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A Pathological Study of Ovarian Abnormalities in Slaughtered Non-Pregnant Cows in Sulaimani Province

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Abstract

The current study was conducted to address the pathological conditions of ovaries of cows slaughtered at the abattoir in Sulaimani province, Kurdistan Region-Iraq. Among the 404 genitalia samples collected from the non-pregnant animals, 206 (51%) were found without gross pathological abnormalities (with cyclic activity) and the remaining 120(29.70%)samples were found with gross pathological abnormalities of ovaries. The ovaries exhibited the highest percentage of lesions 29.70%. Detected ovarian lesions included follicular cyst 10.89%, cystic corpus luteum 5.44%, mild ovariobursal adhesions 4.45 %, sever ovariobursal adhesion 0.25%, paraovarian cysts 3.22%, ovarian hypoplasia 1.98%, ovarian hemorrhage (hemorrhagic cystic corpus luteum) 1.48%, luteal cyst 1.24%, ovarian agenesis 0.50% and ovarian tumor (Gonadoblastoma) 0.25%. Histopathological examinations exhibited that the follicular cysts were lined by several layers of granulosa and theca cell, while the luteal cysts had follicular granulsa and the theca cells with marked luteinization of cytoplasm. Microscopically, the ovarian hypoplasia showed lack of ovarian follicles and oocytes, while the cavities of paraovarian cysts were lined by a single layer of cuboidal epithelial cells, and the hemorrhagic cyst showed scattered hemorrhagic spots close to the lumen and luteinized of granulosa and theca cells layers of cystic wall. Histopathologically, the ovarian gonadoblastoma (Dysgenentic gonadoma) was characterized by dual population of germ cell tumor and sex-cord stromal tumor and this observation has not been recorded in Iraq previously. It was concluded that ovarian abnormalities constitutes an percentage 0f 29.70%. And ovarian gonadoblastoma was firstly recorded in this study in Iraq.

Introduction

Farm animals are one of the fundamental pillars of the economy of Kurdistan region in general. Cow in particular as an economical unit from which people of Kurdistan get great benefit. Thus reproductive problems among cows have a direct influence on the nutritional needs of the people as well as on the economic status of the region *[1]*. Reproductive organ disorders are important cause of infertility and sterility among farm animals *[2]*. Hence the slaughterhouses have been used as the preferred sources for studying the pathological lesions of female reproductive tracts *[3]*. In various livestock farms, percentage of ovarian abnormalities can be different, depending on environment factors, nutritional deficiencies, diseases causing weight loss, various infectious agents, and climatic conditions *[4]*. Numerous abattoir surveys of bovine genitalia have been conducted to

investigate macroscopic and microscopic abnormalities *[5]*. In Iraq there are few grossly and microscopically studies which include the anatomical, physiological, and pathological abnormalities affecting cows and buffalos reproductive tracts through an abattoir survey *[6]*. Fathalla *et al*., 2000 *[7]*; Hatipoglu *et al*., 2002 *[8]*; Durgut *et al*., 2003 *[9]*; Ali, 2009 *[6]*; and Simenew *et al.* 2011*[10]*, recorded the incidence of ovarian abnormalities of bovine genital tract which were 10.5%, 5.92%, 23.84%, 4.5%, 3.81% respectively. The most important abnormalities that observed in the ovaries are follicular cyst, luteal cyst, cystic corpus luteum, paraovarain cyst, ovarobursal adhesion, ovarian tumor *[8]* and *[6]*. The present study was conducted to determine the microscopic and macroscopic lesions of ovarian abnormalities in non pregnant cows slaughtered at the abattoir of Sulaimani province, Kurdistan region- Iraq.

Materials and Methods

The study was conducted on 404 samples of non-pregnant cow's genitalia which were collected on two days of week from anew slaughterhouse in "Qaragol" district in Sulaimani province. The data collection was carried out from February to the end of September 2014. These samples were collected randomly from different breeds, the age of the animals was from 2- 5 years and no information regarding the identity and history of the animals were included in this study. The samples were transported in a cool box to laboratory of Veterinary Teaching Hospital at the College of Veterinary Medicine in the University of Sulaimani within three hours of the collection for gross pathological examination. The pregnant genitalia were excluded and all non-pregnant genitalia were examined visually for gross morphological or pathological abnormalities.

