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Reproductive performance of dairy cows with luteal or follicular ovarian cysts after treatment with buserelin

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ABSTRACT

In dairy farm management economic losses resulting from cystic ovarian degeneration are well known. In spite of this, neither the definition nor the aetiopathology of ovarian cysts are clear and agreed upon. Also the usual classification in luteal and follicular cysts, requiring ultrasound examination together with assessment of P4 to be accurate, is not very helpful in field conditions. Consequently a single treatment is often provided for both types of cysts, and since the 1970s treatments with GnRH and its analogues have been considered very useful. Nevertheless differences in recovery rates after GnRH treatment in animals with either luteal or follicular cysts are reported. Thus, the aim of this study was to evaluate recovery rate, recovery time and conception rate after treatment with buserelin (GnRH-analogue) in cows with ovarian luteal or follicular cysts. In a 5 years period, 150 cows with cysts out of a total of 990 animals, were detected and treated intravenously between 45 and 60 days PP with 20 μg buserelin. No statistically significant differences were found in recovery rates and in conception rates between the two types of cysts. Comparison of recovery times showed significantly shorter recovery for cows with luteal cysts. The results emphasise the usefulness of GnRH to treat ovarian cysts regardless of their type, in relation to both recovery and conception rates. Intervals from treatment to resumption of ovarian activity were affected by the characteristics of ovarian cysts, with a faster recovery for the luteal type.

1. Introduction

The severe economic influence of ovarian cysts on the dairy industry is well-known, since losses caused by prolonged calving intervals and increased culling rates must be added to the direct costs of medical treatment.

During the last few years, the definition of ovarian cysts has been frequently revised. Silvia et al. (2002) defined them as follicle-like structures, with a minimum diameter of 17 mm, persisting for more than 6 days in the absence of a corpus luteum and clearly interfering with normal ovarian cyclicity. Wiltbank et al. (2002) defined them as follicular structures of 20 mm or more in diameter, persisting for at least 7 days in the absence of a corpus luteum. More recently, ovarian cysts have been defined as follicles with a diameter of at least 20 mm, present on one or both ovaries in the absence of any active luteal tissue and which clearly interfere with normal ovarian cyclicity (Vanholder et al., 2006).

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Despite many years of research on this subject, a commonly accepted definition is still lacking, probably due to cyst heterogeneity (type, time of occurrence, clinical signs).

The statement that a single follicle persists, for example, may not always be exact when we recall that, sometimes after a time of persistence, a specific cystic follicle may spontaneously regress (Kesler and Garverick, 1982; Day, 1991) and be replaced by other cysts (Cook et al., 1990; Savio et al., 1990); it is probably more correct to state that the anovulatory condition persists (Peter, 2004). Spontaneously regressing anovulatory follicles are frequently found in the early postpartum, when critical hormonal changes are responsible for resumed regular ovarian cyclicity. Considering the high percentage of spontaneous regression (Day, 1991; Kesler and Garverick, 1982), the detection of anovulatory follicles in the first weeks after calving should not be considered as an ovarian impairment. From a practical point of view, an ovarian dysfunction may be suspected when anovulatory follicles are detected not earlier than 7 weeks after calving, when reproductive functions are thought to be restored (Gier and Marion, 1968; Sheldon and Dobson, 2004).

The exact pathogenesis of cystic ovarian degeneration (COD) in dairy cows is still not completely understood, and it is generally accepted that the etiology is multifactorial, in which genetic, phenotypic and environmental factors are involved (Vanholder et al., 2006). The most widely accepted hypothesis is based on neuro-endocrinological dysfunction of the hypothalamic-pituitary-gonadal axis (Kesler and Garverick, 1982; Liptrap and McNally, 1976).

As regards the role of progesterone (P4) levels in cyst formation, Hatler et al. (2003) found that 66% of cows with follicular cysts had plasma P4 concentrations which were intermediate (0.1–0.93 ng/ml) at the time of cyst detection. In another study, Vanholder et al. (2005) found that, at the time of formation, only a minority of cysts (25%) were associated with suprabasal P4 levels (0.3–2 ng/ml) and that these concentrations are able to block the LH surge, inhibiting ovulation, but differences in the protocols make the two experiments difficult to compare. Moreover, a recent study (Probo et al., 2011) found no evident biological changes in P4 during the cystic condition, with plasma P4 concentrations always ranging from 0.3 to 1.2 ng/ml.

