

Ovarian cysts (persistent follicles) and ultrasonographic texture of uterus in a nulliparous and a primiparous goats

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Abstract

The genesis, evolving and spontaneous regression of a single luteinised ovarian cyst in a nulliparous goat and the ultrasonographic characterisation of a follicular cyst in a primiparous goat were described, after oestrus induction with cloprostenol or male effect with progestagen treatment, respectively. Daily ovarian and uterine transrectal ultrasonography scanning was performed in both animals. After induced oestrus, sexual behaviour and mount acceptance were observed only in the nulliparous goat, and the preovulatory LH peak and ovulation were not detected in both females. In nulliparous goat, the luteinisation of a persistent follicle was observed by ultrasonography and the plasma progesterone (P4) levels increased from 0.2 ng/ml to 2.5 ng/ml. The ovarian cyst reached 20 mm in diameter, 16 days after induced oestrus. On 19th day, a natural oestrus with LH peak and ovulation was observed. Corpora lutea was visualized in presence of cyst that decrease at 5 mm on 10th day of the second oestrous cycle with plasma P4 levels reaching 9.0 ng/ml. In the primiparous goat, the follicular cyst was observed contemporary to a corpora lutea and plasma P4 levels of 5.3 ng/ml. Heterogeneous ultrasonographic texture of uterine horns was observed in presence of both cysts, showing an influence of those structures on the uterus. Also, the occurrence and spontaneous recovery of a luteinised ovarian cyst associated with low (subnormal) plasma P4 levels in a young cyclic goat was observed.

Introduction

The ovarian anovulatory conditions, including the cystic ovarian disease, are well known, from some decades ago, in cows (Wiltbank et al., 2002). Usually, there is a contemporary absence of corpora lutea (CL) and the spontaneous recover of these conditions could happen (Gaverick, 1997).

One of the main reasons to justify the occurrence of this pathology could be related to a decrease in the hypothalamic sensibility to the oestradiol positive feedback. This hypothalamic insensibility causes an abnormal decrease or

absence of the hormonal cascade that is necessary for the preovulatory luteinising hormone (LH) peak and, consequently, a continuous growth of the dominant follicle without ovulation is possible, resulting in a cyst of larger dimensions, luteinised or not (Wiltbank et al., 2002).

In goats, the ovarian cysts were also a cause of infertility and were observed mainly in aged goats (Simões et al., 2006). A goat had a cystic ovary when, at least, one follicle greater than 10 mm persists 10 or more consecutive days, with no CL (Medan et al., 2004). In the last years, the increasing use of transrectal 7.5 mHZ probes, has improving the *in vivo* diagnosis of ovarian cysts in small ruminants.

Apparently, in goats with ovarian cysts, the normal ovarian follicular pattern is changed (Gonzalez de Bulnes et al., 1999) and nonresponsive induction of follicular ovarian cysts after oestradiol and progesterone (P4) treatment was observed (Tanaka et al., 2007) suggesting important differences between goats and cows.

Persistent follicles can occurs after oestrus induction (Gonzalez de Bulnes et al., 1999), but at our knowledge, the complete lifespan of luteinised ovarian cyst including hormonal data (P4 and preovulatory LH peak) and ultrasonographic characterisation of the uterus were not reported in goats.

In the present work we describe the surge of one luteinised and one follicular ovarian cyst from two goats after oestrus induction, in breeding season and out-of-season, respectively.

Material and methods

The oestrus of a nulliparous Serrana goat, 20 months old and weighting 26 Kg, was induced with two intramuscular injections of 50 µg of cloprostenol (Estrumate[®], Schering-Plough II, Germany) given 10 days apart, in September/October (breeding season). The goat was observed during the two following natural oestrous cycles, at the experimental farm of University, located at latitude 41°19' N and altitude 479 m.

