Twin pregnancies in the mare: Approaches and outcomes in different stages of pregnancy

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Abstract

Mares support one fetus during pregnancy, and rarely more than one. Multiple fetuses mainly originate from multiple ovulations, but embryo splitting has been previously reported. Before ultrasound diagnosis, higher incidence of undetected twin pregnancies occurred, accounting for 20-40% of all abortions. However, due to the advent of ultrasonography, embryonic vesicles are easily detected during early stages and multiple vesicles are treated early with better overall success. Therefore, currently only 3% of all mare abortions are derived from twins. If twin pregnancies are established, in 87% of cases one or both fetuses die and are subsequently aborted between 5-9 months of gestation. If both fetuses reach term, a high rate of still birth occurs, live foals are smaller, weaker, and more susceptible to infection, and show delayed development. Twin pregnancies can be easily corrected manually by transrectal palpation during early stages (before day 17 post-ovulation), and by transvaginal ultrasound-guided, transcutaneous ultrasound-guided, craniocervical dislocation by the flank, and surgical removal of the conceptus during later stages.

Key words: Twin, embryo reduction, pregnancy outcome, endometrial cyst, craniocervical dislocation, and mummified fetus.

Introduction

Mares are monotocus species and are rarely able to support more than one fetus (Ginther 1992). Twins are not unusual and mainly originate from multiple ovulation and, rarely, by a single embryo splitting (Meadows et al., 1995; Govaere et al., 2009). Occurrence of multiple ovulations vary according to individual mares and breed. A higher incidence is documented in Thoroughbreds (20-30%) (Ginther 1982, Davies-Morel and Newcombe 2008) and Draft breeds compared with Standardbreds, Quarter Horses, Ponies, and Arabians. Although previously reported in literature, monozygotic twins and triplets are very rare (Meadows et al., 1995; Govaere et al., 2009) likely due to the formation of the capsule around the equine embryo. Interestingly, monozygotic twins have a higher incidence of occurrence after embryo transfer (McCue et al., 1998; Sper et al., 2012; Roberts et al., 2015), but the reason is unknown. It is questionable if this occurrence is actually increased incidence of monozygotic twins or just that they are more appropriately recognized, since only one embryo is placed within the uterus, precluding the confounding effect of an additional ovulation after breeding.

Before ultrasound diagnosis, 20-40% of all abortions were derived from twin pregnancies (Whitwell 1980; Merkt and Jochle 1993), compared with only 3% after ultrasound diagnosis (Rickets et al., 2003). Transrectal ultrasonography allowed the detection of more than one embryonic vesicles at early stages (11-14 days post-ovulation), which allowed early intervention

and establishment of only one of the vesicles, or early termination of the pregnancy for another breeding try before the formation of endometrial cups.

In 87% of cases one or both fetuses die and are subsequently aborted between 5 to 9 months of gestation (Pascoe 1983). If pregnancy is established with both conceptuses, late term abortion, birth, dystocia and placental retention can occur (Frazer 2003). In addition, twins can decrease the live foaling rates in the season following (Pascoe 1983), and high rate of stillbirth in twin foals (Plat 1973). If live twin foals are carried to term, high neonatal mortality occurs, foals are usually smaller, weaker, more susceptible to infection, and show delayed development (Jeffcott and Whitwell 1973). Therefore, twin pregnancies should be avoided in all mares.

The twin fixation occurs mostly in the same horn (unilateral; 70%) than in opposite horns (bilateral; 30%). When asynchronous ovulation happen, two embryonic vesicles get fixed unilaterally, and embryonic vesicles presents more than 4 mm in size different on Day 14, the smaller vesicle will naturally be reduced 100% of the time by a competitive absorption of nutrients (Ginther 1992).

Different approaches can be done to correct twin pregnancies. Success is defined as reduction of one twin and survival of a singleton pregnancy. Manual reduction before fixation (Day 17) is the most common method, which does not increase the risk of pregnancy loss when compared with single pregnancies (Davies-Morel et al., 2012). However, higher pregnancy losses have been reported in mares older than 9 years (Schnobrich et al., 2013). Treatments with flunixin meglumine and altrenogest prior to or at the time of reduction may prevent pregnancy failure by up to 5% (Sheering et al., 2010).