Each ovary of non-pregnant genitalia was carefully examined externally and internally for the presence of different types of gross pathological abnormalities like tumor, cysts, inflammatory conditions, hemorrhage and other visible changes; then the data were recorded in percentage as well as photographed. The size of the largest follicle and cysts on the ovary was measured using electronic Vernier caliper. Ovaries with follicles greater than 2.5 cm in diameter were considered cystic, based on the appearance the cysts were classified into follicular and luteinized cysts. Follicular cysts were more tenser, thin-walled follicles while luteinized cysts were presented as thick-walled follicles.

The ovarian bursa was examined carefully for the presence of adhesions. The severity of the adhesions ranged from the mild strands of connective tissues between the ovarian bursa and the ovary to severe adhesions were completely embedded in fibrous tissues. Tissue samples from affected part of ovaries (sections of approximately 1 cubic centimeter in length) are fixed in a plastic container that contains 10% buffered formalin for histopathological examination.

Results

Non- pregnant genitalia from 404 cows were examined; it was 51% (206 \ 404) genitalia without gross pathological abnormalities (with cyclic activity) while 49% (198 \ 404) of them with gross pathological lesions of ovaries and uterine tubes, it was found that 120 (29 %70) ovaries were affected as in different types of ovarian abnormalities of non-pregnant cows presented in (*Table*: 1).

Table 1: Gross-pathological abnormalities of ovaries in cow's genitalia in the Sulaimani province

Pathological abnormalities	R-side No.	L-side No.	Both side No.	Total No.	Percentage of ovarian abnormalities n= 120	Percentage to the total abnormalities n=198	Percentage % n= 404
Mild-ovariobursal adhesions	9	7	2	18	15.00	9.09	4.45
Sever- ovario bursal adhesion		1		1	0.83	0.51	0.25
Parovarian cysts	7	6		13	10.83	6.56	3.22
Follicular cysts	24	20		44	36.67	22.22	10.89
Luteal cysts	4	1		5	4.17	2.53	1.24
Cystic corpus luteum	13	8	1	22	18.33	11.11	5.44
Ovarian agenesis		2		2	1.67	1.00	0.50
Ovarian Hypoplasia	3	5		8	6.67	4.04	1.98
Ovarian hemorrhage (Hemorrhagic cystic corpus	3	1	2	6	5.00	3.03	1.48
Ovarian tumor (Gonadoblastoma)		1		1	0.83	0.51	0.25
Total	**64**	**51**	**5**	**120**	**100**	**60.60**	**29.70**

Discussion

The present abattoir study has provided useful information on the types and prevalence of gross pathological abnormalities of ovaries of cows in Sulaimani region. About 120 genitalia 29.70% showed one or more abnormalities as in (*Table*: 1).

The total percentage of ovarian abnormalities 29.70% from the total reproductive tracts is higher than the results of other studies by Fathalla *et al.*, 2000 *[7]*; Durgut *et al*., 2003 *[9]*; Ali, 2009 *[6]* and Simenew *et al*., 2011 *[10]*, which were 10.5%, 23.84%, 4.5%, 3.81% respectively, and lower than the observation mentioned by Kunbhar *et al*., 2003*[11]*, which was 49.2%.

This variation may be attributed to that the percentage of gross abnormalities and lesions of reproductive tracts appear to vary from country to country, from population of animal to another population of animal , from year to year and from breed to breed *[12]*, *[13]*, *[8]*, *[6]* as well as Robert, 1986 *[14]*, indicated these variations between

the percentage are due to many factors such as hereditary origin, high milk production, nutritional deficiency , inadequate energy intake, sample size, geographical variation and season.

The percentage of total of ovarian bursal adhesions (*Figure*: 1, 2, 3) reached 4.70 % as in (Table:1). The lesions ranged from slight connective tissue strand to sever extensive lesions and this is in agreement with *[15]*. The majority of the cases are found in the right ovary. The result was higher than the result of [16] and [10], which were 2.9%, 2.5% respectively, while lower than the result mentioned by Fathalla *et al*., 2000 [7] and Ali, 2009 *[6]*, which were 8%, 7.27%, in this study the most cases of adhesions associated with the other pathological conditions which are in agreement with *[17]* and *[7]*. Enucleating of cyst may also result in the formation of these adhesions. Localized abdominal infections such as omphalophlebitis and peritonitis are also suggested to cause this condition *[18]*.

