3 h. After treatment, the reproductive ultrasonographic exam and haematological evaluation were similar to the initial examination but the mare showed no clinical signs and was returned to the herd. The OPU procedure was repeated every 2 weeks in the right ovary and the mare did not exhibit any signs of discomfort, lack of appetite, pyrexia or abdominal pain during this time.

Ten months later, the pony mare showed lameness and frequent lateral recumbency. On initial general physical examination tachypnoea, tachycardia, fever (38.8°C), lack of appetite and abdominal pain was revealed. The mare also showed left hindlimb lameness (2/5) at walk and trot. During transrectal palpation an enlarged, hard non-painful structure could be felt in the left lateral and ventral side of the abdomen. Ultrasonographic exam showed an increased size of the left ovary (9.9 cm), and two well defined structures (4.3 cm), enclosed within a hyperechoic wall, surrounded by heterogenous ovarian

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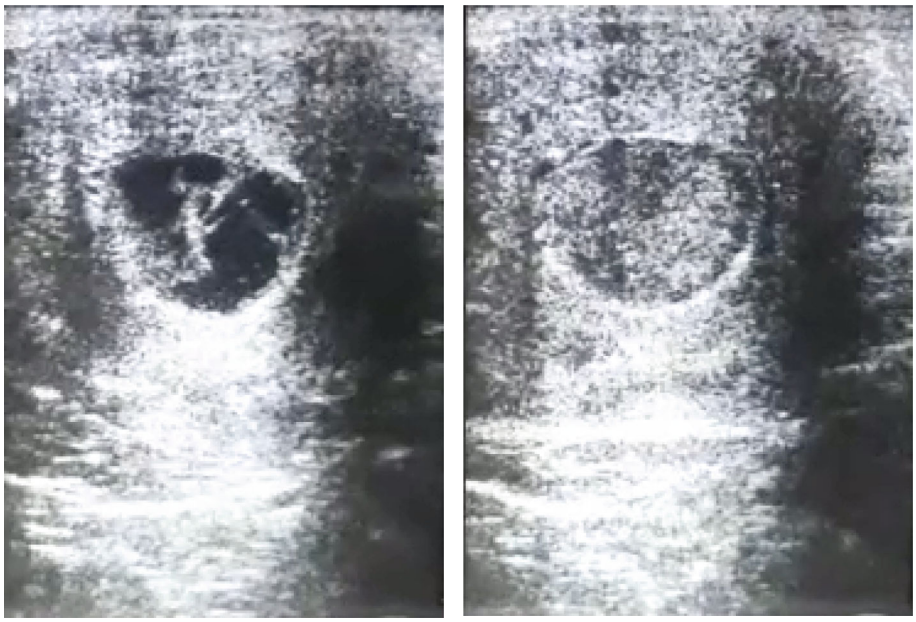

FIGURE 1 Transrectal ultrasonographic images of left ovary of a pony mare (Case 1) showing two circumscribed structures of approximately 2 × 2 cm, enclosed by a hyperechoic wall, surrounded by heterogenous ovarian stroma and containing a trabecular pattern.