Twin reductions can also be done in advanced stages of pregnancy. Post fixation, from day 17 to 30, manual reduction can still be performed if vesicles are easily separated or in

opposite horns, expecting 75% of success (Pascoe et al., 1987). From Days 35 to 45, a "membrane slip" or "ballottement" type motion with the edge of the ultrasound probe can be performed to cause trauma to the vesicle (Mackinnon 2011). The technique includes balloting the pregnancy with a force and rhythm that the fetus swings on its umbilicus. The trauma of the ballottement will cause disruption of the umbilicus causing death to the fetus while preserving the surviving twin. The expected rate of success on reduction is about 50% and, with careful manipulation, the loss of both fetuses may occur in only 5% of cases.

Remember that after Day 35 it is assumed that the endometrial cups are actively producing of eCG, which would inhibit the mare to cycle back for 120 days, likely the next breeding season (Wilsher and Allen 2011). If prostaglandin administration is desired to terminate the pregnancy for a rebreeding, it should be done before Day 30, due to endometrial cups formation.

Transvaginal ultrasound-guided twin puncture can be performed by puncturing the pregnancy vesicle with aspiration of yolk sac or allantoic fluid with or without injecting the fetus. The success is dependent on the stage of gestation. Success is approximately 40% before day 35, decreases to 31% during day 36 to 45, and is only 13% after Day 45 (Journee et al., 2013).

There is an 86% chance of natural reduction in unilateral twins prior to day 45. After 45 days of gestation, natural reduction will occur in only in 6% of the cases (Ginther and Douglas, 1982). Therefore, twin correction or pregnancy termination must be performed for the safety of the mare. Surgical reduction between Days 41 to 65 has been described (Pascoe and Stover, 1989), but due to the low success rate and risk of general anesthesia it has no longer been applied. Manual reduction can still be done by repeated traumatization of the fetus (Mackinnon

2011), but it is important to know that these procedures should be performed without rupturing the chorioallantois.

When the pregnancy advances to after day 55, craniocervical dislocation is a viable option. Reports suggest that this procedure can be done from day 55 to 90 by transrectal approach, or from Days 58 to 110 by standing flank laparotomy (Wolfsdorf et al., 2005, 2009), with 63% of success with both approaches. The disadvantage of transrectal approach is the very high risk of rectal tears, therefore the flank laparotomy is often chosen despite possible post-surgical complications. After decapitation of the fetus, a heart-beat still continues for weeks and was reported to stay for 7 months in one case (Wolfsdorf et al. 2009). However, the decapitated fetus and placenta do not continue to grow and will result in a mummified fetal remnant. If this technique is performed before the completion of the placental formation, it will not harm the growth of the remaining singleton (Wolfsdorf et al. 2005).

Between Days 113 to 130 of gestation, transcutaneous ultrasound guided twin reduction can be applied by intracardiac injection of potassium chloride (Rantanen 1990, Macpherson and Reimer 200) or procaine penicillin in heart, lungs or abdomen (Mackinnon and Rantanen 1998, Ball 2005). Success rate is about 38 to 56% for a live singleton pregnancy (Macpherson and Reimer 200, Ball 2005, McKinnon 2011). However, due to the late term reduction, the singleton born can be smaller and weaker due to the lack of endometrial surface available for oxygen and nutrients for development and growth.

Conclusions

Embryonic vesicle pinching between Days 14 to 17 of pregnancy is the most reliable method for twin reduction. Treatment with flunixin meglumine and progesterone are indicated,

but not necessary. Endometrial cyst map evaluation before pregnancy check or confirmation of cyst are necessary to prevent possible confusions. Craniocervical dislocation is a reliable procedure for twin reductions later in gestation. Twin pregnancies at term are rare and risky, but can sometimes end up in successful outcomes.

References

Ball BA. How to do transabdominal reduction of twin pregnancies in the mare. In: Proceedings of the 8th Annual Meeting of the Italian Association of Equine Veterinarians, Pisa, Italy, 2005.

Davies-morel MCG, Newcombe JR. The efficacy of different hCG dose rates and the effect of hCG treatment on ovarian activity: ovulation, multiple ovulation, pregnancy, multiple pregnancy, synchrony of multiple ovulation: in the mare. Animal Reproduction Science 2008;109,189–199.

Davies-morel MC, Newcombe JR, Lauber M. Manual reduction of multiple embryos in the mare: The effect on subsequent pregnancy outcome. Veterinary Journal 2012;192;322–325.

Frazer GS. Twins. In: Current Therapy in Equine Medicine 5th edn. Eds N.E. Robinson, W.B. Saunders, St Louis. 2003;245–248.

Ginther OJ. Twinning in mares: a review of recent studies. Journal of Equine Veterinary Science 1982;2;127–135.

Ginther OJ. Postfixation embryo reduction in unilateral and bilateral twins in mares. Theriogenology 1984;22;213–223.

