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Abortion and uterine prolapse in a Thoroughbred mare with twin pregnancy: Clinical and laboratory findings and treatment approach

Mohammed ALAMAARY[1]* and Ahmed ALI[2,3]

[1]Horse Clinic, Ministry of Environment, Water and Agriculture, Al Qassim 51911, Saudi Arabia
[2]Department of Veterinary Medicine, College of Agriculture and Veterinary Medicine, Qassim University, Buraidah 51452, Saudi Arabia
[3]Department of Theriogenology, Faculty of Veterinary Medicine, Assiut University, Assiut 71515, Egypt

This report presents a case of uterine prolapse in a Thoroughbred mare. The uterine prolapse occurred after abortion of twins in the eighth month of gestation. The prolapsed uterus was bleeding and congested but not damaged. The placenta was still attached to the endometrium. Blood samples were collected for hematology and for estimation of calcium, progesterone and estrogen. The cervix and clitoris were swabbed for bacteriology. The mare showed a decrease in the number of lymphocytes. The concentrations of estrogen and progesterone seemed normal compared with mares that foaled. Pseudomonas aeruginosa was isolated. The prolapsed uterus was washed with warm normal saline, and the retained placenta was carefully removed. An antibiotic cream was spread on the prolapsed uterus before replacing it. Two-thirds of the upper vulva was transiently sutured. Systemic antibiotics and an anti-inflammatory were administrated for 5 days. After 24 hr, the sutures were removed, and uterine lavage was performed using warmed normal saline for three days. The mare received 20 IU of oxytocin twice a day for three days to aid uterine clearance. A local antibiotic was inserted into the uterus. After treatment, the mare did not show any health disorders. She entered estrus 9 days after abortion and again 10 days later. In conclusion, twin pregnancy in a mare is considered a critical condition that necessitates specific management during early and late pregnancy. Uterine prolapse is an emergency that should be treated in a skilled manner to protect the mare and her future fertility. Calcium deficiency might predispose mares to uterine prolapse.
Key words: *abortion, calcium, uterine prolapse*

Twin pregnancy is the most common cause of the noninfectious abortion in mares, and it causes high rates of stillbirth and neonatal mortality [21, 30]. Uterine prolapse is, however, a rare condition in mares and is considered an emergency that threatens mare health and fertility. Dystocia, retained placenta, abortion or oxytocin overdose are possible causes for uterine prolapse [5, 13, 24].

Endometritis, laminitis, peritonitis and death are possible complications [2, 8, 10]. Clinical conditions that disturb the fetus or placenta are likely to interrupt the endocrine capacity of the fetoplacental unit [20]. Calcium is essential for uterine contraction in mares [6]. This report presents a case of uterine prolapse after abortion in a Thoroughbred mare with twin pregnancy, with especial emphasis on the clinical and laboratory findings.

A Thoroughbred mare with uterine prolapse was admitted to the horse clinic of the Ministry of Environment Water and Agriculture, Qassim region, Saudi Arabia. The mare was 9 years old, with 4 parities, the last of which was two years previously. The mare had no previous history of abortion, dystocia or retained placenta. The uterine prolapse occurred after abortion of twins in the eighth month of gestation.

It occurred 12 hr after abortion. The mare was brought to the clinic 12 hr after the uterine prolapse with retained placenta occurred. An ultrasound scan had been conducted in the first month of gestation only, and the twins were not detected. The mare was fed on concentrate and Alfalfa hay. Rhodes and water were available ad libitum. The mare was scheduled to get about 2 km of exercise a day.

The mare was in relatively good general condition when brought in but had a light degree of dehydration. It remained in a standing position after the prolapse occurred. The prolapsed uterus was bleeding and congested but not damaged. The placenta was still attached to the endometrium (Fig. 1A). The mare's rectal temperature, heart rate and respiratory rate were 39.4°C, 82 beats/min and 20 breaths/min, respectively.