Blood samples were collected every 4 h during the first 24 h after onset of each oestrus (day 0), detected by a vasectomised buck, in order to identify the timing of LH preovulatory surge through plasma LH radioimmunoassay (Pelletier et al., 1968). The sensitivity and inter-assay coefficient of variation of the method were 0.2 ng/ml and 13.7%, respectively.

Both ovaries and uterus were daily scanned with an ultrasonographic device (Aloka[®] 500 SSD, Japan with a 7.5 mHz prostatic human probe, model UST-660-7.5). Ovulation was identified when a large follicle (5 to 9 mm of diameter) disappears between ultrasonographic examinations and confirmed by

subsequent presence of corpora lutea, as described on another side (Simões et al., 2007).

Additionally, blood samples were collected from September 1st to November 26th, twice a week, for plasma P4 analyses by radioimmunoassay (Kubasik et al., 1984). The sensitivity and coefficient of variation of the method were 0.02 ng/ml and 11.5%, respectively.

Another anoestrus primiparous Serrana goat, 20 months old and weighting 40 Kg, was observed during the non-breeding season. The oestrus/ovulation was induced, on May 4th, using the exposition to a sexual active buck (male effect) after a priming progestagen treatment with a intravaginal sponge impregnated with 45 mg of fluorogestone acetate (Chronogest[®], Intervet, Holland) during 6 days. Oestrus behaviour detection, plasma LH sampling were performed, each 4 h, during 3 days after sponge removal/male introduction. Ovarian and uterine structures were daily scanned like described above. In this case, the LH was analysed by Enzyme-linked immunosorbent assay method (Pellicer-Rubio et al., 2007). Plasma P4 analyses were performed from February 21st to May 26th, like previously described.

Results and discussion

In nulliparous goat, sexual behaviour and mount acceptance were observed in the three oestrus periods. The first and second inter-oestrus intervals, after the induced oestrus, had a length of 19 and 20 days, respectively.

At the induced oestrus, neither preovulatory LH peak (plasma LH levels varied from 0.7 to 1.5 ng/ml) nor ovulation were detected. During the first inter-oestrus interval no CL was found, but a typical ultrasonographic image of luteinised tissue, characterized by a well-defined thickness of the cyst border, was first observed on day 8 after the onset of oestrus. This anovulatory persistent follicle was daily observed in the right ovary and increased to 20 mm of diameter on day 16 (Fig. 1) after the induced oestrus.

Plasma P4 levels were low during 4 days after the onset of oestrus (0.2 ng/ml), increased to 1.6 ng/ml the 8th day of the cycle and reached a maximum of 2.5 ng/ml the 11th day.

One day before the onset of the first natural oestrus, the echo-texture of the cyst luteal tissue becomes more heterogenic echo-texture.

A preovulatory LH peak followed by one ovulation in the following day was observed on each of the two subsequent natural oestrus. A maximum LH value of 109.2 ng/ml and 31.6 ng/ml was found in the first and second natural oestrus, respectively.

