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A CASE OF GRANULOSA CELL TUMOR OF THE OVARY IN A NEWBORN CALF

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Granulosa cell tumor of the ovary is not rarely to be met in cattle, but rarely in young heifers, and no case has so far been reported in newborn calves.

The present report deals with a granulosa cell tumor which was observed in the left ovary of a newborn calf.

HISTORY

A 29 month, primiparous Holstein was delivered of a full term, female calf on 28 June 1963. The delivery required obstetrical intervention because of dystocia occasioned by extreme abdominal swelling in the calf. The calf, 45 kg, 80 cm high, 115 cm chest girth, and 120 cm crown-rump length, died within five minutes of delivery. Its abdomen was markedly distended and swollen with an edema extending to both hind legs. The dam had a history of an ovarian follicular cyst from which she had recovered prior to conception. She was artificially inseminated and there were no abnormal symptoms during pregnancy.

MACROSCOPIC FINDINGS

The left ovary was very large (15.5×14.0×7.5 cm), weighing 700 g. The ovary was ovoid, and well encapsulated. A rupture of 12 cm in length was noticed on the capsule. The surface of the capsule was generally smooth. With palpation, the organ was found to be coarsely lobulated with partial fluctuation. Three large cysts about the size of a hen's egg and many smaller cysts were observed on the cut surface of the ovary. These cysts contained dark or red-brown serous fluid. The ovarian stroma was comparatively soft and was composed of vascular and fibrous tissues. The inner surface of the cyst walls had granular and papillary tissues extending into the cavity. There were scattered hemorrhagic areas.

The right ovary was small (1.0×0.4×0.2 cm), containing neither follicle nor corpus luteum. Adhesions were noted between the fimbria of the left oviduct and the ovary on the same side. The right oviduct, uterus, cervix and vagina were fairly normal. There were no remarkable organic changes, except in the abdominal cavity, where there was a large amount (about 1.8 l) of turbid, bloody ascitic fluid and many clots.

MICROSCOPIC FINDINGS

In the histological sections prepared from the left ovary and stained with hematoxylin-

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eosin there were many irregular, follicular-appearing cysts. The cysts were striped with several layers of spindle-shaped cells radially disposed towards the center of the cavity. Inside of the spindle-shaped cell layers, there were one to three layers of larger cells of various shapes. Some of these cells were desquamated and/or mitotic. Both cell types somewhat resembled those of the zona granulosa in the normal follicle. Most of the capillaries were congested and the cell layers were slightly hemorrhagic. Some of the small cysts were blood-filled. In other parts of the ovary, there were many small structures consisting mainly of theca folliculi cells and connective tissues with an abundant supply of congested capillaries. The theca cells were very large, irregular, and clearly stained, closely resembling the cells of the normal corpus luteum. The supporting connective tissue also showed the branch-like arrangement seen in the normal corpus luteum. A large amount of mucous fluid had infiltrated into the connective tissues in some parts of the stroma, while in other parts, the congested capillaries presented a certain hemangiomatic appearance.

From these histological findings, this ovary was diagnosed as having granulosa cell tumor, accompanied in part by theca cell tumor and luteoma.

The cortex of the right ovary contained many primary follicles. There was no corpus luteum. No endometrial gland was observed in the uterus. The histological examination of the oviduct, cervix, vagina, thymus, heart, lung, liver, spleen and kidney revealed no abnormal changes.

DISCUSSION

Little information is available on neoplastic diseases of bovine genital organs, especially on the morbidity of granulosa cell tumor in cattle. LAGERLÖF and BOYD reported detection of only 3 cases of granulosa cell tumor in 6,286 bovine genital organs which they had examined. SAEKI also described only one case of this tumor in a survey of the literature on neoplasms in domestic animals in Japan from 1900 to 1960. KANAGAWA, one of the present authors, reported only one case in 192 slaughtered cattle. ANDERSON and DAVIS reported 6 cases of granulosa cell tumor among 42 neoplasms affecting bovine internal genital organs. The incidence of this tumor seems to be fairly high among the various bovine ovarian neoplasms. MCENTEE and ZEPP have reported that 17 of 18 bovine ovarian tumors were granulosa cell tumors. Likewise, MONIUX et al. described 6 granulosa cell tumors in 7 ovarian neoplasms.