Blood samples were collected via the jugular vein when the mare arrived for hematology and for estimating the concentrations of calcium (using photometric titration). The progesterone and estrogen concentrations were assessed using ELISA kits (MAGLUMI PRG [CLIA] and MAGLUMI Estradiol [CLIA], Shenzhen New Industries Biomedical Engineering Co., Ltd., Nanshan, Shenzhen, China). The cervix and clitoris were swabbed for bacteriological examination 24 hr after uterine replacement. The mare had marked lymphopenia and a relatively decreased calcium concentration (Tables 1, 2), as shown in Table 2. *Pseudomonas aeruginosa* was found in the cervical and clitoral swabs. The other hematological parameters, as well as the progesterone and estradiol concentrations, were within the normal reference values for mares at parturition (Tables 1 and 2).

The prolapsed uterus was washed with a warm (37°C) normal saline, and the retained placenta was carefully removed. An antibiotic cream (procaine benzylpenicillin 100,000 IU, streptomycin sulphate 100 mg, neomycin sulphate 100 mg and prednisolone 10 g; Multiject IMM®, Norbrook, Newry, Northern Ireland, U.K.) was spread on the prolapsed uterus before replacing it. The prolapsed uterus was carried using sterile gloves and pushed as far inside as possible to return it to its normal position. No epidural anesthesia was administered for the present case. The uterus was replaced easily. Then two-thirds of the upper vulva was sutured with four simple interrupted sutures after the administration of local anesthesia (lidocaine 2%). Systemic antibiotics (procaine benzylpenicillin and dihydrostreptomycin sulphate, 12.5 ml/200 kg, i.m., Combikel 20+20®, Kela, Hoogstraten, Belgium) and an anti-inflammatory (flunixin meglumine, 50 mg/45kg, i.v., Fulimed®, Alke, Istanbul, Turkey) were administered for 5 days. After 24 hr, the sutures were removed, and uterine lavage was
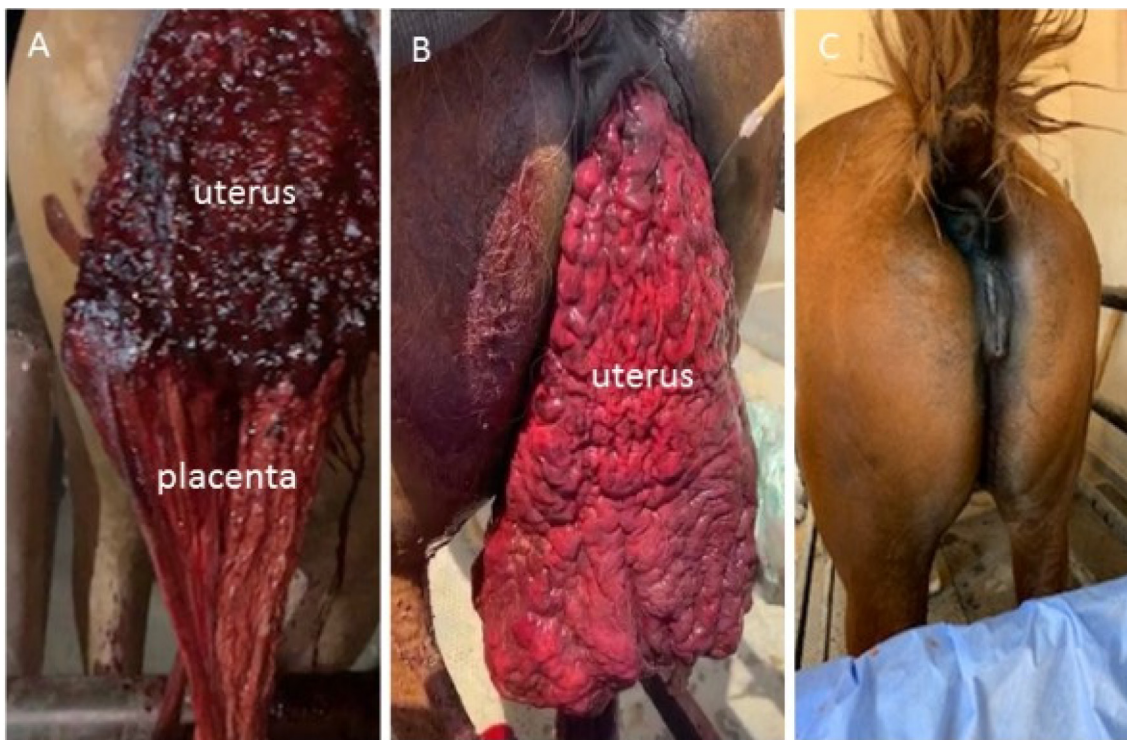
Fig. 1.   Uterine prolapse in a 9-year-old Thoroughbred mare after abortion of twins in the 8th month of gestation. (A) Congested uterus with retention of the placenta. (B) The placenta was gently removed, and the uterus was washed with warm normal saline. (C) The uterus was replaced completely, and two-thirds of the upper vulva was sutured for 24 hr.

