

FEMALE GENITAL SYSTEM

ABORTION

Expulsion of a dead foetus prior to the normal gestation period is called abortion. The abortion is mainly due to the infection of the foetus, placenta or uterus and due to these, death of foetus occurs. A dead foetus treated as foreign body so it is expelled from uterus.

There are two other terms related to abortion i.e. stillbirth and premature birth. Stillbirth is defined as expulsion of dead foetus on its full maturity while premature birth is birth of a live foetus before attaining full gestation period.

There are 3 main infections causes abortion:-

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| 1. Brucellosis | - | Last trimester of the pregnancy |
| 2. Vibriosis | - | II nd trimester of the pregnancy |
| 3. Trichomoniasis | - | I st trimester of the pregnancy |

Other infections like listeriosis, leptospirosis, *Salmonella abortus equi* in horses, viral infections like Equine herpes virus in mares, Bovine herpes virus-I in cattle & fungal infections may also causes abortion.

(1) Brucellosis:-- *B. abortus, B. melitensis, B. suis*

- (A) Route of infections:- It occurs due to-
- (i) Ingestion of infections agent with contaminated feed & water.
 - (ii) By coitus or artificial insemination.
 - (iii) Contamination of healthy udder from an infected one during milking.
 - (iv) Through skin & Conjunctiva.

Due to Brucellosis infection, there is placentitis and a purulent exudate accumulates b/w the endometrium and chorion. There is oedema & infiltration of chorion membrane by macrophages, lymphocytes and plasma cells. Necrosis of foetal membrane occurs and they become separated from the uterine endometrium. Due to this the foetus become died and expelled from uterus causes abortion.

In aborted foetus, there may be presence of pneumonia, oedema of pericardium, umbilical cord and the skin. Hyperplasia of lymph nodes and spleen are the characteristic lesions during histo-pathological examination.

(2) Vibriosis:--

Causal organism is - *Vibriosis foetus* causes abortion in cows & sheep. The infection is by ingestion and by coitus or arificial insemination. This organism causes acute catarrhal endometritis, cervicitis & vaginitis. The pathogenesis is same as Brucellosis.

Now the aborted foetus shows oedema of sub cutaneous tissue, pleuritis, peritonitis, pericarditis, fatty degeneration of liver and haemorrhages in the renal cortex.

(3) Trichomoniasis:-

Causal organism is *Trichomonas foetus*. It is transmitted through coitus. In the cow, within 3 days after infection, there is vulvitis and vaginitis develops. Then there is cervicitis, endometritis and placentitis occurs. This causes abortion in early phase of gestation.

(4) Listeriosis:-

Causal organism – *Listeria monocytogenese*

It primarily affects the brain and may sometime infect the pregnant uterus which causes abortion in cattle & sheep. Abortion usually occurs during the last trimester of pregnancy. The foetus shows haemorrhages in the kidney, anasarca, areas of necrosis in liver, spleen, lungs & kidney.

(5) Epizootic Bovine Abortion:-

The abortion caused by virus of the family *Psittacosis lymphogranuloma* group in the cow & sheep.

Abortion occurs during the last trimester. The virus causes death of foetus and the characteristic lesion found in all the organs is a focal inflammation consisting of neutrophils, lymphocytes & macrophages. It also causes petechial haemorrhage on the skin and internal organs of the foetus.

(6) Leptospirosis:-

In cattle various strains of leptospira produce abortion in last trimester of pregnancy. The placenta is avascular; cotyledons are atrophic, yellow-brown in colour and leathery. No inflammatory infiltration occurs.

In foetus oedema of sub cutis, peritoneum, umbilical cord, pericardium, focal interstitial nephritis with round cell infiltration, glomerulonephritis, infiltration of eosinophils into the cortex & round cell infiltration into the periportal tissue of the liver. Abortion is due to foetal death.

(7) Mycotic Abortion:-

It is caused by following species-*Aspergillus*, *Absidia*, *Mucor* and *Rhizopus*.

The infection is secondary one, the primary lesions being in the lungs, abomasum and intestine. Infection is by the blood stream. Abortion occurs in last trimester of pregnancy & placenta is retained.

Macroscopic Features- The foetus may show circumscribed greyish plaques on the skin resembling ring worm lesions. In cow, lesions are present in placenta. The chorion-allantois is thick and leathery.

Microscopic Features- The typical lesion consists of focal collection of inflammatory cell macrophages predominantly. Extensive necrosis of placentomes occurs. In uterine wall, the inter caruncular areas shows red patches covered by thin yellowish grey pseudo membrane. At these places, thrombosis and peri vascular necrosis occur. Some degeneration of circular muscles, small arteries is hyalinised throughout the uterine wall.

Hyperaemia & haemorrhages are common in affected areas. Separation of placenta from cotyledons causes death of the foetus.

Note: In Brucellosis and vibriosis, descending infection due to endometrium involves first while in Trichomoniasis, ascending infection occurs.

