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Ultrasonographic measurements of the combined thickness of uterus and placenta (CTUP) during normal and compromised pregnancies of non-descript cats

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Abstract

The present study was carried out to assess the combined thickness of uterus and placenta (CTUP) in normal and compromised pregnancies of cats. The 12 queens presented with the history of breeding more than four weeks were screened by transabdominal ultrasonography for confirmation of pregnancy. Based on the clinical findings and ultrasonographic evidence, the animals were divided into two groups. Group I consisted of six queens with viable foetuses, and Group II consisted of six queens with compromised pregnancy characterised by non-viable conceptus in utero and/or abnormal vulvar discharge. All animals were monitored at weekly intervals until the end of gestation. The combined thickness of uterus and placenta (CTUP) increased significantly ($p < 0.01$) from 5th to 9th week of normal gestation (3.37 ± 0.04 mm; 3.79 ± 0.03 mm; 4.33 ± 0.04 mm; 4.66 ± 0.06 mm; 5.02 ± 0.04 mm). In compromised pregnancies, CTUP was markedly higher ($p < 0.01$) during the 8th week (6.23 ± 0.13 mm) compared to normal pregnancies of the same period. These findings suggest that CTUP may serve as a valuable ultrasonographic parameter for assessing placental development and identifying pregnancies at risk in cats.

Keywords: Cat, CTUP, placenta, ultrasonography, compromised pregnancy

Introduction

Monitoring pregnancy and foetal well-being is an important aspect of reproductive management in domestic cats. Ultrasonography is widely used in veterinary obstetrics as a safe and non-invasive technique that allows real-time evaluation of the uterus, placenta, and developing foetuses. In feline practice, early recognition of pregnancy abnormalities is particularly valuable, as compromised pregnancies may progress without obvious clinical signs or may present only with vulvar discharge.

The placenta plays a vital role in maintaining pregnancy by facilitating nutrient and gas exchange between the dam and the foetus. In cats, the zonary placenta is closely associated with uterine function, and changes in placental thickness may reflect disturbances in uteroplacental circulation or foetal health. Measurement of the combined thickness of the uterus and placenta (CTUP) was used as an indicator of placental status in several species (Renaudin *et al.*, 1997; Troedsson, *et al.*, 1997; Bucca *et al.*, 2005; Morris *et al.*, 2007; Hendriks *et al.*, 2009; Gaikwad *et al.*, 2017) [3, 4, 2, 5, 6, 1]. However, information regarding its clinical application and reference values in feline gestation is still limited.

In view of the limited availability of species-specific data, the present study was designed to evaluate the variation in normal and compromised feline pregnancies using ultrasonography. By comparing CTUP measurements between healthy pregnancies and those showing evidence of foetal compromise, this study aims to provide useful baseline information that may assist clinicians in the early detection and management of abnormal pregnancies in cats.

Materials and Methods

Animals under study

The twelve queens presented to the Teaching Veterinary Clinical Complex, Pookode and the University Peripheral Clinic, Kakkavayal during July 2024 to December 2025 with the history of breeding more than four weeks were screened by transabdominal ultrasonography for confirmation of pregnancy. Based on the clinical findings and ultrasonographic evidence, the animals were divided into two groups. Group I consisted of six queens with apparently normal pregnancy and viable foetuses, while Group II consisted of six queens with compromised pregnancy characterised by non-viable conceptus in utero and/or abnormal vulvar discharge.

Ultrasonographic examination

Following clinical examination, transabdominal ultrasonographic evaluation was performed using an Aeroscans CD E-LITE ultrasound unit (Fig. 1) equipped with sector and linear-array transducers operating at frequencies ranging from 7-17 MHz. The ventral abdominal region was clipped from the xiphisternum to the pubis, and acoustic coupling gel was applied. Scanning was conducted with the animals positioned in dorsal and lateral recumbency.

Measurement of CTUP

The central region of the zonary placenta in contact with the endometrium was examined using a linear-array transducer. CTUP was measured as the distance between the outer uterine wall and the allantochorionic surface adjacent to the foetal fluid. For each conceptus, three measurements were recorded, and the mean value was used for statistical analysis.

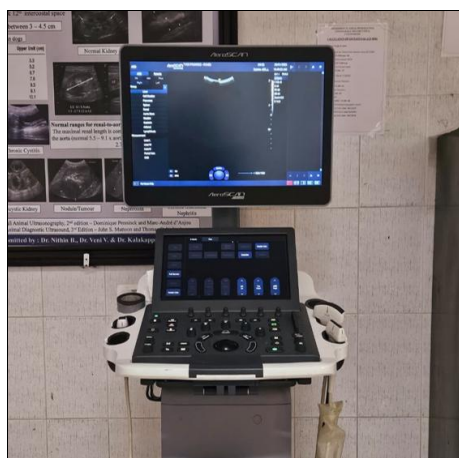


Fig 1: Aeroscans CD E-LITE ultrasound unit



Fig 2: Combined thickness of the uterus and placenta in normal pregnancy

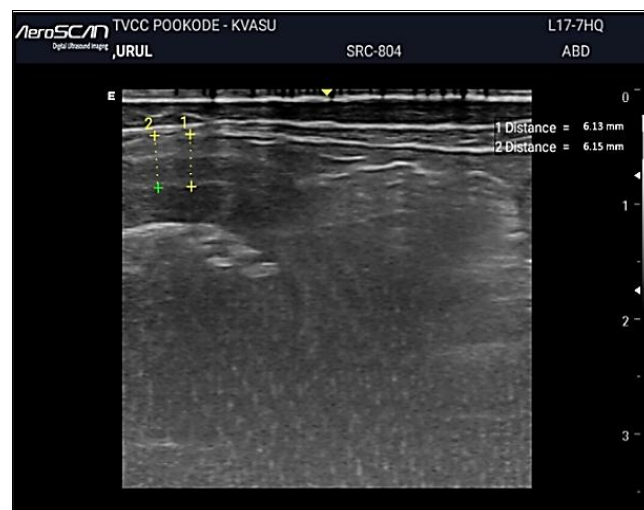


Fig 3: Combined thickness of the uterus and placenta in compromised pregnancy

Statistical analysis

Statistical analysis of the data was carried out using SPSS version 24.0. CTUP values in different weeks of normal pregnancy were compared using repeated measures ANOVA and the values in normal and compromised pregnancies were compared using independent 't' test.

