Fetal and Maternal Heart Rates in a Case of Twin Pregnancy of the Thoroughbred Horse

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ABSTRACT. Fetal electrocardiogram in a twin pregnancy of a Thoroughbred horse was recorded. Two colts were born alive at 340 days of gestation. One was healthy but the other was growth-retarded. Both fetal heart rates decreased similarly with gestational age, but the discrepancy was noted from 4 days before parturition. The higher heart rate seemed to be obtained from the growth-retarded colt. Maternal heart rate increased gradually with the advancement of gestational period and then increased prominently during the last 2 weeks before parturition. —KEY WORDS: fetal heart rate, Thoroughbred horse, twin pregnancy.


Fetal electrocardiograms (FECGs) have been used to predict the vitality and the position of the fetus and the occurrence of multiple pregnancy in horses [2, 3, 10] and cattle [5, 6]. Recently, fetal heart rate (FHR) is correlated to the fetal health in human and we reported the normal FHR and maternal heart rate (MHR) during normal single pregnancy in Thoroughbred horse [8]. Horses with twin pregnancy have a high incidence of abortion [1, 4, 7]. This report describes FECG in a case of twin pregnancy in Thoroughbred horse. The FECG was recorded from 208 to 336 days (4 days before parturition or -4 days) of gestation. The FECG pattern characteristic to twin pregnancy was found intermittently in a record made for 20 min at 208 day and was found almost continuously thereafter. The method for recording and data presentation was reported previously [8].

The maternal P wave, QRS complex and T wave, and the fetal QRS complexes of the twin fetuses were identified and are shown in Fig. 1. Deflections of the QRS complexes from each fetus were separated by either the configuration of the QRS complex or the beat to beat intervals. The amplitude of the twin QRS complexes increased with gestational age.

Fig. 2 shows diagrams of FHR from both fetuses, which are plotted at an interval of 10 sec during 20 min at various gestational age. FHR of both fetuses was indistinguishable at 241 to 323 days of gestation. Our previous paper [8] pointed out the FHR acceleration (a brief tachycardia) in a diagram of FHR, probably due to the fetal body movement. In the present diagram, however, it was difficult to point out the FHR acceleration. FHR from the twin is represented as the mean except on -4 day of gestation in Fig. 3 and FHR from normal single pregnancies reported previously [8] is superimposed. The mean FHR from the twin decreased with gestational age as FHR of the normal single pregnancy. The higher FHR in the twin might possibly due to the inclusion of the FHR acceleration. The mean FHR at 12 days and 17 days before parturition was lower than those of the single pregnancy. FHR from each fetus was separable at 4 days before parturition, and the higher FHR was defined as Fetus 1 and the lower one as Fetus 2.
The mare delivered two live colts at 340 days of gestation, being 8 days shorter than the previous gestational period of this mare with a single fetus. The period is not significantly different from that in other Thoroughbred mares at single pregnancy (mean±S.D., 335±7.0 days of gestation, n=10) [8]. One colt was slightly small but healthy (body weight: 41 kg, withers height: 93 cm) and the other had a severe growth-retard (body weight: 23 kg, withers height: 83 cm) and did not stand up. The present case is categorized as Type A (twins dissimilar size) of Jeffcott and Whitwell [4] but the sum of the body weight (64 kg) was considerably heavier than that reported by them (51 kg).

In a previous report [8], we have suggested that the baseline FHR can be used as an indicator of the fetal maturity, since it decreases logarithmically with the advance in gestational period and that this decrease may reflect the functional maturity of the autonomic nervous system regulating the cardiac movement. Based on this idea, the healthy colt must show lower FHR before parturition. Fetuses 1 and 2 in Fig. 3 would be the growth-retarded and the healthy colts, respectively.

The mean MHR increased with the advance in gestational period like during single pregnancy, though it was at a higher level. A prominent increase in MHR near the term was more exaggerated in the present case of twin pregnancy (Fig. 3). It has been reported that a pregnancy-induced hypertension in human occurs more frequently at twin pregnancy [9]. A higher level of the mean MHR near the term in the present case might be caused by an increased requirement for blood supply. The FECG in a twin pregnancy is useful to predict the health condition of each fetus.
Fig. 2. A diagram of FHR of twin fetuses with age. Negative numbers in parentheses indicate days before parturition. The level of the FHR near the term differentiates between two fetuses.
Fig. 3. Changes in the mean FHR of the twin and the mean MHR during gestation. The data of single normal pregnancies reported previously [8] are superimposed. Single pregnancy: the baseline FHR (○) and the mean MHR (●). Twin pregnancy: the mean FHR of the twin fetuses (□) and the mean MHR (■). The levels of the mean FHR of the twin fetuses (□*: Fetus 1 and □**: Fetus 2) are separately plotted at 4 days before parturition.

References

要約

サラブレッドにおける双胎妊娠時の胎仔ならびに母体心拍数について：松井寛二（東京大学農学部附属牧場）
———一方はやや小さいながら発育良好で、他方は未熟仔であった。1例のサラブレッド双胎仔仔心電図を追跡記
録した。両胎仔心拍数は胎齢の進行にともなって減少し、出生4日前には両胎仔間に明瞭な差異が認められた。
発育良好仔仔のそれは単胎の場合と類似し、数値の大きい方は未熟仔仔のものと推測された。母体心拍数は妊娠
の進行とともに徐々に増加し、とくに分娩前約2週間には急増した。