Histological Evaluation of the Canine Decidual Reactions Induced by Intraluminal Injection of Olive Oil

Koichi NOMURA
Laboratory of Surgery, Department of Veterinary Science, College of Agriculture, University of Osaka Prefecture, 1-1 Gakuen-cho, Sakai, Osaka 593, Japan

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ABSTRACT. The present study deals with histological changes of the canine decidual reactions of the endometrium stimulated by intraluminal injection of olive oil with or without scratching injury using a wire. Olive oil caused conspicuous proliferation of the superficial endometrial glands. When olive oil injection was carried out after the scratching, cystic hyperplasia of basal glands as well as proliferation of superficial glands occurred. The results suggest that olive oil stimulates only proliferation of the superficial endometrial glands and the occlusion of the glandular orifices by some stimuli such as the traumatic injury would be needed to induce cystic hyperplasia of the basal glands.—KEY WORDS: canine, cystic endometrial hyperplasia, decidual reaction, olive oil, uterus


It is generally accepted that the dog belongs to the deciduata [1]. Decidual changes seen in normal implantation of the dog are characterized by the proliferation and dilatation of the uterine glands [2, 3]. In the rodents, on the other hand, it is well known that the decidua consisting of proliferating stromal cells can be induced by some artificial stimuli during pseudopregnancy [4, 6]. However, it is unclear if the dog has so-called decidual cells originated from endometrial stroma like the rodents. There have been few reports concerning the induction of canine deciduoma. Krainz [9] first reported cystic hyperplasia of the endometrial glands at the site of incision to insert glass balls. Hadley [7] accidentally noted cystic hyperplasia of the glands at the needle inserted site for biopsy. This cystic hyperplasia is very similar to early phase of canine placenta formation. At that time, however, they did not recognize such endometrial changes as deciduoma of the dog.

Recently the author [12] has reported that cystic hyperplasia of the uterine glands was caused by some of stimuli such as scratching of the endometrium with wire and insertion of a silk suture into the uterine cavity. They were almost the same methods as used for induction of deciduoma in rodents. From these results, the author has suggested that the cystic glandular hyperplasia could be termed deciduoma of the dog. These histological changes of the endometrium would be various according to stimuli given to the endometrium.

Thus, the present study is designed to clarify histological changes of the endometrium following olive oil injection into the uterine cavity with or without injury by wire scratching at the early term of gestation.

MATERIALS AND METHODS

Fifteen adult mongrel bitches from random sources, weighing 8 to 12 kg, were used in this experiment. In anestrus, each animal was anesthetized and laparotomized. The left oviduct and uterine horn near the bifurcation site were ligated with silk suture to prevent the nidation of fertilized ova. The right oviduct and uterine horn were untreated. Each bitch was monitored for estrous cycle by external signs and vaginal cytology [8]. During estrus, each bitch was allowed to copulate with a male dog daily. On the twelfth day of metestrus, the bitches were divided into three experimental groups consisting of 5 bitches each. Group 1 animals were injected with 0.5 ml of olive oil into the lumen of the left uterine horn using a sterile syringe with a 25G×5/8" gauge needle. Group 2 animals underwent scratching on the endometrium of the left horn at the opposite site of perimetal attaching by inserting a stainless steel Kirschner's wire (0.1 mm diameter) immediately before injection of olive oil. Group 3 animals received 0.5 ml of sterile physiological saline into the left lumen with the same gauge syringe and needle. All bitches were daily injected with antibiotics (aminophenylacetamido penicillin acid 10 mg/kg/day) until end of the experiment. All surgeries were performed by a standard aseptic technique.

On day 24 of metestrus, the bitches were ovariohysterectomized. The uterus was observed grossly and fixed in 10% neutral buffered formalin. Microscopical sections were made routinely and stained with hematoxylin and eosin (H E) or, if necessary, Periodic acid Shiiff (PAS) or Azan.

RESULTS

Gross findings: The endometrium of left uterine horn in both groups 1 and 2 was slightly hypertrophied and edematosus. A small amount of mucus contents were found in the lumen. Many wrinkles were seen on the endometrial surface of the left horn of group 1 animals. In group 2, small cysts were frequently found on the endometrial surface of injured region. The bitches in group 3 showed neither hypertrophy nor edema, but there
were many small constrictions on the outer surface showing a corkscrew like structure. The endometrium was wet and looked like velvet without luminal content. These findings were similar to the endometrial condition as seen in the normal diestrous uterus. Quail egg to pigeon egg-sized developing fetal tissues with normal appearance and size at early pregnancy were seen in the right horn of all the animals.