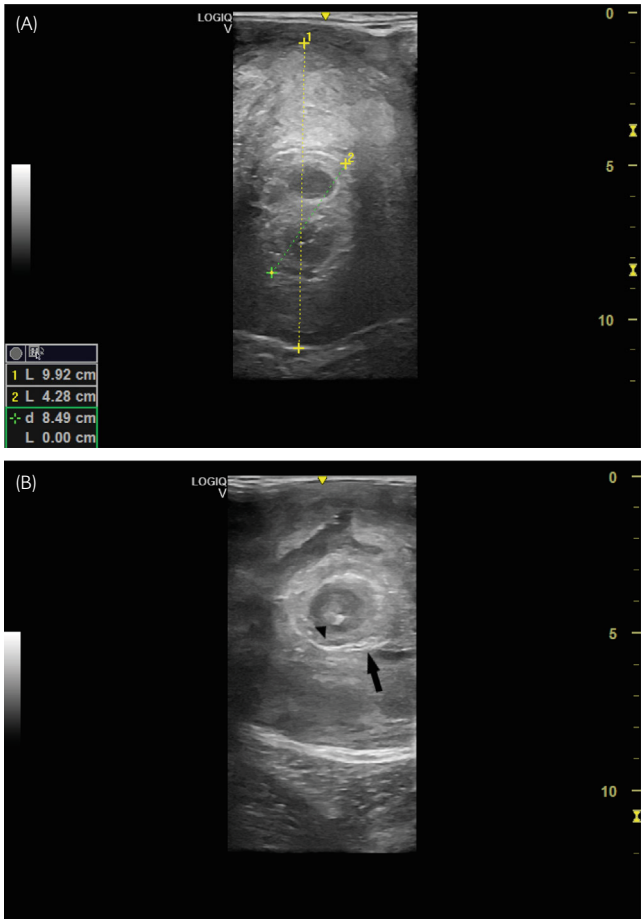

FIGURE 2 Transrectal ultrasonographic images of left ovary of Case 1 10 months later. (A) Ultrasonography shows an enlarged left ovary (9.9 cm) and two well defined structures (4.28 cm), enclosed by a hyperechoic wall (arrow), surrounded by heterogenous ovarian stroma, a fibrous aspect (3 cm) and (B) containing focal hyperechoic areas (arrowhead) encircled by echogenic and homogenous content.

stroma (Figure 2). Haematological evaluation revealed severe leucocytosis (total white blood cell count 28.44 × 10^3/μL; rr 6–12 × 10^3/μL), characterised by neutrophilia (neutrophils 21.93 × 10^3/μL; rr 2.1–9 × 10^3/μL), monocytosis (1.61 × 10^3/μL; rr 0.12–1.2 × 10^3/μL) and a slight increase in serum amyloid A: 9.13 μg/mL (rr < 7.0 μg/mL). Blood biochemistry was unremarkable.

A left ovariectomy via standing laparoscopic surgery was chosen. Prior to surgery, the patient was treated with doxycycline (Doxivet® 5, Group Divasa-Farmavic SA; 30 mg/kg po q12h) and flunixin meglumine (Flunixin Injectable Norbrook®, 50 mg/mL; 0.5 mg/kg po q12h) until surgery, 10 days later. Perioperative treatment consisted of sodium benzyl penicillin (Penilevel®, Laboratorios ERN, S.A; 22 000 ui/kg iv q6h) with gentamicin (Genta—Equine®, Dechra Veterinary Products; 6.6 mg/kg, iv, q24h) and anti-inflammatory therapy (Flunixin Injectable Norbrook®, 50 mg/mL; 1.1 mg/kg, iv, q12h).

The sedation protocol comprised an initial bolus of xylazine hydrochloride (Xilagesic® 200 mg/mL; 0.8 mg/kg iv) and morphine (Morfina®, B Braun medical Rubı; 50 μg/kg iv). Sedation was maintained by a constant intravenous rate infusion of xylazine hydrochloride (0.65 mg/kg/h), morphine (30 μg/kg/h) and ketamine (Ketamidor® 100 mg/mL, Richer Pharma; 0.4 mg/kg/h). Local anaesthetic was infiltrated in the laparoscopic sites for portal placement (Lidocaine®, B. Braun 20 mg/mL), and caudal epidural injection of lidocaine (Lidocaine 5%, B. Braun; 0.22 mg/kg) and xylazine hydrochloride (0.17 mg/kg) was also administered.

The mare underwent a standing laparoscopic unilateral ovariectomy as previously described.[13] Briefly, two ipsilateral laparoscopic portals were placed in the left flank and one laparoscopic portal for the optics was located in the 17th intercostal space. After ovarian exposure, anaesthesia of the ovarian pedicle was performed using 15 mL of mepivacaine (Mepivacaina 2%, B. Braun). Dissection and secure haemostasis of the mesovarium was achieved using a vessel-sealing system (LigaSure® Force Triad™, Tyco Healthcare Deutschland GmbH).