Paraovarian cysts in the present study (*Figure*: 4) reached 3.22% from the total reproductive tracts, and the percentage is higher than the results reported by *[16]*, *[7]*, *[8]*, *[6]* and *[10]* which were 0.26%, 2%, 0.72%, 1.81%, 0.5% respectively and lower than the rate reported by Kunbhar *et al*., 2003 *[11]* which was 15.4%.

All paraovarian cysts are benign, with no negative effects on reproduction and fertility *[15]* and *[19]*. It is one of the congenital anomalies correlated to mesosalpinx and does not interfere or affect the uterine tube *[15]*.

On histopathological examination of paraovarian cysts in this study agreed with *[8]* which showed a single layer of tubal-type ciliated cuboidal epithelial cells resting on a thin layer of fibrous tissue (*Figure*:5).

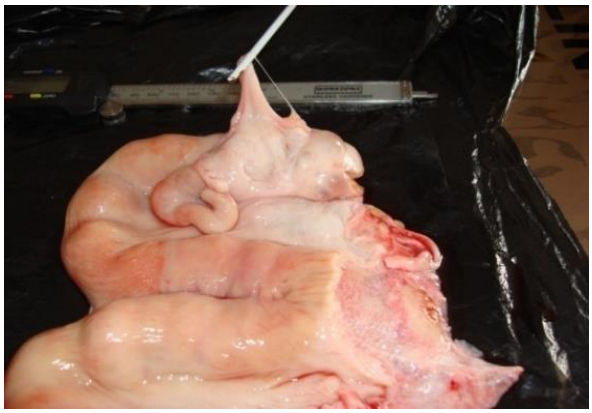

Figure- 1: Mild ovario- bursal adhesion.

Figure -2: Bilateral ovario-bursal adesion.

Figure -3: Complete ovario-bursal adhesion in the left ovary.

Figure- 4: Single para ovarian paramesonephric cyst side in the right side.

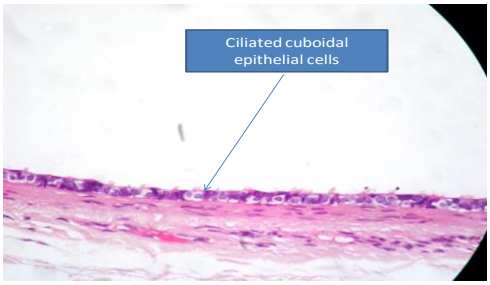

Figure -5: Shows a single layer of tubal-type ciliated cuboidal epithelial cells resting on a thin layer of fibrous tissue.

The total percentage of follicle cysts (*Figure*: 6) reached 10.89%, the rate of the percentage was lower than of *[12]* which was 14.9% and nearly resembled the result of *[11]* which was 10.8%. The prevalence in the present study is higher than that of other previous reports recorded by *[20]*, *[7]*, *[16]*, *[8]*, *[6]* and *[10]* which were 4.5%, 7%, 3.35%, 1.88%, 2.72% and 3.3% respectively. Variations in the percentage are the result of many factors such as breed, age, level of milk production, feeding, management and exercise *[18]*. Microscopical finding in this study demonstrated several layers of follicular granulosa and theca cells lining the cyst which gradually blend with normal ovarian stroma. The lumen contains an esinophilic proteinaceous secretion and lack of ovum, and this is in agreement with *[21]* and *[8]*, (*Figure*: 7).

Figure -6: Follicular cyst showing in the right side is thin -walled and contain clear fluid.

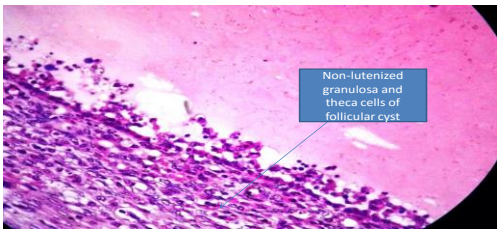

Figure 7: Follicular cyst of with several layers of follicular granulosa and theca cells.

Another type of cystic ovarian disease observed in this study is luteal cyst (*Figure*: 8). Its percentage reaches 1.24% the right side is more affected, which is thick- walled and lutenized and became opaque with fleshy like consistency. They represent anovulatory follicles, this rate of percentage was lower than the rate reported by *[9]* and *[11]* which were 10.7%, 7.7% respectively. In Iraq, it was higher than the result reported by *[3]* and *[6]* which were 0.2%, 0.76%, and was lower than the result observed by *[22]* which was 72.7%. Histopathological of luteal cyst (*Figure*: 9) showed follicular granulosa and theca cells with marked lutenization of cytoplasm, this is in agreement with *[21]* and *[7]*.