Results

The combined thickness of the uterus and placenta (CTUP) measured by transabdominal B-mode ultrasonography in cats with normal pregnancies (Group I) showed a consistent and statistically significant increase ($p < 0.01$) with advancing gestational age. The mean CTUP values increased progressively from 3.37 ± 0.04 mm during the 5th week to 3.79 ± 0.03 mm in the 6th week, followed by further increases to 4.33 ± 0.04 mm, 4.66 ± 0.06 mm, and 5.01 ± 0.04 mm during the 7th, 8th, and 9th weeks of gestation, respectively (Table 1).

Table 1: Combined thickness of uterus and placenta/CTUP (Mean $\pm$ SE) observed in trans abdominal B-mode ultrasonography of cats with normal pregnancies (n = 6)

Period of gestation	5 th week	6 th week	7 th week	8 th week	9 th week	P-value
CTUP (mm)	$3.37^a \pm 0.04$	$3.79^b \pm 0.03$	$4.33^c \pm 0.04$	$4.66^d \pm 0.06$	$5.01^e \pm 0.04$	< 0.01

Values with different superscripts in row differ significantly

In contrast, cats with compromised pregnancies (Group II) exhibited significantly higher ($p < 0.01$) CTUP values (6.23 ± 0.13 mm) compared to those with normal pregnancies (4.66 ± 0.06 mm) at the corresponding period of gestation (8th week), indicating marked variation in uteroplacental thickness associated with pregnancy compromise (Table 2).

Table 2: Combined thickness of uterus and placenta/CTUP (Mean $\pm$ SE) observed in trans abdominal B-mode ultrasonography of cats with compromised pregnancies (n = 6)

Groups	CTUP (mm)
Group 1	$4.66^a \pm 0.06$
Group 2	$6.23^b \pm 0.13$
P-value	< 0.01

Values with different superscripts in column differ significantly

Discussion

In the present study, the combined thickness of the uterus and placenta (CTUP) showed a significant and progressive increase with advancing gestation in cats with normal pregnancies. The gradual rise in CTUP from 5th to 9th week reflects normal placental growth and increasing uteroplacental demands as pregnancy progresses. These findings indicate that CTUP follows a predictable pattern during normal feline gestation and may serve as a useful ultrasonographic parameter for monitoring placental development. The values obtained here can be considered for reference during the particular week of gestation.

The CTUP values observed in the present study are comparable with those reported previously in cats. Ribeiro *et al.* (2017) [7] documented mean CTUP values of 0.36 ± 0.01 cm between 40 and 50 days of gestation and 0.40 ± 0.01 cm between 50 and 60 days, with normal values not exceeding 0.57 cm. The progressive increase in CTUP noted in the current investigation falls within the reported physiological range and supports earlier descriptions of normal placental thickening in feline pregnancy. Furthermore, the technique employed for CTUP measurement, involving assessment at the central region of the zony placenta, aligns with the methodology described by Ribeiro *et al.* (2017) [7], thereby enhancing the reliability of the findings.

In contrast to normal pregnancies, cats with compromised pregnancies exhibited significantly higher CTUP values during the 8th week of gestation. The marked increase in uteroplacental thickness observed in compromised pregnancies suggests the presence of placental or uterine alterations associated with abnormal gestation. Here, the CTUP obtained in compromised pregnancy was above the upper limit suggested by Ribeiro *et al.* (2017) [7]. Similar observations were reported in other species, where increased CTUP was linked with pregnancy disorders. In bitches, CTUP values exceeding the normal range were associated with threatened abortion (Gaikwad *et al.*, 2017) [1], while in mares, increased CTUP was widely recognized as a sensitive indicator of placentitis and impending pregnancy loss (Troedsson *et al.*, 1997; Bucca *et al.*, 2005; Morris *et al.*, 2007; Hendriks *et al.*, 2009) [4, 2, 5, 6]. In bitches, Lopate (2008) [8] reported that placental thickness might increase following placental separation, and such changes are often associated with poor foetal prognosis. Alterations in placental perfusion can lead to oedematous changes and abnormal thickening of the placenta, which may be detected ultrasonographically and are indicative of placentitis. The findings of the present study suggest that CTUP may have similar diagnostic relevance in feline gestation, particularly for identifying pregnancies at risk. Overall, the results indicate that CTUP is a reliable indicator of healthy placental development in cats and may also serve as a valuable marker for detecting pregnancy compromise. The significant increase in CTUP observed in compromised pregnancies highlights its potential role in early identification of abnormal uteroplacental changes. However, further studies involving larger sample sizes and correlation with pregnancy outcomes are warranted to establish definitive reference values and to strengthen the clinical applicability of CTUP in feline reproductive practice.

Conclusion

The combined thickness of the uterus and placenta increases progressively with advancing gestation in normal feline pregnancies. Significantly elevated CTUP values observed in compromised pregnancies highlight its potential as a valuable

ultrasonographic indicator for identifying pregnancies at risk. CTUP measurement may therefore serve as a useful tool in the early detection and clinical management of abnormal feline pregnancies.

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Conflict of interest

The authors declare that they have no conflict of interest.

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