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The mesovarium was intimately adhered to the uterine horn and during the ovarian resection the uterine lumen was exposed. The ovary was completely removed, and for abdominal extraction, it was placed within an intraabdominal sterile plastic bag. Due to the size of the ovary, the skin incision was enlarged by connecting the two instrument portals to a length of 12 cm using a modified grid technique.[14] After ovary removal, the lumen of the uterine horn was closed using a purse-string inverted suture pattern with a 0 Monosyn® and portals and flank incisions were closed in several layers.

After surgery, macroscopic examination of the ovary revealed adhesion of the uterine horn to the surface of the ovary (10 × 10 cm) and close to this area the ovary presented a haemorrhagic region (Figure 3A). On macroscopic evaluation, the ovary exhibited small follicles (Figure 3B) and two foci of chronic apostematous oophoritis (Figure 3C).

The purulent content produced a massive growth of β haemolytic *Streptococcus equi subsp. Zooepidemicus* sensitive to several antibiotics including doxycycline, penicillin and gentamicin.

The mare developed postoperative complications including incisional infection and peritonitis. The complications were treated with incisional and peritoneal drainage and lavage with isotonic saline solution, anti-inflammatory and broad-spectrum antibiotics (no bacterial growth was observed in the peritoneal fluid). After 1 month, both complications had responded to the treatment and the patient was discharged from the clinic. Currently, the mare has been included again in the periodic experimental OPU programme.

2.2 | Case 2

During a routine transrectal ultrasonographic exam an abnormal structure compatible with an ovarian abscess was observed in the left ovary of an 8-year-old crossbred mare in the absence of clinical signs or abnormal haematological or biochemical parameters. The abnormal structure measured 2.5 cm and was surrounded by heterogenous ovarian stroma; the structure's core was heterogeneous, and hyperechoic areas were observed (Figure 4).

A few days after the diagnosis of an abnormal ovary by rectal ultrasonography, a medical approach was initiated to treat the ovarian abscess following the first-line procedure commonly used in women with tubo-ovarian abscesses.[15,16] Transvaginal ultrasound-guided aspiration was used to obtain a sample of the content of the ovarian structure for bacteriological culture and antibiogram (Figure 5).

This confirmed ovarian abscess and produced abundant and pure growth of *β haemolytic Streptococcus equi subsp. Zooepidemicus*; the antibiogram indicated sensitivity to rifampicin and trimethoprim—

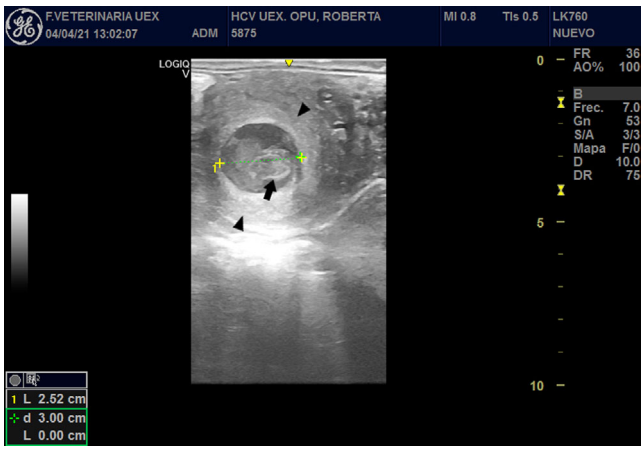

FIGURE 4 Transrectal ultrasonographic image of the left ovary from 8-year-old crossbred mare (Case 2) showing the ovarian abscess. There is an abnormal structure of 2.5 cm in diameter surrounded by a heterogenous ovarian stroma (arrowhead) containing hyperechoic and heterogenous areas (arrow).