Figure -8: Luteal cyst in the right ovary, thick-walled and lutenized.

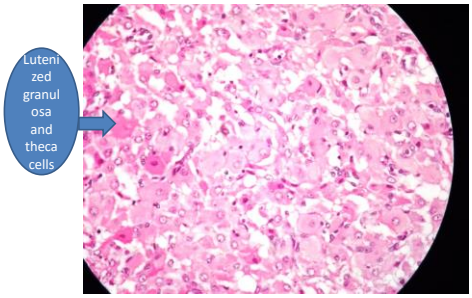

Figure- 9: Show follicular granulosa and theca cells with marked lutenization of cytoplasm.

The most common lesion in the ovary was cystic corpus luteum (*Figure*: 10) which reached 5.44%. This result is higher than previous results observed by *[7]* and *[8]*. The difference might be due to breed species variation and hormonal imbalance *[21]*. Because cystic corpora lutea are found in cows that are normally cycling or pregnant, they are considered to be a normal stage or variation of CL development *[23]*. Cystic corpora lutea arise as a consequence of premature closure of the ovulation site hence forming a central cavity *[24]*. They have no effects on the cow's fertility *[25]* and *[26]*. Cystic CL occurs spontaneously, when follicles become luteinized without ovulation *[27]*. Microscopic examination on this study (*Figure*: 11) shows the zone of a thin layer of fibrous tissue between luteal cells and the cystic cavity that is in agreement with *[8]* and *[25]*.

Figure- 10: Cystic corpus luteum. The diameter of cavity is 1.7 cm.

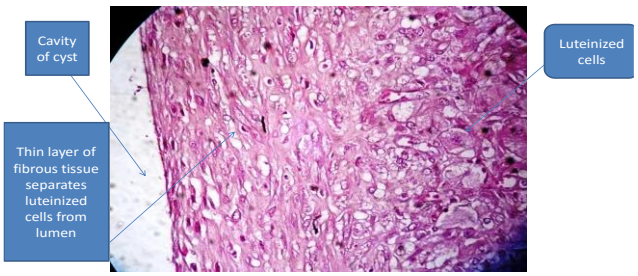

Figure- 11: Cystic corpus luteum, Zone of a thin layer of fibrous tissue between luteal cells and the cystic cavity.

Ovarian agenesis (*Figure*: 12) can affect one or both ovaries and the associated tubular genitalia may be absent or underdeveloped *[15]*. The percentage observed in present study is 0.50%, which is associated with uterus unicornus of the genital tract, while Fincher, 1946 *[28]* reported three cases accompanied by an infantile genital tract and an absence of cyclical behavior.

Figure- 12: Uterus unicornus and ovarian agenesis.

The ovarian hypoplasia (*Figure*: 13) is recorded as 1.98% in the present study. This value is higher than the finding of *[12]* which is 0.11% while lower than the findings of *[16]*, *[11]* and *[29]* which are 2.20% and 4.6%, 21.6% respectively. This variation in ovarian hypoplasia may be due to hereditary characters and other environmental factors such as body condition and the percentage of gonadal hypoplasia can be reduced by using only animals (both male and female) with normally developed sexual organs as breeding stock *[12]* and *[30]*. Histopathologically in present study (*Figure*: 14) shows few inactive primordial ovarian follicles and related sex cords, which indicate arrest of embryologic development of the ovary that is in agreement with *[25]*.

The percentage of ovarian hemorrhage (*Figure*: 15) reaches 1.48 % this result is higher than the percentage observed by *[7]* which was 0.5%, while the result is less than the result reported by *[11]*. Microscopically, the result agreed with *[25]* and *[6]* which represented by the hemorrhagic cyst, that contains scattered spots of hemorrhage close to the lumen. The wall of the cyst is lined by numerous layers of lutienzed granulose and theca cells (*Figure*: 16).

Figure- 13: Showing the total ovarian hypoplasia in left side. small, smooth surface and lack of ovarian follicles.