performed using warmed normal saline for three days. The mare received 20 IU of oxytocin (VMD® Livestock pharma, V.M.D. nv/sa, Arendonk, Belgium) i.m. twice a day for three days to aid uterine clearance. A cefapirin antibiotic (500 mg, Metricure®, Intervet, Boxmeer, Netherlands) was inserted into the uterine body using a disposable catheter to control the *Pseudomonas aeruginosa* infection based on the results

of a sensitivity test (Table 3). After treatment, the mare did not show any health disorders. She entered estrus 9 days after abortion and again 10 days later. The owner, however, did not want to breed the mare at that time.

Delivering twins is very rare in mares, and diagnosing mares with twins consider hazards for the twins and mare. In the mare, the full uterine surface is necessary to deliver

Table 1. Hematology of the mare with uterine prolapse after abortion of twins in the 8th month of gestation

Test	Units	Results	Ref. range*
Hgb	G/DI	12.0	11–19
RBCs	$10^{12}/l$	7.53	6.80–12.90
Hct	%	38.6	32–53
MCV	fl	51.3	37–59
MCH	bg	15.9	12.3–19.7
MCHC	G/dl	31.1	31–39
RDW	%	18.3	17–20
Plt	$10^9/l$	164	100–400
Pct	%	0.10	0.07–0.21
MPV	fl	5.9	4–6
PDW	fl	15.7	15–21
WBCs	$10^9/l$	5.6	5.4–14.3
Neutrophils	$10^9/l$	4.97	2.30–9.50
Lymphocytes	$10^9/l$	0.16	1.5–7.70
Monocytes	$10^9/l$	0.39	0.0–1.50
Eosinophils	$10^9/l$	0.03	0.0–1.0
Basophils	$10^9/l$	0.04	0.0–0.3

Hgb, hemoglobin; RBCs, red blood cells; Hct, hematocrit; MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; RDW, red cell distribution width; Plt, platelet; Pct, procalcitonin; MPV, mean platelet volume; PDW, platelet distribution width; WBCs, white blood cells. *[9, 18, 32].

Table 2. Calcium, progesterone and estradiol 17β in serum of the mare with uterine prolapse after abortion of twins in the 8th month of gestation

Test	Unit	Result	Ref. Range
Calcium	mg/dl	9.83	11.5–14.5*
Progesterone	ng/ml	5.86	2–12**
Estradiol-17β	pg/ml	11	10–20***

*[32], **[15, 20], ***[22].