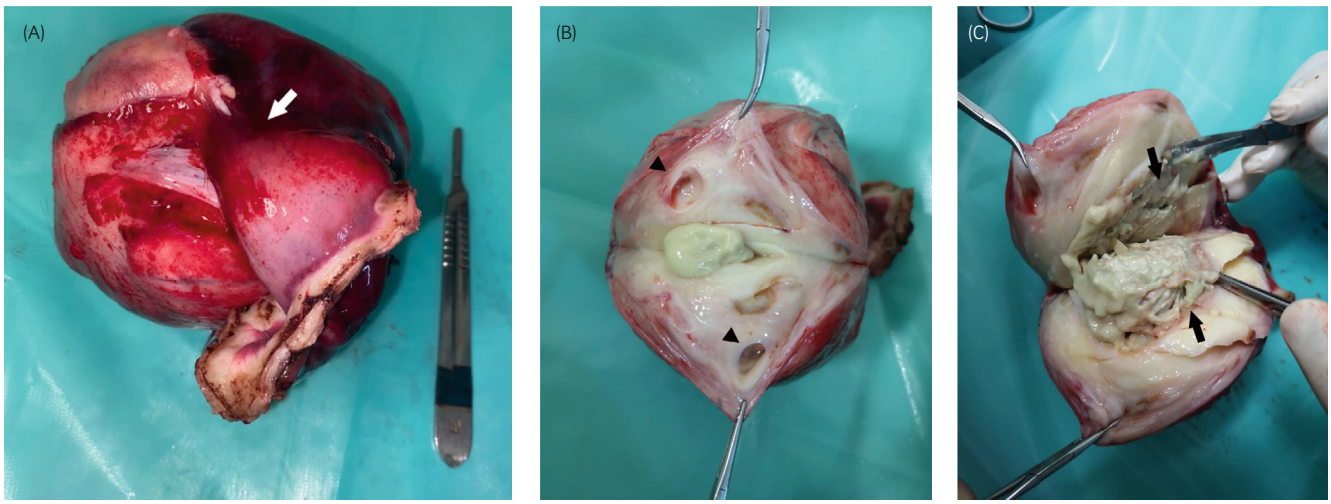

FIGURE 3 Macroscopic image of the left ovary from Case 1 after surgery. Gross examination revealed (A) adhesion of the uterine horn to the surface of the ovary (arrow) and next to this area the ovary showed a haemorrhagic region. (B) The ovary has small follicles (arrowheads) and (C) two foci of chronic apostematous oophoritis (arrows).

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sulfadiazine. The mare was treated with rifampicin (Rifaldin 300 mg capsules, Sanofi; 5 mg/kg po q12h) and trimethoprim—sulfadiazine at (Equibactin® 333 mg + 67 mg, Dechra; 30 mg/kg po q12h). Flunixin meglumine (Flunixin Injectable Norbrook®, 50 mg/mL; 1.1 mg/mL po) was given as two episodes of fever were registered immediately after the transvaginal sample collection.

The antibiotic treatment was maintained for 40 days. During this time, repeated transrectal ultrasoographic examinations were performed,

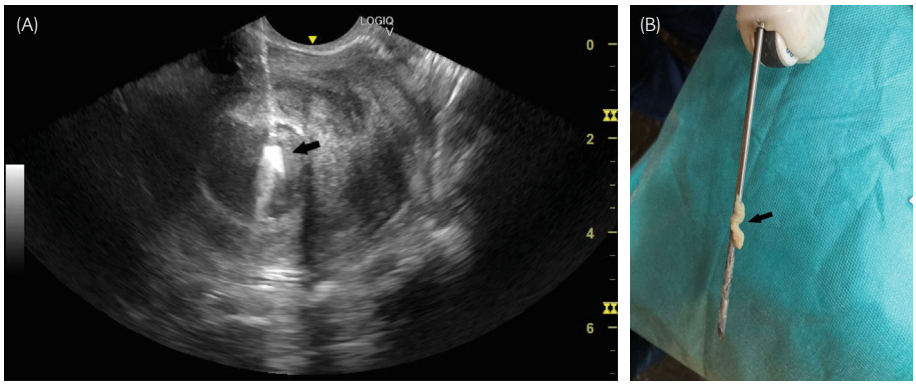

FIGURE 5 (A) Transvaginal ultrasonographic picture of left ovary with the ovum pick up (OPU) needle (arrow) puncturing and aspirating the hyperechoic content of the ovarian structure in Case 2. (B) The OPU needle and transvaginal ultrasound probe after obtaining the sample, showing the purulent material recovered from the abscess (arrow).

