Abstract
Vaginoscopy has been successfully used in canines as a tool to identify the various stages of oestrous cycle as well as to predict the optimum time for breeding in order to maximize fertility. Visualisation of the vaginal epithelium by vaginoscopic examination during various stages of cabergoline-induced oestrus in 8 female dogs, which were previously in anoestrus, revealed progressive changes similar to those of naturally occurring oestrus. From the results of the present study, it could be inferred that vaginoscopy could be used as a tool for the identification of various stages of cabergoline-induced oestrus as well as for the prediction of the optimum time for breeding to maximize fertility in induced oestrus.

Key words: Cabergoline, Canine, Vaginoscopy

Introduction
One of the important components of successful reproduction in canines is the breeding management. Domestic bitches are non-seasonally monoestrous and as a result of this unique reproductive physiology, they exhibit heat only once or twice in a year. The length of oestrous cycle in them is considerably longer than that in most other domestic species and exceptional in that there is an obligatory anoestrus following termination of the luteal phase\(^3\).

The squamous epithelial lining of the vagina of bitch which is normally only a few layers thick responds to endogenous oestrogen by increasing its thickness to 20 to 40 layers in order to protect from injuries during copulation. Hence, exfoliative vaginal cytology could be used as a routine technique to evaluate the status of the vaginal epithelium during various stages of the oestrous cycle\(^11\). Even though, it could be used as a routine technique to evaluate the status of the vaginal epithelium during normal and induced oestrus in female dogs, the major limitation of this technique is that it is not exact enough to determine the onset of ovulation or the optimal time of breeding\(^3\).
VAGINOSCOPY IN ANOESTROUS DOGS

Vaginoscopy is a more accurate diagnostic breeding management tool in bitches than vaginal cytology, one major advantage being easiness to perform in an awake, non-tranquilized, standing bitch. Proctoscopes or endoscopes, either flexible or rigid, may be used for the visualization of the vaginal epithelium. A number of authors have recommended vaginoscopy as a tool to identify the various stages of oestrous cycle in bitches. Under the influence of oestrogen, the vaginal folds become swollen, moist, and pink and as a bitch progresses through prooestrus and into oestrus, these folds begin to lose their swollen appearance and become wrinkled. When the bitch is in full oestrus, the vaginal folds have pronounced wrinkles with well defined edges. Based on the appearance of these wrinkles, a timed breeding schedule can be prepared in order to maximise chances of conception.

As far as therapeutic management of anoestrus in bitches is concerned, a number of protocols for the induction of fertile oestrus in bitches with varying rates of success are available in the literature. From among them, induction protocol using the anti-prolactin drug cabergoline seems to be the recent one. As there is paucity of information on the details of vaginoscopy during various stages of cabergoline-induced oestrus in anoestrous bitches, the present study was undertaken to record the sequential changes happening in the vaginal epithelium during various stages of cabergoline-induced oestrus in anoestrous bitches.

Materials and Methods

Female dogs of different breeds with the history of anoestrus presented at the Gynaecology unit of University Veterinary Hospital, Kokkalai, Thrissur, Kerala formed the material for the present study. Exfoliative vaginal cytology (EVC) and estimation of serum progesterone level were undertaken to confirm anoestrus. From among the bitches confirmed as in anoestrus, 10 were selected at random and subjected to vaginoscopy to visualize the pattern of vaginal mucosa. Vaginoscopic examination in all the bitches was performed after physically restraining them. Subsequently, they were subjected to oestrus induction using cabergoline (5 µg/kg. body weight, orally once daily for 14 days consecutively). All the animals subjected to oestrus induction protocol were monitored closely for the onset of proestrual bleeding. Bitches which responded to the treatment by evidencing proestrual bleeding were further subjected to EVC to determine the stage of oestrus and subsequently vaginoscopy to monitor the progressive changes in the pattern of vaginal mucosa during the various stages of proestrus, oestrus and metoestrus/dioestrus.

RESULTS AND DISCUSSION

Exfoliative vaginal cytology of anoestrous bitches selected for the present study revealed parabasal and intermediate cells as the preponderant types. The mean serum progesterone level among them was found to be 0.59 ± 0.04 ng/ml, confirming the anoestrous status.

Out of the 10 anoestrous bitches subjected to induction of oestrus using cabergoline, 8 (80%) responded to the treatment by exhibiting proestrual bleeding. Exfoliative vaginal cytology findings during anoestrus and various stages of induced oestrus were comparable with the earlier reports.
VAGINOSCOPY IN ANOESTROUS DOGS

On endoscopy, the vaginal mucosa during anoestrus was found to be relatively simple and featureless (Fig. 1. A).

Fig. 1. Endoscopic appearance of vaginal mucosa during anoestrus and various stages of cabergoline-induced oestrus in bitches

It appeared to be swollen, moist and pink during the different stages of The endoscopic appearance of vaginal mucosa during various stages of cabergoline-induced oestrus in the present study was found to be similar to that of natural oestrus as reported earlier\textsuperscript{3,5,12}. According to Feldman and Nelson\textsuperscript{3} and Hewitt and England\textsuperscript{5}, the decreasing oestrogen and increasing

progesterone concentrations associated with the last one to three days of proestrus caused oedema in the vaginal mucosa to subside and the luminal surface became progressively wrinkled and was referred to as crenulation. the induced proestrus (Fig. 1. B, C & D). Shrinkage with angulations could be noticed during early oestrus (Fig. 1. E), followed by a rounding out pattern during metoestrus/dioestrus (Fig. 1. F).

According to Wilson\textsuperscript{12}, the endoscopic appearance of the vagina could be divided into four clearly defined phases \textit{viz.} oedematous, shrinkage without angulations, shrinkage with angulations and rounding out. The initial phase of shrinkage without angulations occurred from around the time of the pre-ovulatory LH surge until ovulation. Development of angulations was associated with the period of ovulation and oocyte maturation. The rounding-out phase corresponded to the shift in cell types seen in vaginal smears indicating the onset of dioestrus. From the results of the present study, it could be inferred that vaginoscopy could be successfully used as a tool for the proper identification of various stages of cabergoline-induced oestrus as well as for the prediction of the optimum time for breeding to maximize fertility in induced oestrus in anoestrous bitches.

**Acknowledgements:** Thanks are due to Professor and Head, Veterinary College Hospital, Mannuthy and University Veterinary Hospital, Kokkalai for the facilities provided and the Dean, College of Veterinary and Animal Sciences, Mannuthy for granting permission to publish this paper.

**References**