Microscopic findings: In group 1, luminal dilatation with contents and thinness of the uterine wall in the left horn could be seen histologically (Fig. 1). The degree of the dilatation of the uterus was not equal but differed with the portion taken. Especially in the regions where faced near the oviduct or uterine body, the dilatation was remarkable. Endometrial thickening due to superficial glandular proliferation was observed in dogs of group 1. Structure of

![Fig. 1. Histological picture of the left uterine endometrium. 12 days after olive oil injection (group 1). Olive oil remains in the lumen. Superficial endometrial glands were hyperplastic, H E. × 15.](image)

![Fig. 2. Higher magnification of Fig. 1. Superficial glands proliferate and form a net like structure. Hyperplasia of basal glands was not remarkable. H E. × 40.](image)
the superficial endometrium was like a net or tree branches (Fig. 1). The stroma was edematous in the superficial endometrium. Little or no glandular proliferation and dilatation were observed in the basal layer (Fig. 2).

In group 2, more prominent endometrial hyperplasia was seen, especially at the injured region (Fig. 3). The hyperplasia was characterized not only by proliferation of the superficial glands but also by dilatation of the basal glands. The superficial changes were almost the same as that of bitches in group 1, but the degree of the superficial proliferation was more slight. On the other hand, in the basal layer, the proliferation and dilatation of the glands were more marked in the form of cystic endometrial

Fig. 3. Microscopical picture of left uterine horn which received surgical trauma by scratching with wire before injection of the olive oil (group 2). Note thicker uterine wall and narrower lumen than those of group 1. In the injured region (arrow), the basal glandular hyperplasia as well as the superficial hyperplasia was very marked. On the other hand, in the intact region only the superficial hyperplasia was observed. H E. × 15.

Fig. 4. Higher magnification of Fig. 3, indicating papillary hyperplasia of the superficial endometrium and cystic glandular hyperplasia of the basal layer. H E. × 40.
hyperplasia which is often called “Swiss cheese endometrium” (Fig. 4).

In group 3, there were many tubular glands in the endometrium without dilatation, indicating nearly same appearance as in normal diestrous endometrium.

Bulges of the right uterine horns in each dog showed the histological characteristics of an early placentation. Fetal trophoblasts reached at middle of the compactant layer.

Corpora lutea were seen in the ovaries of all bitches. Histological features of corpora lutea were the same as those seen in normal diestrous bitches.

DISCUSSION

From these histological findings described above, olive oil could give the contact stimuli to the superficial layer, but not give any influences to the deeper layers. Since olive oil is a liquid agent, proliferation of the epithelium into the lumen is not disturbed. Olive oil might stay in the uterine lumen longer than saline and could give the endometrium a contact stimulus. However, olive oil may stimulate only the superficial endometrium and not affect the basal gland.

On the other hand, after scratching with stainless steel wire, olive oil injection induced not only proliferation of the superficial glands but also cystic endometrial hyperplasia in the basal layer. Moreover, these scratching damages would cause the occlusion of glandular orifices, then, the dilatation of the basal glands, and finally cystic glandular hyperplasia.

The injection of E. coli into canine uterine lumen also induced endometrial cystic hyperplasia especially in the basal layer [10, 11]. Strong inflammation may cause the occlusion of the orifices of the glands. Very recently we revealed that the insert of silk suture into the uterine lumen induced histological changes of the endometrium similar to these in placenta at the early gestation [13], such as hyperplastic functional layer and dilatation of the basal glands.

In the rodentia, the deciduoma induced by olive oil [5] is histologically shown to be hyperplasia of the stromal cells. The same histological features were also induced by some other stimuli such as endometrial scratching, insertion of threads and injection of physiological or unphysiological solutions [4, 6, 14].

From these evidences, the following hypothesis could be proposed: canine deciduoma consists of hyperplasia of the endometrial glands, while the rodential deciduoma is composed of the proliferated endometrial stromal cells. What factor cause the difference, is an interesting problem and is to be studied further.

REFERENCES