Plasma P4 levels have been demonstrated to be positively correlated with cyst thickness (Douthwaite and Dobson, 2000) so that measurement of P4 concentrations can be used to determine cyst type. In any case, accurate classification and diagnosis of cyst type requires ultrasound examination together with assessment of P4, since each examination alone frequently leads to ambiguous results (Dobson et al., 1977; Hanzen et al., 2000). However, milk or plasma P4 tests are not extensively available and, as it is often difficult to differentiate luteal from follicular cysts in farm conditions (Lopez-Gatius and Lopez-Bejar, 2002), a single treatment is often provided for both types. The possibility to diagnose luteal cysts would allow to treat them with PGF2α shortening the recovery time, while using PGF2α on follicular cysts would result useless. Since the 1970s, hCG and GnRH analogues have been used to treat ovarian cysts, and both appear to be equally effective as regards treatment response and fertility (Peter, 2004). Between the two, the use of GnRH and its analogues has been considered as very interesting, due to its satisfactory success rate, irrespective of type of cyst, absence of antigenic effects, and low pharmaceutical cost (Carruthers, 1986; Ngategize et al., 1987). In a study employing various doses of GnRH, Bierschwal et al. (1975) found a recovery rate of 64–82%, a mean time from treatment to oestrus of 22.2–22.8 days, and a conception rate of 72–87%; similar results were also found by Ijaz et al. (1987), with 65–80% of cows re-establishing ovarian cyclicity after GnRH treatment. Nevertheless, poor or no response by luteal cysts to GnRH has also been previously reported (Dobson et al., 1977; Sprecher et al., 1990), and opinions vary among bovine practitioners regarding differing recovery rates after GnRH treatment in animals with luteal or follicular cysts. Thus, the aim of this study was to evaluate recovery rate, recovery time and conception rate after treatment with buserelin in cows with ovarian luteal or follicular cysts.

2. Materials and methods

2.1. Farms, animals and treatments

The study took place over a 5-year-period in four herds (200–300 cows each) located in northern Italy (Lat 9° 55′ N; Long 45° 52′ E), significant climatic variables of the area are reported in Table 1. The herds were characterised by mean annual milk production of 8700 kg per cow (3.8% fat and 3.5% proteins). The diet was formulated to provide 23 kg/day, 16.0% crude protein, 1.90 Mcal/kg NEL (Net Energy of Lactation), 31.4% NDF (Neutral Detergent Fibre), 40.5% NSC (Non-Structural Carbohydrates) and 6.1% crude fat.

During postpartum (PP) monitoring, starting from the 4th week PP, a single practitioner examined by rectal palpation once a week the genital tracts of 990 Friesian cows, together with an ultrasound examination (real-time linear array, 7.5 MHz rectal probe, Esaote Pie Medical, Florence, Italy) for better evaluation of the morphology and evolution of ovarian structures.

Only cows bearing follicular structures with diameter larger than 20 mm, in the absence of any corpus luteum and persisting for at least 7 days, were considered as affected by ovarian cysts.

The ultrasound examination was combined with assessment of P4 plasma values to identify cyst type. A plasma progesterone cut-off of 1 ng/ml was used. Cysts with a thicker wall (≤3 mm), a visible echogenic rim or echogenic spots, and a P4 concentration ≥1 ng/ml, were considered as luteal (group A); cysts with a thin wall (≤3 mm), a uniformly anechogenic fluid and a P4 concentration <1 ng/ml were considered as follicular (group B) (Vanholder et al., 2006).

At confirmed diagnosis, all cows with ovarian cysts were then treated, one time, intravenously between 45 and 60 days PP with 20 μg buserelin (GnRH-analogue).

After treatment, animals were clinically checked twice a day to detect oestrus. Recovery was identified as the presence of normal oestrus, without any relapse of cysts, within 30 days of treatment. Only cows in oestrus, within 30 days