Marta de Ruijter-Villani

Department of Equine Sciences, Faculty of Veterinary Medicine, Utrecht University, the Netherlands

INTRA-UTERINE SEX DETERMINATION & FETAL MONITORING

Over the last two decades, the significant improvements within ultrasonographic technologies and the increased accessibility of these technologies for practicing equine veterinarian, have allowed ultrasonography to become widely adopted for both monitoring of fetal well-being and determination of fetal gender. While during early gestation transrectal ultrasonography allows thorough examination of both the fetus and the fetal membranes, during late gestation this technique is primarily useful for evaluating the placental at the cervical star, fetal fluid appearance, and to lesser extent, the fetus (i.e., carotid pulse and orbit diameter). Transabdominal ultrasonography is the most accurate technique to examine the fetus and cranial placenta in late gestation.

Fetal monitoring

Several authors have described normal parameters for fetus and mare throughout gestation including fetal hart rate, fetal activity, aortic diameter, uteroplacental thickness, allantoic fluid appearance and fetal breathing movements. It is important to note that all these parameters vary with the advance of gestation and most of them differs in various horse breeds and are correlated to maternal size.

Fetal monitoring throughout gestation has several advantages. The early detection of **developmental disorders and position of the fetus** before parturition allow the clinician to anticipate and possibly treat in time problems which can occur during gestation or delivery. Fetal abnormalities that can be detected during gestation are the presence of twins, reduced fetal size for gestational age, body pregnancy, transverse or caudal presentation, dilatation of the fetal bladder and amniotic urachus secondary to umbilical cord torsion, poor involution of yolk sac remnants with persistence of a cystic structure on the umbilical cord, incomplete closure of the abdominal wall, hydrocephalus and fetal cataract.

Moreover, ultrasonography can aid a prompt diagnosis and treatment of gestational disorders such as **placentitis** or **hydropic conditions**. Ascending bacterial placentitis is an important cause of abortion and perinatal death in horses. The most frequently affected area of the placenta is the caudal aspect of the allantochorion in close contact with the internal cervical os (i.e. cervical star). Therefore, ascending placentitis can be identified at ultrasonography as an increase of the combined thickness of uterus and placenta (CTUP). Values exceeding 5 mm (<270 days of pregnancy), 8 mm (271-300 days), 10 mm (310-330 days) and 12 mm (>330 days) have been associated with placental inflammation. The identification of pockets of hyperechoic fluid between the uterus and the placenta is also indicative of exudative inflammation and pathognomonic for placentitis. Hydramnios and hydrallantois are exaggerated fluid accumulation in the amniotic and allantoic compartments, respectively, and mainly occur during the last three months of gestation. While hydrallantois is caused by placental disorders, hydramnios has unknown etiology and it is probably related to fetal abnormalities. In most of the cases the fetus is not palpable, and the transabdominal ultrasound shows a large amount of fluid (>18 cm) both in the pregnant and non-pregnant horn.

In course of systemic illness of the pregnant mare the ultrasonographic evaluation of **presence of fetal stress of demise** is also crucial in helping the clinician to decide for the best treatment strategy. In particular a thickened feto-placenta unit, tachycardia, bradycardia, absence of hart beat, lack of fetal movements are all associated with fetal stress or demise.

Determination of fetal gender

During early gestation (between 55 and 70 days) fetal sex determination rely on the identification of the genital tubercle, a "V" shape hyperechoic structure which is either positioned just caudal to the umbilical insertion into the abdomen (male fetus) or underneath the tail (female fetus). The limitations of this technique are that it requires a very experienced examiner and it allows fetal gender determination only during a short window of time. The detection of fetal gender during mid or late pregnancy is based on the visualization of fetal gonads, external genitalia and mammary gland. Between 90 and 150 days of gestation the fetus is easily accessible via transrectal ultrasonography, while after 150 days transabdominal ultrasonography is needed. Fetal ovaries appear at the ultrasonographic image as formed by 2 components, one hypoechoic at the periphery and one hyperechoic at the center, these two components are separated

FROM GESTATION TO A HEALTHY FOAL

by a ring of small blood vessels readily detectable with the color Doppler. Testicles are homogeneous and contain a unique large vessel at the center (central vein). The greatest advantages of performing fetal gender determination later in gestation are that this period falls outside the breeding season, moreover, it can be performed with good accuracy by less experienced examiners.