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STRUCTURAL DEFECTS OF THE OVIDUCT CAUSING INFERTILITY IN CROSSBRED DAIRY COWS

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ABSTRACT

Anatomical defects of the oviduct leading to infertility was studied using the genitalia of 100 dairy cows / heifers collected from Meat Technology Unit, Mannuthy with a known history of infertility. Among the study group, three animals showed unilateral tubal obstruction. The patency of the oviduct was assessed by perfusing of 0.9 per cent sodium chloride solution with 1 per cent methylene blue. After morphological examination, tissue samples were fixed in 10 per cent neutral buffered formalin. Standard procedures were adopted for histoarchitectural studies. The defects were classified as type IV with complete occlusion. Gross examination by dye infusion test revealed that the oviducts were blocked near utero-tubal junction. The obstructed region became enlarged, thickened and more readily palpable. More amount of adipose tissue was deposited surrounding the ovary and oviduct. Oviduct became thickened and curled with the mesosalpinx. Histological examination of these oviducts showed the lamina epithelialis as detached from the mucosa and the cells formed clumps in the lumen of the occluded area. In the occluded oviduct, the tunica muscularis was approximately twice thicker than the normal oviduct which contributed to the increased thickening of the occluded region. The disturbances in tubal patency might negatively affect fertility by obstructing the passage of sperm and ovum through the oviduct.

Keywords: Tubal obstruction, Patency, Histology, Oviduct, Dairy cows

INTRODUCTION

Infertility is one of the major problems confronting the dairy industry and is a frequent reason for culling. Anatomical abnormalities of the oviduct can be responsible for a variety of reproductive problems, ranging from a temporary reduction in fertility to sterility. The

ovum shed during ovulation is collected by the fimbriated end of infundibulum and conveyed in opposite direction to meet the spermatozoa usually in the isthmic-ampulla region of the oviduct where fertilization occurs and the formed zygote is transported to the uterus. Abnormalities in the Fallopian tube will affect these processes, making fertilization impossible. The most common lesions encountered in the oviduct are salpingitis, pyosalpinx and hydrosalpinx. It is assumed that disturbances in patency of the oviduct also have some close relation to infertility. Usually these defects will be noticed when the animals are slaughtered or examined morphologically at the time of post-mortem examination. Structural abnormalities of the oviduct are present in only a small proportion of most herds, but if present, may lead to infertility. Hence, the present study is designed to find out the incidence of tubal obstruction in crossbred dairy cows and to study the histomorphology of the occluded oviduct collected from these animals.

MATERIALS AND METHODS

The present study was conducted on the female genitalia collected from 100 dairy cows / heifers from the Meat Technology Unit, Mannuthy. The animals brought for slaughter at Meat Technology Unit, Mannuthy were from herds of five different farms (University and Government Undertaking farms) in Kerala state. This included six animals culled on account of factors other than infertility (like wart, abscess, laminitis etc) with normal reproductive system (control group) and the remaining animals with a known history of infertility. In total, three animals showed unilateral tubal obstruction. The patency of the oviduct was assessed through the perfusion of 0.9 per cent sodium chloride solution with 1 per cent methylene blue. The oviduct was classified and ranked according to its patency as patent, partially patent and occluded. After gross examination, tissue samples were fixed in 10 per cent neutral buffered formalin. Standard procedures were adopted for histoarchitectural studies (Luna, 1968).

RESULTS AND DISCUSSION

Incidence

Oviducts were examined for tubal obstructions based on the patency of lumen (dye infusion test), abnormal enlargement, attachment, hardness and consistency. In this study, tubal obstruction was detected in three specimens among the 100 animals (3%). Hatipoglu *et al*. (2002) reported an incidence of 0.81 per cent of tubal defects in cows. The higher incidence in the present study might be due to the fact that the animals (except control group of six animals) were with a known history of infertility. Among the tubal abnormalities,

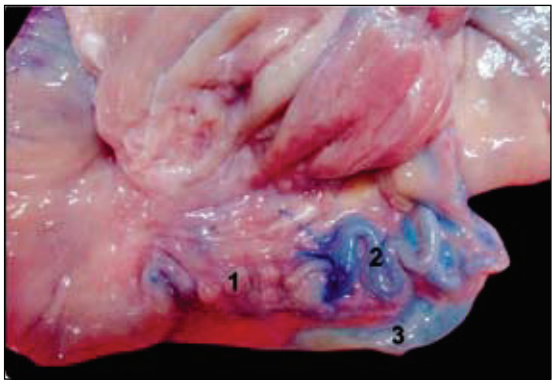

Fig. 1. Genitalia of a cow with unilateral tubal obstruction
1.Oviduct, 2. Oviduct filled with methylene blue solution, 3. Mesosalpinx