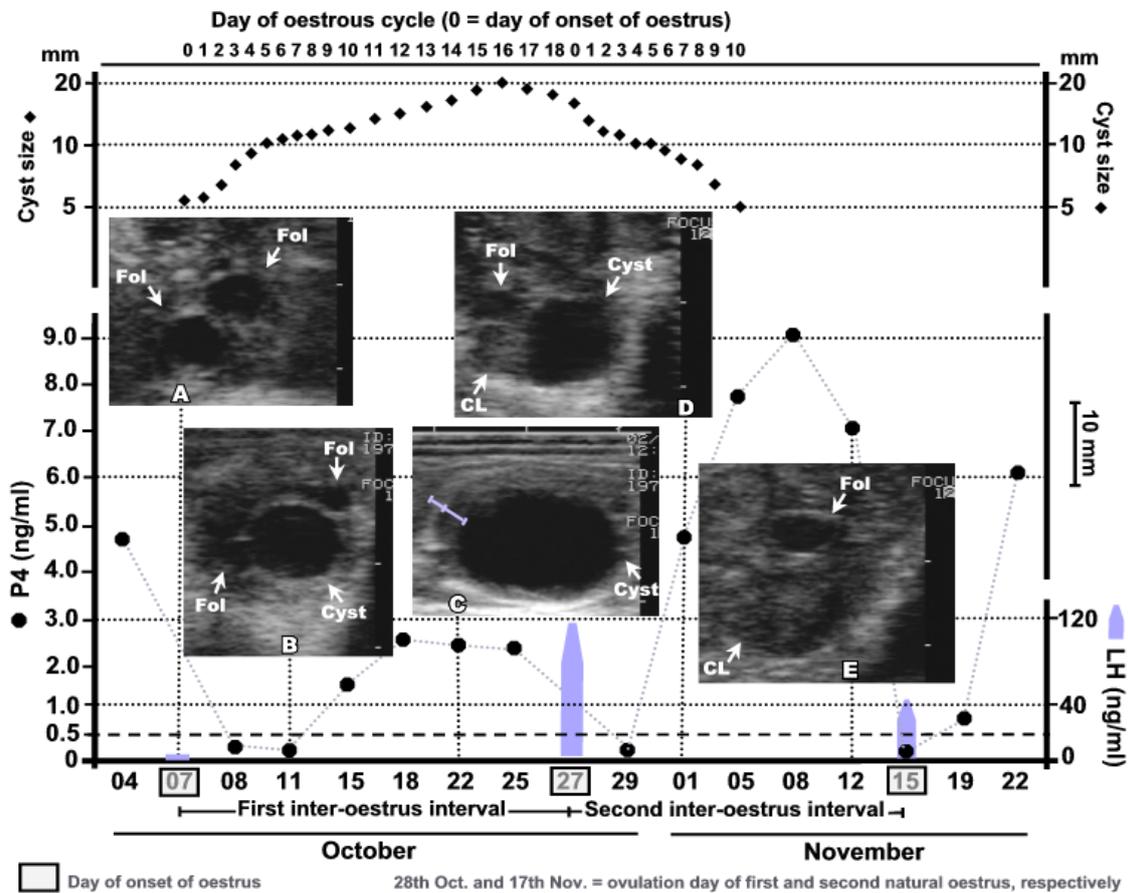


Fig. 1: Evolution of the luteinised cyst during two consecutive oestrous cycles. Two follicles (Fol) larger than 5 mm of diameter were observed (A) at the induced oestrus. One of them persisted and increased in size to > 10 mm (B) and a well-defined thick border was observed with a more hypoechogenic granular echotexture than the ovarian stroma (C). Regression of the other follicle was observed through 3 days. Five days after the first natural oestrus, a solid corpora lutea (CL) was also observed in the same ovary (D). Three days before the second natural oestrus, a follicular wave with a dominant follicle was observed in right ovary (E), but the onset of ovulatory wave occurred in the contralateral ovary. (Lateral bars of sonograms represent 10 mm).

At the 3rd day of the second cycle, a CL was first visualized in the right ovary, while the size of cyst gradually decreases from 10 mm diameter on the 4th day to 5 mm on 10th day and disappeared in the following days. In the 10th day, plasma P4 level reached a maximum of 9.0 ng/ml.

In the primiparous goat, oestrus behaviour and preovulatory LH peak were not observed, but ovulation was detected 4 days after sponge removal.

A CL was observed, adjacent to the persistent follicle in right ovary. Plasma P4 levels increased from < 0.5 to 1.6 ng/ml, 5 days after ovulation.

On 10th day after ovulation, the persistent follicle remained non-luteinised and reached 15 mm in diameter (Fig. 2). It decreased afterwards, to disappear just before the following oestrus.



Fig. 2: A persistent non-luteinised follicle (cyst) with 15 mm diameter in a primiparous goat, 10 days after ovulation. A corpora lutea (CL) was also observed in same sonogram. (Lateral bars of sonograms represent 10 mm).