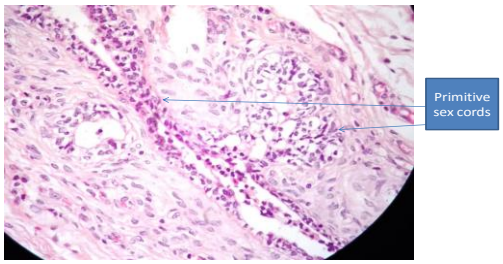

Figure- 14: Ovarian hypoplasia. The few inactive primordial follicles.

Figure- 15: Showing the haemorrhagic cyst.

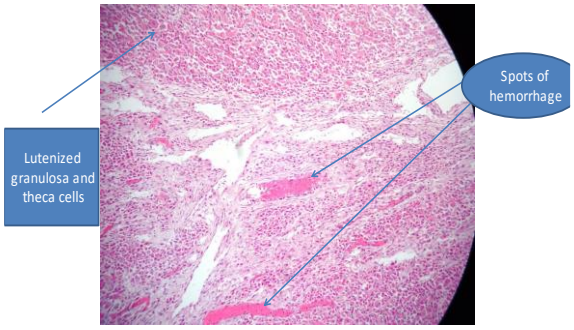

Figure- 16: The cystic lesion contains scattered spots of hemorrhage close to the lumen.

The percentage rate of ovarian Gonadoblastoma (*Figure*: 17) reach 0.05% from the total gross abnormalities, and it is less than the results found by *[31]* which were observed in two cases of two immature heifers. This observation has not been reported previously by Iraqi researchers. Ovarian Gonadoblastoma (dysgenetic gondoma) is a benign tumor, and is a mixture of germ cell tumor and sex-cord stromal tumor, which occur more commonly in human. It usually occurs in individuals with abnormal sexual development and indeterminate gonads *[32]* and *[33]*. The basic pattern of gonadoblastoma may be altered by three processes: hyalinization, calcification and overgrowth by neoplastic germ cell element *[33]*. Histopathological study of this condition agreed with *[33]* whom revealed that the lesion of this tumor composed of round nests of small tubular formations and it is characterized by dual populations of sex-cord stromal cells forming microfollicular formation in the form of tubules lined by an outer layer of small cells resting on a thick layer of basement membrane, and aggregates of larger cells with vesicular nuclei germ cell surrounded by ovarian stroma (*Figure* :18 and 19). Calcification is prominent. They occur in all age Groups, but their percentage increase with age. The maority of the cases reported are unilateral and benign in nature *[24]*. In the mare and the cow where the tumors are frequently reported and effects extensively studied, the active steroid secretion has been documented, and progesterone, oestrogen, testosterone, and inhibin are secreted by the tumor to varying degrees *[24]* and *[34]*. The pathophysiology of gonadoblastoma is gonadal differentiation starts during of gestation and depends on sex chromosome of fetus, errors in this complex multistep process of sexual differentiation may cause dysgentic gonads *[33]*.

Figure- 17: Showing a Gonadoblastoma, spherical, firm 10cm.

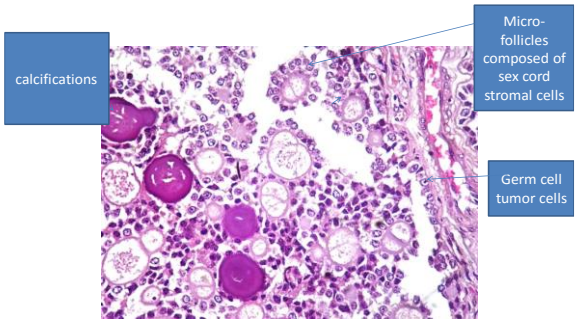

Figure -18: Showing (Gonadoblastoma), dual population of cells, sex-cord stromal cells forming micro follicular formations in form of tubulesand aggregates of larger cells with vesicular nuclei (germ cell tumor component).

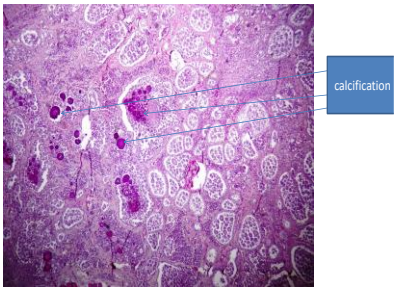

Figure-19: A tumor composed of round nests of tubular formations. Dark blue spots represent calcification.

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