

Theriogenology Question of the Month

In cooperation with



History

An 8-year-old 450-kg (1,100-lb) Quarter Horse mare was evaluated to determine pregnancy status at 150 days after breeding. The mare was reproductively normal and had given birth to a live foal after breeding during each of the preceding 2 years. For the current breeding season, the mare had been artificially inseminated with fresh semen and 3,000 units of human chorionic gonadotropin had been administered IV to induce ovulation for that breeding. The mare had not been examined to detect pregnancy before our examination on day 150 after breeding.

Transabdominal ultrasonography was performed by use of a 3.5-mHz curvilinear probe. Two fetuses were evident. One fetus was smaller than the other as determined on the basis of measurements of fetal thoracic diameters; the larger fetus had a thoracic diameter of 9.6 cm, and the smaller fetus had a thoracic diameter of 7.6 cm (Figure 1).

Both fetuses were active, and each fetus had a heart rate of approximately 120 beats/min. Character and amount of amniotic and allantoic fluids were considered typical. Fetal membranes appeared normal with

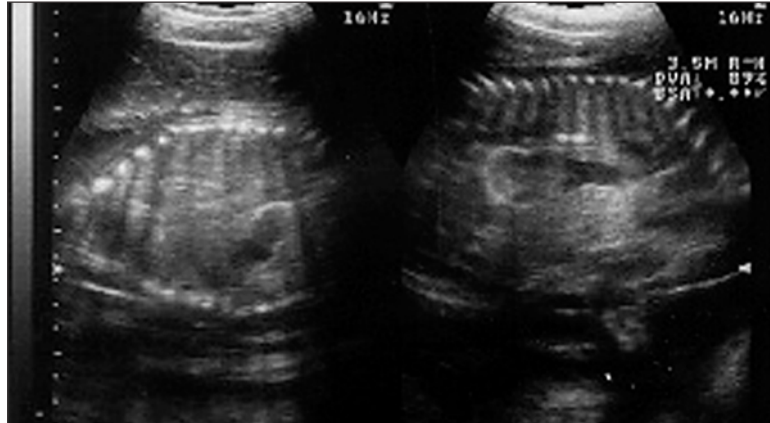


Figure 1—Transabdominal ultrasonographs of twin equine fetuses at 150 days of gestation. Tick marks on the left side are at intervals of 1 cm.

appropriate thickness for the gestational stage; measurements obtained via transrectal ultrasonography revealed that the combined thickness of the uterus and fetal membranes was < 1.0 cm. Measurements obtained via transabdominal ultrasonography revealed that thickness of the fetal membranes was < 2.0 cm.

Question

What are the 3 management options for a mare with twin fetuses at this stage of gestation? *Please turn the page.*

PPG Procaine penicillin G

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Answer

Attempt to eliminate one of the fetuses in utero with the intent that the mare would subsequently give birth to 1 healthy foal, manage the mare in an effort to allow her to give birth to 2 healthy full-term foals, or induce abortion of both fetuses.

Results

The owner opted to proceed with an ultrasound-guided, transabdominal fetal cardiac puncture to eliminate one of the fetuses. The mare was administered altrenogest^a (0.044 mg/kg [0.020 mg/lb], PO), clenbuterol^b (2.0 µg/kg [0.91 µg/lb], PO), and flunixin meglumine^c (1.1 mg/kg [0.5 mg/lb], IV) on the morning of the reduction procedure. The mare was placed in stocks for restraint. A 3.5-MHz curvilinear probe was used to image both fetuses, and the smaller fetus was identified on the basis of repeated measurements of the fetal thoracic diameter. Fetuses were located on the floor of the abdominal cavity approximately midway between the mare's udder and xiphoid process.

The mare was sedated by IV administration of 4 mg of detomidine^d and 5 mg of butorphanol tartrate.^e After the mare was sedated, fetal heart rate of the larger fetus decreased to 97 beats/min and heart rate of the smaller fetus decreased to 112 beats/min. At that time, the fetuses were located in a more cranial position within the mare's abdomen as a result of uterine relaxation.

The ventral portion of the mare's abdomen was clipped and aseptically prepared for transabdominal fetal cardiac puncture. Local anesthesia of the skin and abdominal muscles corresponding to the site of insertion of the needle was achieved by injection of 5 mL of lidocaine hydrochloride. A 5.0-MHz curvilinear ultrasound probe fitted with a needle guide was used to identify the long axis of the thorax of the smaller fetus and the heart located within. A 6-inch, 18-gauge spinal needle was aseptically introduced through the port on the ultrasound probe. The needle was inserted just to the right of midline through the abdominal wall and uterus and into the fetus' thorax. Needle placement was followed by injection of 15 mL of PPG; however, the PPG was not ultrasonographically seen entering the heart of the fetus. Thirty minutes after PPG injection, the injected fetus had a heart rate of 94 beats/min, whereas the other fetus had a heart rate of 112 beats/min.