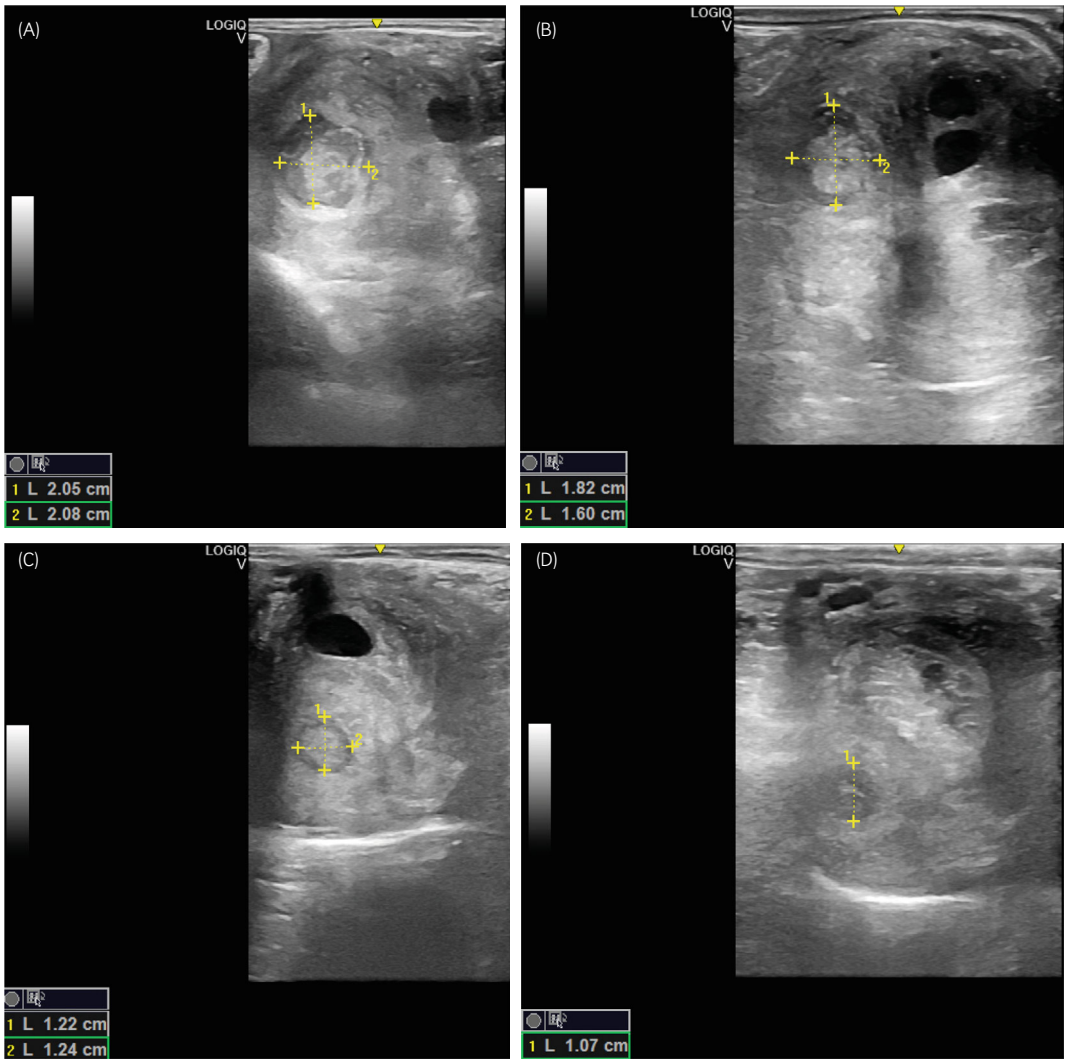

FIGURE 6 Evolution of the size of the ovarian abscess by transrectal ultrasonography in Case 2. (A) The ovarian abscess was 2.05 × 2.08 cm 7 days after the onset of the treatment. (B) 1.82 × 1.6 cm 24 days after treatment started. (C) 1.22 × 1.24 cm 32 days after treatment onset. (D) 1.07 cm 40 days after treatment began, which was the last ultrasonographic examination in which the abscess could be identified.