Table 3. Culture and sensitivity of cervical and clitoral swabs of the mare with uterine prolapse after abortion of twins in the 8th month of gestation: culture and sensitivity

Culture	
• Sample	Cervical and uterine swabs
• Organism A	*Pseudomonas aeruginosa*
• Culture condition	Aerobic
Sensitivity	
• Highly	Ceftriaxone, cefotaxime, cefixime
• Moderate	Amoxicillin + clavulanic, trimethoprim + sulfamethoxazole
• Resistant	Ciprofloxacin, amoxicillin, clarithromycin

enough oxygen and nutrition to the developing fetus. If a mare is carrying twins, there is less nutrition available for each fetus. Consequently, abortion of both fetuses is likely to occur in late pregnancy, although the mechanism that causes this has not yet been precisely identified [17]. Basically, twin embryos either occupy separate uterine horns or share a horn. If two embryos are lying near each other in the same uterine horn, one of the embryos has a probability of more than 50% of reabsorbing by day 40 of gestation [27]. Spontaneous resorption is infrequent if the embryos occupy separate uterine horns, and abortion will occur with the advance of pregnancy. In 2007, Causey *et al.* [3] reported a case of uterine prolapse in a mare that was pregnant with twins. The twins might not have been the main cause of uterine prolapse, but they could have been one of the predisposing factors for it. Consequently, embryo reduction nowadays is the mutual procedure when twins are identified in early pregnancy [16, 21]. In the current case, the mare was not under the clinic control; thus, embryo reduction was not conducted.

Although uterine prolapse is not common in mares, it is considered an emergency that could affect the life of a mare. Prolapse might affect either the whole uterus or part of it. In some cases, the bladder may prolapse and complicate the situation. Death can occur via a sequence of peritonitis, uterine or bladder rupture, systemic shock and bleeding. There are reports of some cases dying or being euthanized [7, 19, 23]. Thoughtful consideration of the circumstances of these cases could assist in protecting the mares from complications associated with this condition. Additionally, appropriate management of such cases could maintain the future fertility in the mares. The serum calcium concentration in the current case was lower than the physiological range. Hypocalcaemia is considered to play a role in the etiology of uterine prolapse in mares [4] and other domestic animals [1, 26]. Additionally, Friesian mares with retained placentas show lower serum calcium levels than mares without retained placentas [28]. Basically, changes in calcium expression around term play an imperative role in overriding uterine excitability and contractility [31].

The lymphopenia observed in this case may have been due to the stress on the mare as a result of the prolapse of the uterus. A decrease in the number of lymphocytes is most commonly caused by corticosteroids, either those secreted in the body due to stress or those administrated as a treatment for a disease. Lymphopenia is also infrequently caused by other circumstances, such as viral infections like viral arteritis, and hereditary diseases like combined immunodeficiency disease in Arabian foals [12, 25].

The serum concentrations of estrogen and progesterone in the mare appeared normal compared with mares that foaled. But, in fact, we do not know what the levels of these hormones were prior to or at the time of abortion. According to a 2017 study be Shikichi *et al.* [29], mares with a high concentration of progestins and low concentration of estrogens were likely to deliver aborted/dead foals during mid-to-late gestation. Estradiol 17-β has been found to be low until day 90 of pregnancy, increased until day 240 of pregnancy, subsequently decreased until day 300 of pregnancy and then comparatively stable until parturition, and basal levels were observed by one day after parturition. Progesterone increased during the last few weeks of gestation, with a peak about five days before foaling, and subsequently decreased quickly following parturition, and baseline levels were observed within 24 hr of foaling [14, 22].

Pseudomonas aeruginosa, which was isolated from the cervix and clitoris of the current case, may be caused by the abortion process or the result of external pollution. In the current case, no edema, allochroism, hyperplasia or lacerations were observed on the attached placenta. *Pseudomonas aeruginosa* was reported to be one of the major microorganisms associated with placentitis in aborted, stillborn and premature foals [11]. Therefore, treatment of the uterus in a professional manner is important after the abortion process to avoid continued microbial infection.

In conclusion, twin pregnancy in a mare is considered a critical condition that necessitates specific management. Ultrasound scans should be conducted routinely during early pregnancy in equine practice. Uterine prolapse is an emergency that should be treated in a skilled manner to protect the mare and its future fertility.

Acknowledgments

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