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Ultrasonographic characteristics of early pregnancy failure in bitches

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Abstract

Resorption of conceptuses was identified in 6 of 20 bitches examined daily from 15 to 35 d after the estimated pre-ovulatory LH surge. One or more conceptuses were resorbed in each bitch but there was continuation of the remaining pregnancy to term. This paper details the ultrasonographic embryological features of normal and resorbing conceptuses. Impending resorption may be predicted by detecting a delay in the time of development of a specific embryological feature or measuring a slow growth rate. Interestingly, there were greater number of conceptuses initially identified in bitches that subsequently resorbed than in those which did not.

Keywords: Canine; Pregnancy; Embryonic death; Ultrasonography

1. Introduction

Diagnostic B-mode ultrasound has been used for some time to diagnose early pregnancy in the bitch [1–5]. In several studies, resorption of a small number of conceptuses has been observed, with a continuation of the remaining pregnancy to term [6–9]. The etiology of isolated embryonic resorption is uncertain, although it appears that it is not a result of infection, nor is it more common in bitches that have previously had reproductive tract disease [6]. In other species, the incidence of conceptual resorption has been shown to be range from 5 to 13% [10]. In bitches, serial ultrasound examinations of accurately timed pregnancies have been used to record normal embryological features of pregnancy [11,12]. However, no studies have characterised in detail the features of conceptuses that subsequently resorb.

2. Materials and methods

Twenty pregnant Labrador retriever bitches (aged 3–5 y) were examined daily for 30 d (from approximately 10–40 d after ovulation); data for Days 15–35 (estimated pre-ovulatory LH surge = Day 0) were subsequently analysed. Bitches were examined in either the standing position or in dorsal recumbency, using a 7.5 MHz mechanical sector transducer (Pandion 300S; Pie Medical Ltd.). The body of the uterus and the two uterine horns were identified at each examination. Stringent attempts were made to identify individual conceptuses within the uterus, based upon their location within the uterine horns and the uterine body. Each conceptus was uniquely identified, based upon its

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location and this information was updated at each examination.

For each conceptus, measurements were made of the internal diameter and length (in the direction of the uterine horn) of the vesicle. A detailed examination was performed to record whether the forming placenta was identifiable, whether the embryo proper was identifiable, and whether there was an embryonic heartbeat present. Furthermore, the maximum length of the embryo proper was measured when imaged in the longitudinal plane of the embryo, and the presence and appearance of the allantois and limb buds were recorded. For measured parameters, mean growth rates were calculated (mm/d) throughout the time periods described.

For all conceptuses, the day upon which the specific features were observed was related to the day of the estimated pre-ovulatory LH surge (Day 0), calculated as 65 d prior to the day of the onset of parturitition (see [13,14]). For one bitch with eight conceptuses (all went to term), all characteristic features were identified 1 d later than for all other normal conceptuses; data for these eight conceptuses were therefore transposed by 1 d, such that the estimated LH surge was calculated as 64 d prior to the onset of parturitition.

Conceptuses that progressed to term were considered to be normal, whereas other conceptuses were resorbed during the study period. Descriptive statistics (mean ± S.D.) were used to report differences between the normal group and the group in which subsequent resorbtion occurred, and between bitches in which conceptuses were subsequently resorbed and those in which there was no identified pregnancy loss. Groups were compared using a Student's *t*-test. Values were considered significant at $P < 0.05$.

3. Results

3.1. Incidence of resorption

A total of 132 conceptuses were initially identified in the 20 bitches. In 14 bitches, there was no pregnancy loss (83 conceptuses were identified and 83 pups were delivered), whereas in 6 bitches, there was loss of 1 or more conceptuses, but continuation of the remainder apparently normally to term (49 conceptuses were identified, of which 14 subsequently resorbed and 35 pups were delivered; Table 1).

The overall embryonic loss for all bitches was 10.6% (14 of 132); for affected bitches, the embryonic loss was 28.6% (14 of 49).

3.2. Development of normal conceptuses (n = 118)

Spherical conceptuses were first identified between Days 19 and 20, when they were approximately 1 mm in internal diameter; 112 conceptuses were first identified on Day 19 and the remaining 6 were first identified on Day 20. By Day 21, the conceptuses were not spherical in shape (demonstrated by imaging in two planes), and in some, an echogenic line bordering the yolk sac was evident. This was thought to be the forming placenta, but was not always identified. At this stage, the conceptus caused enlargement of the uterus.

At Day 23, the embryo proper was identified in 101 of the 118 conceptuses, and it was present in all conceptuses by Day 24. The heartbeat was visible by Day 23 in 101 conceptuses, Day 24 in 104 conceptuses, and Day 25 in all conceptuses. At approximately Day 26, the allantois was visible as an emerging anechoic fluid-filled structure; it subsequently enlarged and surrounded the regressing relatively echogenic yolk sac. The timing of these events was difficult to determine in all conceptuses, although by Day 30 the allantois exceeded the volume of the yolk sac in all cases.

Limb buds were first identified at Day 34 in 116 of the normal embryos and in all of them by Day 35. The echogenic fetal skeleton was evident from Day 35 in all cases.

From Day 21, the initially spherical conceptuses became oblate in shape and their length exceeded their diameter (Fig. 1). Between Days 19 and 32, the diameter of the conceptuses increased almost linearly

Table 1
Overall features of early embryonic loss in 20 Labrador retriever bitches

	Total no. of conceptuses identified	Total no. of conceptuses lost	Total no. of pups born	Mean (±S.D.) no. of conceptuses identified per bitch	Mean (±S.D.) no. of pups born per bitch
Bitches with no embryonic loss ($n = 14$)	83	0	83	5.9 ± 2.3^{a}	5.9 ± 2.3
Bitches with embryonic loss ($n = 6$)	49	14	35	8.1 ± 2.1^{b}	5.8 ± 1.7

Superscript letters (a and b) within a column, means without a common letter are different.