- Anasarca – Oedema of subcutaneous tissue.
- Psittacosis – Generally occurs in birds. When it occurs in man, people speak like a bird who suffered from this infection.

MASTITIS

Mastitis is the inflammation of mammary gland characterized by oedema, haemorrhage and fibrosis of udder. Mastitis is always infectious and is a disease of lactating glands. There is no hematogenous infection and infections enter through teat canal to cause mastitis.

Etiology

- (1) **Bacteria:** *Staphylococcus aureus*, *Streptococcus dysgalactiae*, *Streptococcus agalactiae*, *Corynebacterium pyogenes*, *Pasturella*, *Pseudomonas aeruginosa*, *Brucella abortus*, *Mycobacterium tuberculosis*, *Mycoplasma* etc.
- (2) **Virus:** FMD virus, Pox virus
- (3) **Fungi:** Nocardia, *Candida albicans*, *Trichosporon* spp. etc.

Development of Mastitis: It can be described under 3 phases.

- (1) **Invasion phase:** - The bacteria are able to enter the teat orifices, and be present in the teat canal.
- (2) **Infection phase:** The organisms are able to overcome the resistance of host body and multiply.
- (3) **Inflammatory phase:** The organisms invade the tissue of udder.
 - (a) The organism that penetrates the interstitial tissue causes oedema & infiltration by neutrophils which destroy some of the organism.
 - (b) The lymphatics in the stroma become widely dilated due to infiltration by leucocytes that migrate from the regional lymph node.
 - (c) The epithelium of the acini becomes vacuolated and desquamated.

Milk is a good medium for growth. There is accumulation of exudate which leads to fibrosis of acini. Initially there is excessive no. of neutrophils which become replaced by macrophages and fibroblast. There may be stagnation of milk secretion in the smaller ducts and at this stage the udder may be firm due to the inflamed inter alveolar tissue and retained secretion.

When acute stage passed off then there is a slight regeneration of the acini may occur but if there is excessive destruction of the tissue, then regeneration is not possible and the acini is collapsed and are replace by the granulation tissue. Interstitial spaces are infiltered by lymphocytes. This mammary gland is reduced in size it is also known as "Shrunken Quarter".

Macroscopic: One or more quarter may be effected. The secretion may be serous or sometimes it may be purulent. The gland is swollen and slightly hard and on section, it may be severly congested. There may be flakes (*coagulated milk proteins*) in milk and milk may be blood mixed.

Microscopic:

- Infiltration of neutrophils, macrophages, lymphocytes
- Necrosis of alveolar epithelium, hyperplasia of epithelial lining.
- Proliferation of fibrous tissue
- Increase in WBC count in milk (more than 100/ ml milk).

GANGRENOUS MASTITIS

In severe cases of mastitis caused by *Staphylococcus aureus* and *E. coli* with *Clostridium welchii* produce this condition. Usually all the four quarters may be affected. The udder becomes cold and bluish in colour and in many cases death of individual may occur.

MYCOPLASMAL MASTITIS

It is caused by the various spp. of mycoplasma. This caused is commonly found in the lactating cows.

All the four quarters may be involved with sudden fall in the milk yield. Faulty milking machines and unsterilized teat syringes and contamination of teat during milking leads to this condition. This organism cause purulent type of mastitis.

Note- *Corynebacterium pyogenes* is the cause of the so called "Summer Mastitis" affecting both immature and lactating glands. There is watery dirty grey or dark colour milk in animals, which are in dry period.

METRITIS

Metritis is the inflammation of uterus characterized by suppurative exudate, hemorrhage and necrosis of uterus. It involves whole thickness of the wall of uterus. If the inflammation is restricted to the endometrium of the uterus alone then the condition is known as Endometritis. Inflammation of the serosa is known as Perimetritis.

Etiology

- *Actinomyces pyogenes*
- *E.coli*
- *Staphylococci* spp.
- *Streptococci* spp.
- *Trichomonas foetus*
- *Campylobacter foetus* etc.

Macroscopic and Microscopic features of Metritis-

- Congestion, catarrhal or purulent exudate.
- Haemorrhage, oedema

- Oozing out of pus from uterus on pressure and presence of seropurulent exudate in uterine wall
- Infiltration of macrophages and lymphocytes
- Desquamation of lining epithelium

Macroscopic and Microscopic features of Endometritis-

- Catarrhal discharge from uterus containing desquamated cells.
- The mucosa may be swollen, red or haemorrhagic and rough instead of having a smooth surface and covered with fragments of necrotic material.
- Congestion.
- The surface epithelium shows degenerative and necrotic changes along with moderate infiltration of lymphocytes, plasma cells and neutrophils in mucosa.

PYOMETRA

Pyometra is an acute or chronic inflammation of uterus characterized by accumulation of pus in the uterus.

Etiology

- Increased level of Progesterone
- E.coli
- Staphylococcus aureus
- Actinomyces pyogenes
- Trichomonas foetus
- Campylobacter foetus etc.