It is generally accepted that neoplastic diseases in humans and domestic animals tend to increase with age. In humans, it is considered that approximately 50 percent of ovarian granulosa cell tumors occur in women in the post-climacteric.¹¹⁾ This seems also to be true in the bovine. In this connection, it is noteworthy that YAMAUCHI has reported 3 cases of this tumor in Japanese Black Cattle of 17, 21 and 28 years and that KANAGAWA's case, mentioned above, was observed in a 13-year-old Holstein cow and FINCHER's case, cited by ROBERTS, in a 14-year-old Angus cow.

In contrast, only a few granulosa cell tumors have been reported in heifers or calves. HARVEY et al. have described 4 granulosa cell tumors in calves and WILSON one case in a 6-month-old Holstein calf. ROBERTS, and LANGHAM and CLARK have found this tumor in a 15-month-old Guernsey heifer and a 2-year-old Holstein heifer, respectively. As far as the present authors know, no granulosa cell tumor has so far been detected in newborn calves.

Little is known about the clinical symptoms of granulosa cell tumors. This may be partly because neoplastic diseases in bovines are generally detected only in animals to be slaughtered. The most prominent, but not constant, symptom of the tumor seems to be nymphomania. MCENTEE and ZEPP, stated that in 3 of 17 cases, the tumor produced typical symptoms of nymphomania, while 1 case developed mucometra as a result of estrual failure. LANGHAM and CLARK, KINGMAN and DAVIS, and ROBERTS pointed out that granulosa cell tumors could exert a remarkable feminizing hormonal influence leading to symptoms of nymphomania. ANDERSON and DAVIS insisted that differential diagnosis should be made by rectal examination, since cystic ovaries can also produce a similar syndrome.

Another important symptom of this tumor, especially in heifers, is marked mammary development, sometimes with milk secretion, as described by ROBERTS, WILSON and others. This symptom is, in general, associated with chronic nymphomania. Mammary development and a nymphomaniac syndrome are generally accepted as being manifestations of a high estrogenic hormone activity. In relation to this, ROBERTS attempted a biological assay of the cystic fluid of the tumor, but no appreciable estrogenic substance was detected. Unfortunately, in the present case, neither clinical symptoms nor the presence of estrogenic substances in the tumor could be examined, since the calf died immediately following delivery.

Is it possible that heredity is a factor? In this connection, it is interesting to note that, in 3 cases in Guernsey cows, MCENTEE and ZEPP reported closely related lines in two of the pedigrees, however, much still remains to be studied prior to any decisive conclusion.

Granulosa cell tumors have so far been reported to vary in size and weight. For example, MCENTEE and ZEPP reported variations in weight ranging from 11.9 g to 12.3 kg. The tumor can originate in either ovary, but it seldom occurs bilaterally. The same is reported to be the case in humans (about 10% are bilateral)¹¹. Metastasis of the tumor to the peritoneum, internal iliac, or mediastinal lymph nodes was described by ANDERSON and DAVIS. In the present case, no evidence of metastasis was detected in any organs, despite the presence of considerable ascites.

Many variations in the microscopic characteristics of the tumor have been

reported. MCENTEE and ZEPP have distinguished three fundamental microscopic forms; follicular, trabecular and diffuse. They have also stated that the tumor is primarily composed either of one form or of several forms mixed together in varying degrees. The present case is considered to belong to the latter, mixed form, with the exception of certain features such as the theca cell tumor and the luteoma.

SUMMARY

Granulosa cell tumor of the left ovary was detected in a newborn Holstein calf. Histologically, this tumor was found to be accompanied in part by theca cell tumor and luteoma.

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EXPLANATION OF PLATES

PLATE I.

- Fig. 1. Dorsal view of the internal sex organs (scale: cm)
LO: Left tumor ovary RO: Right ovary
LU: Left uterine horn RU: Right uterine horn
VA: Vagina
- Fig. 2. Cross section of the tumor ovary (scale: cm)
- Fig. 3. A part of the inner surface of the cyst wall. A number of zona granulosa cells are seen. $\times 100$
- Fig. 4. A part of a small cyst. Several layers of spindle-shaped cells are seen. $\times 250$

PLATE II.

- Fig. 5. Large cells in the inner part of the cyst wall. The arrow shows mitosis. $\times 1,000$
- Fig. 6. Many small cysts with follicular appearance. $\times 100$
- Fig. 7. Large cells with close resemblance to luteal cells. $\times 250$
- Fig. 8. Numerous primary follicles in the cortex of the right ovary. $\times 100$