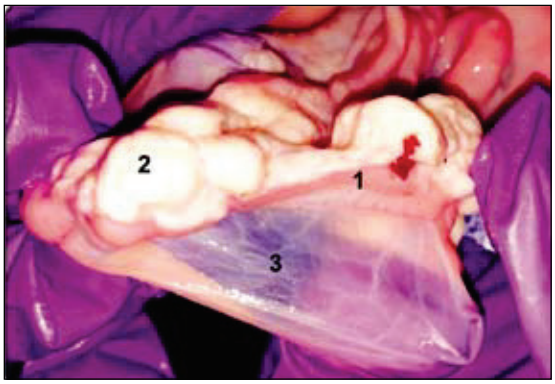

Fig. 2. Oviduct embedded with adipose tissue in unilateral tubal obstruction
1. Oviduct, 2. Adipose tissue, 3.Mesosalphinx

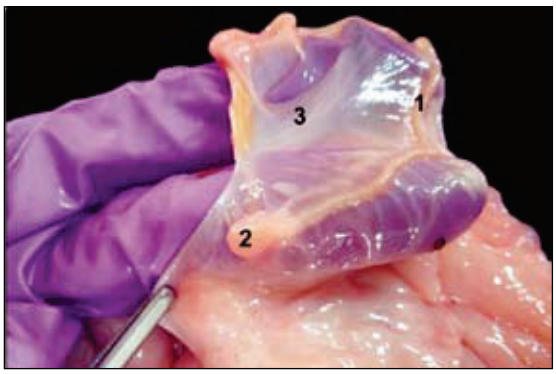

Fig. 3. Blind end of the left oviduct in a cow with uterus unicornis
1. Oviduct, 2. Blind end of oviduct, 3.Mesosalpinx

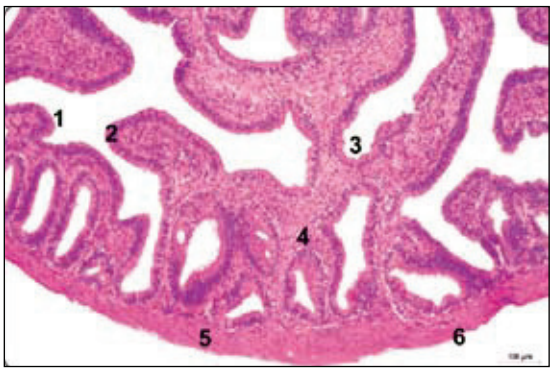

Fig. 4. C. S. of oviduct in a cow (control group). H&E x 100
1. Cilia, 2. Simple columnar epithelium, 3. Mucosal folds, 4. Lamina propria-submucosa, 5. Tunica muscularis, 6. Tunica serosa

one specimen had oviductal occlusion alone and other two genitalia showed tubal obstruction along with kinked cervix and uterus unicornis. The animal with tubal obstruction alone was nine years of age and had a history of infertility and the oviductal occlusion was seen on the right side. In the other two specimens, lesions were observed in the left side. The condition of tubal obstruction was also reported by Afiety *et al*. (1973) and Hatipoglu *et al*. (2002) in cows where majority of the lesions were noticed on the right side followed by the

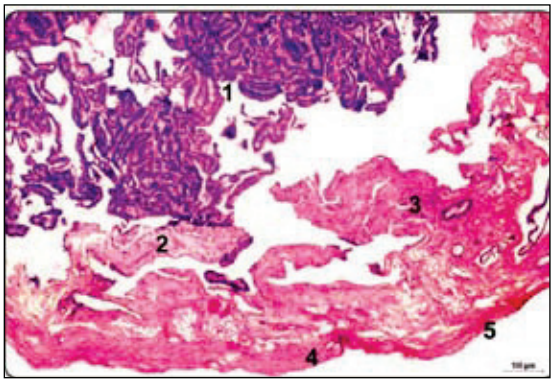

Fig. 5. C. S. of occluded oviduct in a cow. H&E x 100
1.Desquamated epithelium, 2.Mucosal folds, 3.Lamina propira-submucosa, 4.Tunica muscularis, 5.Tunica serosa

left side and bilateral lesions. Simenew *et al*. (2011) suggested that after occlusion, adhesion might develop between the mucosal folds which would lead to the formation of dilated cysts and thus cause physical obstruction for the transport of oocyte.