Ginther OJ, Douglas RH. The outcome of twin pregnancies in mares. Theriogenology 1982;18;237–244.

Govaere JL, Hoogewijs MK, de Schauwer C, et al. Transvaginal ultrasound guided aspiration of unilateral twin gestation in the mare. Equine Veterinary Journal 2008,40,521–522.

Jeffcott LB, Whitwell KE. Twinning as a cause of fetal and neonatal loss in the Thoroughbred mare. The Journal of Comparative Pathology 1973;83;91–106

Journeé SL, de Ruijter-villani M, Hendriks WK, et al. Efficacy of transvaginal ultrasound guided twin reduction in the mare by embryonic or fetal stabbing compared with yolk sac or allantoic fluid aspiration. Theriogenology 2013;80;346–349.

Mckinnon AO. Management of twins. In Equine Reproduction. 2nd Edn. Eds McKinnon AO, Squires EL, Vaala WE, Varner DD. Wiley-Blackwell 2011;2099–2117.

Mckinnon AO, Rantanen NW. Twins. In Equine Diagnostic Ultrasonography. Eds N. W. Rantanen and A. O. McKinnon. Williams and Wilkins 1998;141–156.

Macpherson ML, Reimer JM. Twin reduction in the mare: current options. Animal Reproduction Science 2000;60–61;233-244.

Mccue PM, Thayer J, Squires EL, et al. Twin pregnancies following transfer of single embryos in three mares: a case report. Journal of Equine Veterinary Science 1998;18;832–834.

Meadows SJ, Binns MM, Newcombe JR, et al. Identical triplets in a Thoroughbred mare. Equine Veterinary Journal 1995;27;394–397.

Merkt H, Jochle W. Abortions and twin pregnancies in Thoroughbreds: rate of occurrence, treatments and prevention. Journal of Equine Veterinary Science 1993;13;690–694.

Pascoe RR. Methods for the treatment of twin pregnancy in the mare. Equine Veterinary Journal 1983;15;40–42.

Pascoe DR, Stover SM. Surgical removal of one conceptus from fifteen mares with twin concepti. Veterinary Surgery 1989;18;141–145.

Pascoe D, Pascoe R, Hughes J, et al. Comparison of two techniques and three hormone therapies for management of twin conceptuses by manual embryonic reduction. Journal of Reproduction and Fertility Supplement 1987;35;701–702.

Platt H. Etiological aspects of perinatal mortality in the Thoroughbred. Equine Veterinary Journal 1973;5;116–120.

Rantanen NW. Ultrasound guided fetal cardia puncture for twin reduction in mares. In Proceedings of the Annual Meeting of the Society of Theriogenology 1990;169–170.

Ricketts SW, Barrelet A, Whitwell KE. Equine abortion. In Reproduction Foaling. Part 2: Fetal and Neonatal Aspects, EVE Manual 6. Eds P.D. Rossdale, T.S. Mair and R.E. Green. Equine Veterinary Journal 2003,18–21.

Roberts MA, London K, Campos-Chillón LF, et al. Presumed monozygotic twins develop following transfer of an in vitro-produced equine embryo. Journal of Equine Science 2015;26;89–94.

Schnobrich MR, Riddle WT, Stromberg AJ, et al. Factors affecting live foal rates of Thoroughbred mares that undergo manual twin elimination. Equine Veterinary Journal 2013;45;676–680.

Sheerin PC, Howard CE, Leblanc MM, ey al. Effects of operator, treatment and mare age on the live foal rate of mares after manual twin reduction. Animal Reproduction Science 2010;121;312–313.

Sper RB, Whitacre MD, Bailey CS, et al. Successful reduction of a monozygotic equine twin pregnancy via transabdominal ultrasound-guided cardiac puncture. Equine Veterinary Education 2012;24;55–59.

Whitwell KE. Investigations into fetal and neonatal losses in the horse. Veterinary Clinics of North America: Large Animal Practice 1980;2;313–331.

Wilsher S, Allen WR. Factors influencing equine chorionic gonadotrophin production in the mare. Equine Veterinary Journal 2011;43;430–438.

Wolfsdorf KE, Rodgerson D, Holder R. How to manually reduce twins between 60-120 days gestation using craniocervical dislocation. Proceedings of the annual convention of the American Association of Equine Practitioners 2005;51;284–287.

Wolfsdorf KE, Rodgerson D, Holder R, et al. Success rate of post-fixation twin reduction using cranio-cervical dislocation. Proceedings of the annual convention of the American Association of Equine Practitioners 2009;55;257–261.