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showing a decrease in the size of the abscess until it was no longer visible (Figure 6). The mare had no further episodes of fever, discomfort or other complications, and haematology and blood biochemistry were normal.

At the current time, the mare has normal ovarian ultrasonographic images, with normal follicular activity (Figure 7), and is included again in our biweekly OPU programme. The mare became pregnant from an in vitro produced embryo and she is currently maintaining the pregnancy without progesterone supplementation.

3 | DISCUSSION

In this report, we describe the clinical signs, diagnosis and successful treatment of ovarian abscesses in two mares subjected to OPU. Although the ultrasonographic images of both ovarian abscesses were similar, clinical signs, blood and biochemical parameters differed markedly between the mares. The first mare, in which surgery was performed, had fever, tachypnoea, tachycardia, abdominal pain, left hindlimb lameness and severe leucocytosis. However, no clinical or laboratory alterations were observed in the second mare. This difference can be easily explained because, in the first mare, even when the ovarian abscess was suspected, aggressive treatment was not initiated until discomfort recurred 10 months after the initial episodes, whereas in the second mare, the treatment was initiated very quickly in the absence of clinical signs. In the literature, a spectrum of clinical presentations has been described. The two cases of ovarian abscess described by Ramirez et al.[10] presented similar clinical signs, including lameness of the hindlimb ipsilateral to the abscessed ovary and severe leucocytosis. However, Bøgh et al.[9] and Velez et al.[4] described cases without clinical signs, although blood samples were not analysed.

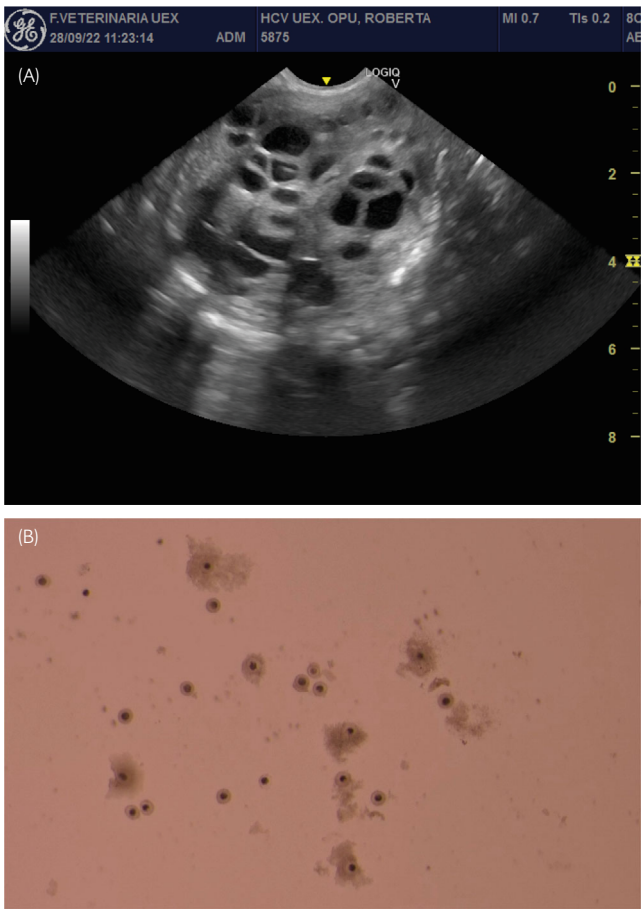

FIGURE 7 Ultrasonographic image of Case 2's ovary, and oocyte recovery 1 year after treatment of the abscess. (A) Transvaginal ultrasonography of the left ovary with normal ovarian activity. (B) Oocytes recovered by ovum pick up from the same mare.