Morphology

In the present study, the obstructed region of the oviduct became enlarged, thickened and more readily palpable. More amount of adipose tissue was deposited around the oviduct and ovary. The entire oviduct was firmly attached to the surrounding adipose tissue and curled with the mesosalpinx (Fig. 1). Gross examination by dye infusion test revealed that the oviducts were blocked near utero-tubal junction (Fig. 2). The lumen of the oviduct was not patent and the occluded area was more tortuous and harder in consistency. Anterior to the obstruction, the oviduct was distended with fluid. The present results are in accordance with the observations made by Rogers *et al*. (1972) and Hatipoglu *et al*. (2002) in cows where they opined that mesosalpingial adhesion was one of the major defects that caused the curling and subsequent thickening of the oviduct.

In case of uterus unicornis specimen, the left oviduct (length, 18.0 cm) showed a blind ampullary component with a small distension at the terminal portion (Fig. 3). Consistent with this, Oshea *et al.* (1974) also reported some degree of aplasia in the oviduct.

Patency of oviduct

Koike and Kawata (1959) classified tubal impotency into four types: easy passage (type I), temporary occlusion (type II), difficult passage (type III) and occlusion (type IV). In the present study, type IV with complete occlusion of the oviduct was observed in all the three specimens. In the oviducts lacking patency, the infused dye was blocked at the occluded site and the oviduct anterior to occlusion became engorged. Koike and Kawata (1959) noted that the obstruction sites of the oviduct were limited mostly to the portions near the uterus and not near the ovary. They also opined that the disturbances of tubal patency might be due to the removal of the persistent corpus luteum, artificial rupture of the Graafian follicle manually and breaking of the cystic follicle per rectum, which might cause various disturbances of the oviduct.

Histology

The occluded region of the oviduct was histologically examined. The mucosa was thrown into irregular folds as that of the control animals (Fig. 4). The lamina

epithelialis was seen detached from the mucosa and the cells formed clumps in the lumen of the occluded area (Fig. 5). This agrees with the findings of Koike and Kawata (1959) and Hassan and El-Metwally (2016) in cows. The height of the mucosal folds and lining epithelia was significantly less than the normal oviduct at 1 per cent level (Table. 1). In the control animals, the mucosa was thrown into numerous primary, secondary and tertiary folds and was lined with pseudostratified ciliated columnar epithelium and the lumen was mostly empty. The thickness of lamina propria-submucosa was less in the affected oviduct compared to the normal oviduct. Lamina propria- submucosa was highly distorted. In the occluded oviduct, the tunica muscularis was approximately twice thicker than the normal oviduct which contributed to the increased thickening of the occluded region as reported by Al-Wan and Amine (2010) in goats.

CONCLUSION

The results of this study revealed that the incidence of tubal obstruction was higher and all the obstructions were type IV with complete occlusion, which considerably influence fertility of the affected dairy cows by limiting the movement of the fimbriae and passage of germ cells and embryo. Histopathological examination of these oviducts showed that the lamina epithelialis was seen detached from the mucosa and the cells formed clumps in the lumen of the occluded area. In the occluded oviduct, the tunica muscularis was approximately twice thicker than the normal oviduct which contributed to the increased thickening of the occluded region. The occurrence of occluded oviduct due to anatomical defects may negatively affect the fertility leading to economic loss to the farmers.

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Table 1. Micrometrical parameters of different layers of the oviduct

Parameters	Control group	Tubal obstruction	t-value	p-value
Height of oviductal epithelium (µm)	29.33 ± 2.83	13.09 ± 0.92	5.468**	0.002
Width of lamina propria- submucosa of oviduct (µm)	41.83 ± 4.45	23.34 ± 1.85	3.835**	0.007
Width of tunica muscularis of oviduct (µm)	72.31 ± 5.75	137.47 ± 11.09	5.217**	<0.001
Width of tunica serosa of oviduct (µm)	74.35 ± 8.41	96.66 ± 12.47	1.483^{ns}	0.169

providing necessary facilities needed for carrying out the research.

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