The mare was discharged to the owners with instructions for the mare to undergo an additional ultrasonographic examination later that day to assess fetal viability. The owners were instructed to continue to administer altrenogest (0.044 mg/kg, PO, q 24 h) to the mare for an additional 30 days, flunixin meglumine (1.1 mg/kg, IV, q 24 h) for 10 days, and trimethoprim-sulfamethoxazole tablets^f (20 mg/kg [9.1 mg/lb], PO, q 12 h) for 10 days. The ultrasonographic examination repeated later on the day of injection revealed 2 fetal heartbeats.

The owners returned the mare to our facility 3 days later for a second injection procedure. During the second attempt, 2 fetuses were again identified, each of which had a heart rate of 113 beats/min. The same sedation and injection procedures were used as described previously; however, the PPG was seen entering the heart of the smaller fetus (Figure 2). Five minutes after PPG injection, there was no detectable

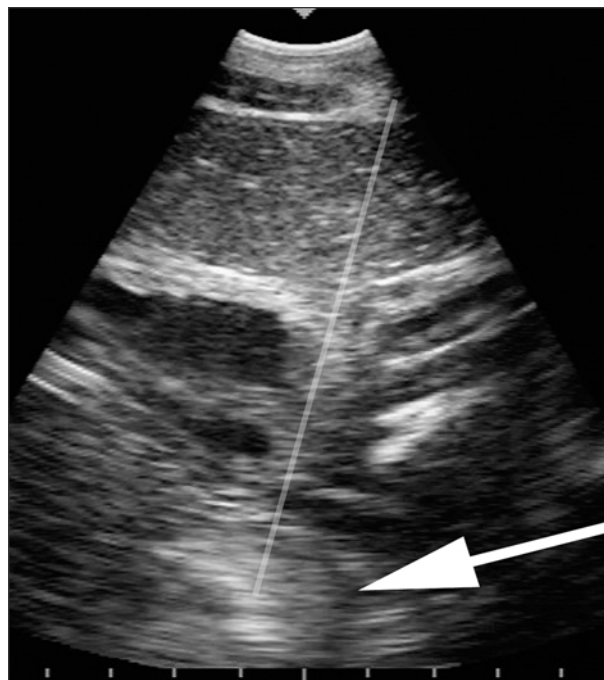


Figure 2—Transabdominal ultrasonogram obtained by use of a 5-MHz curvilinear transducer fitted with a needle guide during intracardiac injection of PPG into an equine fetus at 150 days of gestation. The track for the spinal needle is indicated (gray line). Notice the hyperechoic area (arrow) that indicates PPG injection into the heart of the fetus. Tick marks on the bottom are at intervals of 1 cm.

heartbeat in the smaller fetus, whereas the larger fetus had a heart rate of 105 beats/min.

The mare was discharged to the owners with instructions for administration of a tapering dose of flunixin (1.1 mg/kg, IV, q 24 h for 6 days; then 0.75 mg/kg [0.34 mg/lb], IV, for 1 day; and then 0.5 mg/kg [0.23 mg/lb], IV, for 1 day). The owners were instructed to continue with the full course of administration for the altrenogest and trimethoprim-sulfamethoxazole tablets.

Serial measurements of estrone sulfate and total progestagen concentrations were obtained on days 150 (day of the initial procedure), 153 (day of the second procedure), 154, 156, and 181 of gestation. Serum estrone sulfate concentrations were 1,955, 1,773, 1,458, 1,055, and 1,673 pg/mL, respectively, whereas total progestagen concentrations were 7.4, 6.0, 3.7, 4.0, and 4.6 ng/mL, respectively. Estrone sulfate concentrations in a mare between 150 and 320 days of gestation should be > 1,000 pg/mL, whereas total progestagen concentration should be > 2.0 ng/mL. Transabdominal ultrasonography of the mare performed on day 240 of gestation revealed 1 apparently normal fetus.

Discussion

Management of mares with twin fetuses is commonly dealt with by equine practitioners. In mares, twin fetuses carry a high risk of dystocia or loss of both fetuses; < 1% of pregnancies with twin fetuses result in the birth of 2 healthy foals.¹

The use of transrectal ultrasonography during early pregnancy (before day 30 of gestation) has reduced the incidence of abortions resulting from twins during the past few decades.² However, some twin pregnancies may not be detected until after the formation of endometrial cups, which form at approximately day 35 to 40 of gestation.

Reduction of twins in a mare before endometrial cups form is preferred and can be accomplished by manually pinching or crushing one of the embryos; ultrasound-guided transvaginal embryo aspiration; waiting for natural reduction, which is seen in approximately 60% of twin equine pregnancies³; or inducing abortion of both fetuses. Endometrial cups form at day 35 to 38 of gestation and remain until approximately day 100 to 150 of gestation, at which time they are destroyed by a maternal immune response.⁴ When a pregnancy with twin fetuses is not identified until after the endometrial cups form, termination of the pregnancy will lead to a period of continued secretion of equine chorionic gonadotropin and, hence, anestrus until the cells of the cups are destroyed. Owners are often discouraged from allowing a mare to carry twins to term because of the risks of complications, such as loss of both fetuses, dystocia, retained fetal membranes, or injury to the mare (eg, rupture of the prepubic tendon).