On 19th day, plasma P4 levels decreased from 5.3 to 0.1 ng/ml, indicating the natural luteolysis of CL.

In both cases, an abnormally heterogeneous texture of uterine horns was observed, by ultrasound examination, in presence of the cysts (Fig. 3), but no significant intraluminal fluid was detected.

After the period of observation, goats were mated by a buck and become pregnant.

The lack of preovulatory LH surge until 24 h after the onset of induced oestrus was the potential cause of the ovulatory failure in nulliparous goat. Neither ovulation nor CL was found by ultrasonography in the following days. However, the persistent follicle was apparently responsive to LH, producing luteinization of its wall, contrary to the observed, by other authors, in a 12 years old goat (Kawate et al., 2000).

A persistent follicle after an incomplete oestrus behaviour was also reported in a nulliparous Saanen goat (de Castro et al., 1999), but together with a high inter-oestrus interval. However, 6 days after the incomplete oestrus behaviour, a silent ovulation and luteinisation of the persistent follicle was observed in this Saanen goat, followed by an inter-ovulation interval of 20 days of length.

The characteristic luteal tissue we observed surrounding the cyst in our goat was similar to that one found in natural luteal cysts of cows (Farin et al., 1990) or in cysts developed after GnRH treatment in goats (Medan et al., 2004).

The luteinised follicles of goats can be confounded with a fluid-filled CL, when a few ultrasound examinations were performed. However, the cavity size and evolution of those CL throughout the oestrous cycle are different from the luteinised follicles. Another study showed that CL was firstly visualized 3 days after the ovulation (Simões et al., 2007) and its cavity, if present, had 5.5 ± 2.3 mm of diameter with a decreasing size through the oestrous cycle (3.5 ± 2.2 mm on day 14) and a having a quick structural regression after the natural luteolysis.

In the first described case, the maximum size of the luteinised cyst (20.0 mm) was observed on day 16th of the oestrous cycle, which is in agreement with size of ovarian cysts (20.7 ± 2.8 mm) observed at day 14 after oestrus in non-lactating Murciana-Granadina goats (Gonzalez de Bulnes et al., 1999). Also, maximum plasma P4 level (2.5 ng/ml on day 11), during this first oestrous cycle with no CL observed, was low (subnormal) when compared either with the maximum value reached in the second oestrous cycle (9.0 ng/ml on day 10) or with the mean values (9.3 ± 1.8 ng/ml) observed in Serrana goats (Simões et al., 2007). However, similar plasma P4 levels (1.57 ± 0.2 ng/ml) were observed in cows with luteinised cysts (Farin et al., 1990) and follicular cysts (Silvia et al., 2002). These low plasma P4 levels were presumably due to the small quantity of luteinised tissue surrounding the ovarian cysts.

The alteration of luteal tissue of the cyst, observed one day before the first natural oestrus, was presumably due to the endogenous release of $\text{PGF}_{2\alpha}$, which stimulates ovulation and cyst regression.

The second observed case showed that the occurrence of ovulation and persistent non-luteinised follicle after induced oestrus are also possible in goats with a normal length oestrous cycle.

The heterogeneous texture of uterine horns, in both goats was probably due to the edema of the uterine wall, produced by the effect of estradiol from the ovarian cysts. The more homogeneous texture observed during the normal diestrous phase of the second oestrous cycle, in the nulliparous goats, is in agreement to the observed in cows (Bonafos et al., 1995).

Conclusion

Two ovarian cysts were reported in goats during the breeding and nonbreeding seasons. The presence of a luteinised ovarian cyst was associated with subnormal levels of plasma P4.

The texture of uterine horns appears heterogeneous in presence of ovarian cysts, when observed by ultrasound scanning. More studies seem to be necessary in order to evaluate the frequency of this phenomenon and its impact on the fertility of goats.

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