Bacteriological cultures revealed *Streptococcus equi subsp. Zooepidemicus* as the infectious agent, coinciding with previous reports of equine ovarian abscesses.[4,10] This is the bacterial species most commonly isolated in the mare's uterus,[17] and, as demonstrated in women[18,19] and horse,[20] we suggest that bacterial inoculation in the ovary occurs from bacteria present in the vagina, possibly coming from the uterine microbiota. Hence, OPU should not be performed in mares in which active uterine infection and an open cervix are found, because a higher propensity to peritonitis and/or ovarian abscesses may be expected. There are reports in horses in which a vaginal lavage is performed prior to OPU[12] and this has potential as a prophylactic measure to diminish the bacterial load of the vagina. In our OPU programme, it is notable that prior to prophylactic antibiotic use, a prevalence of 3.33% was observed (2 abscesses out of 60 OPUs), while there were no cases after instituting prophylactic antibiotics regularly in our subsequent 216 OPU procedures. The overall prevalence of ovarian abscesses in our OPU programme (2 abscesses in 276 OPUs) is 0.7% in line with previous reports.[4] Currently, prophylactic antibiotics is administered to all our mares during the OPU procedure.

In the first mare a unilateral ovariectomy by a standing laparoscopic procedure was performed.[14] In the second case, in accordance with a first-line procedure in women with tubo-ovarian abscesses,[16] antibiotic therapy was chosen. In mares, standing laparoscopy is associated with low perioperative morbidity and mortality[13]; however, incisional infection and mild peritonitis developed in Case 1. These complications could be explained by the size of the flank incision[13] and the exposure of the uterine lumen during the dissection of the adhesions between the uterine horn and the ovarian surface. Clearly when surgical treatment is performed, the mare cannot keep both ovaries. This is the first report in which an ovarian abscess was punctured successfully for bacterial culture and antibiogram. A similar treatment has been previously described in mares,[21] where the abscess was located into the abdominal cavity and was punctured by means of a standing laparoscopic procedure. The risk of fatal septic peritonitis is recognised in all forms of abdominal abscesses; however,[22] the complications caused by ovarian abscesses have not been reported extensively. In our report, Case 1 did not develop peritonitis despite chronic abscessation of the ovary for 10 months prior to surgery, as also reported by Velez et al.[4] However, in that report, the mare was euthanised 66 days after diagnosis of ovarian abscess in the absence of any systemic signs. Thus, ovarian abscesses may be subclinical and have been described 2 years after OPU[10] and as an incidental findings post-mortem.[9]

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In the mare managed medically, no severe complications were observed after sample recovery from the abscess, and the abscess completely resolved in less than 2 months and the mare fully recovered her normal ovarian activity. Rifampicin, one of the antibiotics to which the isolated pathogen was susceptible, has an optimal ability to penetrate into the tissues and is recommended for the treatment of pathogens located in difficult-to-reach target areas, like abscesses.[23] Recently, a human medicine systematic review on the management of tubo-ovarian abscesses in women indicated that image-guided drainage of the abscesses provided the highest success rate, fewest complications, and the shortest hospitalisation duration compared with a laparoscopic approach.[24] Thus, our observations in this single case parallel those of human medicine. However, this approach is not without risk since peritonitis and subsequent sepsis and mare death could occur if not managed properly. In conclusion, we describe the diagnosis and clinical findings in two mares with ovarian abscesses and two different treatment approaches. Despite the general concern about indiscriminate use of prophylactic antibiotics,[4,12,25,26] and considering that the two mares reported here had no history of endometritis, we recommend antibiotics are administered prior to OPU in mares. Our findings may help equine practitioners to choose the best clinical approach for similar cases.

AUTHOR CONTRIBUTIONS

All authors contributed to case management, drafting of the manuscript and have approved the final version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

There are no competing interests to declare.

PEER REVIEW

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/evj.14031.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request: Open sharing exemption granted by editor for this descriptive retrospective clinical report.

ETHICAL ANIMAL RESEARCH

Research ethics committee oversight not required by this journal: retrospective study of clinical records.

INFORMED CONSENT

Owners gave explicit consent for inclusion of their animal in the report.

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