Multiple doses (2 to 5 IM injections) of an exogenous prostaglandin analogue,⁴ may be required to induce abortion during mid- to late gestation. Another option for a mare with twin fetuses at this stage of gestation (ie, after endometrial cups form) is to attempt to reduce the number of fetuses. Some of the methods used include nutritional deprivation of the mare, surgical removal of a fetus, transvaginal or transabdominal ultrasound-guided puncture of the smaller fetus, and manual ballottement to cause trauma to 1 fetus.

Initially, reduction techniques used intracardiac injection of potassium chloride to cause fetal death.⁵ A subsequent technique⁶ used injection of PPG into the thorax or abdomen of the fetus. Administration of PPG is preferable to the use of potassium solutions because PPG can be injected into the fetal thorax or abdomen, provides reduced bacterial contamination, and allows the injection to be observed on the ultrasound screen.² The volume of PPG injection necessary to induce fetal death should be between 15 and 20 mL. A fetus may not succumb immediately after injection, and it may require several hours before the fetus dies.² The first procedure in the mare described here failed as a result of improper needle placement (ie, the needle was in the allantoic or amniotic fluid but did not penetrate the fetus).

The smaller fetus is chosen for termination because it presumably has a smaller placenta and should consume less space in the uterus after death. The best success for fetal reduction by means of transabdominal fetal puncture is obtained when the procedure is performed between days 115 and 130 of gestation; attempts earlier during gestation have a lower success rate, whereas attempts later during gestation are associated with an increase in neonatal problems.⁷

Before undertaking transabdominal fetal puncture, the mare should be treated by administration of supplemental progestins, systemically administered antimicrobials for prophylaxis of infection, and flunixin meglumine for antiprostaglandin effects. Use of supplemental progestins is controversial, and some practitioners believe it is unnecessary.⁶ Mares receiving progestin treatment should be monitored to ensure that the unpunctured fetus remains viable.² When used, progestin treatment should be continued for at least 2 weeks after the procedure and may be continued longer, if desired. It has been reported⁶

that most losses of the remaining viable fetus are within 2 to 4 weeks after the puncture procedure.

Success rates after transabdominal fetal puncture, as indicated by the birth of a single live foal, range from 32% to 57%.^{2,6,7} Both fetuses may be born dead. Intervascular connections between the 2 fetuses causing admixture of the fetal blood supplies are a likely explanation. The injected solution (PPG) or a product from a dead or dying fetus could be transported to the unpunctured fetus and cause fetal compromise or death.

After fetal cardiac puncture, a dead fetus should mummify and remain within the uterus until parturition of the surviving fetus. Bones may or may not be evident within the mummified fetus, which is typically found in an invaginated allantoic cavity of the fetal membranes of the surviving fetus.²

Early during gestation (< 60 days), the fetoplacental unit produces small amounts of progestagens, but these amounts increase with increasing gestational age.⁴ The decrease in estrone sulfate and total progestagen concentrations in the mare reported here can be explained by either of 2 possibilities. One possibility is that the demise of one of the fetoplacental units caused an overall decrease in the hormone concentrations. The second possibility is that a natural decrease in total progestagen concentrations resulted from normal regression of corpora lutea, leading to a reduction in total progestagen concentration.

Outcome

On day 360 of gestation, the mare went into labor and, unassisted, gave birth to a healthy filly foal that weighed approximately 35 kg (77 lb) and a small, mummified fetus. The fetal membranes were passed immediately after birth of the healthy foal; there was a large avillous area on the chorionic surface that corresponded to the placental tissue of the mummified fetus.

- a. Regu-Mate, Intervet Inc, Millsboro, Del.
- b. Ventipulmin, Boehringer Ingelheim Vetmedica Inc, St Joseph, Mo.
- c. Banamine, Schering-Plough Animal Health Corp, Union, NJ.
- d. Dormosedan, Pfizer Animal Health, New York, NY.
- e. Torbugesic, Fort Dodge Animal Health, Fort Dodge, Iowa.
- f. Sulfamethoxazole-trimethoprim 960-mg tablets, Mutual Pharmaceutical Co Inc, Philadelphia, Pa.

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3. Pascoe DR. Pregnancy diagnosis and management of twins, in *Proceedings*. 19th Bain-Fallon Memorial Lectures 1997;103–115.
4. LeBlanc M, Lopate C, Knottenbelt D. Pregnancy. In: Knottenbelt D, LeBlanc M, Lopate C, et al, eds. *Equine stud farm medicine and surgery*. Philadelphia: WB Saunders Co, 2003;227–268.
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6. McKinnon AO, Rantanen NW. Twins. In: Rantanen NW, McKinnon AO, eds. *Equine diagnostic ultrasonography*. Baltimore: The Williams & Wilkins Co, 1998;141–156.
7. Rantanen NW. Ultrasound guided fetal cardiac puncture for twin reduction in mares, in *Proceedings*. Annu Meet Soc Theriogenol 1990;169–171.