Macroscopic and Microscopic features

- Discharge of thin cream like pus from vulva soiling the tail and perineal region.
- Pus discharge is more on sitting position of animal.
- Enlargement of abdomen due to distension of uterus.
- Uterus looking like as pregnant uterus as a result of accumulation of pus. This condition is also known as Pseudopregnancy.
- Retention of lutein cyst.
- Congestion, infiltration of neutrophils, lymphocytes and plasma cells.
- Necrosis of mucosal epithelium of uterus.
- Proliferation of endometrial epithelium.

MUCOMETRA

It is accumulation of mucus in the uterus.

ENDOMETRIOSIS

Endometriosis means presence of endometrial glands and stroma in places other than endometrium.

CERVICITIS

Cervicitis is the inflammation of cervix as a result of either descending infection from uterus or ascending infection from vagina and characterized by catarrhal inflammation.

Etiology

- Etiological agents are similar as in endometritis.

Macroscopic and Microscopic features

- Congestion.
- Enlargement of cervix.
- Catarrhal inflammation of cervical mucosa.
- Hyperplasia of mucous glands with tall mucin containing epithelial cells.
- Presence of mucin in lumen.

VAGINITIS

Vaginitis is the inflammation of vagina characterized by congestion, granularity as a result of elevations in mucosa. This is also known as infectious pustular vulvovaginitis in cattle caused by herpes virus.

Etiology

- Mycoplasma spp.
- Bovine herpes virus-1 (BHV -1)
- Picorna virus
- Trichomonas foetus

Macroscopic and Microscopic features

- Granular elevation in vaginal mucosa.
- Congestion.
- Prolapse.
- Accumulation of lymphocytes in sub epithelial region.

MUMMIFICATION OF FOETUS

Mummification of foetus is shrinkage of foetus by absorbing all fluid of foetus and uterus. It causes the death of foetus, autolytic changes in foetus, absorption of placental and foetal fluids, involution of maternal caruncles and foetus becomes brown or black and rather leathery, moist on the surface with sticky mucus without odour.

MACERATION OF FOETUS

Maceration of foetus is defined as foetal death followed by putrification of foetus and died foetus will be like the threads of tissue. If it occurs before bone formation then it is reabsorbed. If it occurs after bone formation, the muscles will be destroyed and bone will remain there.

RETAINED PLACENTA/ PLACENTITIS

Retention of placenta occurs after abortion or parturition as a result of inflammation characterized by swelling, edema or fibrosis which prevents the separation of chorion from endometrium.

Etiology

- Lack of progesterone
- Infection e.g. Brucellosis, Trichomoniasis.

Macroscopic and Microscopic features

- Retained placenta undergoes autolysis, putrefaction causes toxæmia.
- Endometritis, Pyometra.
- Placenta is oedematous and congested.
- Infiltration of neutrophils, mononuclear cells.
- Proliferation of fibroblasts.

Free Martin: It is an imperfectly developed female calf, usually sterile and born as the twin of a male.

Intersexes: The intersex is an individual with congenital abnormality, where the gender can be uncertain because of presence of various components of both male and female types.

Intersexes may be of two types-

- A. True hermaphrodites- in which gonads of both sexes are present
- B. Pseudo-hermaphrodites-These have gonads of only one sex but has development of reproductive organs with some characteristics of the opposite sex. Such animals are classified as male and female pseudohermaphrodites depending on the gonads present.

White Heifer Disease: This condition occurs due to a single sex linked gene defect responsible for white coat colour. It consists of a number of abnormalities due to arrest in the Mullerian duct system. In such animals, there are normal ovaries, oviduct but uterus is incomplete and may lack communication with cervix. There is hypoplasia of cervix and vagina.

Uterus Unicornis: It is presence of only one horn of uterus instead of two, seen in animals with white heifer disease.

Uterus Didelphys: It is the occurrence of two cervix with two uterine bodies and single or double vagina. It occurs due to failure of Mullerian ducts to fuse at their distal end. Sometimes failure of fusion may affect only cervix and there is two cervix which is termed as Cervix bifida.

CYSTIC OVARIES

Cystic ovaries are defined as an ovary, which contains one or more clear cysts ranging from one to several centimeters in size.

Etiology

- Hormonal imbalance.

Macroscopic and Microscopic features

- Presence of cysts in ovaries. These are of two types- Follicular cyst and Lutein cyst.
- Hormonal imbalance of animal leads to sterility, continuous estrus, nymphomania due to follicular cyst
- Lutein cysts may cause pyometra leading to pseudopregnancy.

Polyoogonia: It is a condition in which each follicle, which normally contains only one ovum may contain several ova without disturbing the function of genital organs.

Perioophoritis: Inflammation of serosal surface of the ovary is called perioophoritis.

Oophoritis: It is the inflammation of ovary caused by trauma, infection and characterized by granulomatous or lymphocytic inflammation of ovary.

Etiology

- Mycobacterium tuberculosis
- Herpes virus

Macroscopic and Microscopic features

- Hard, nodular lesions in ovary, encapsulated with fibrous tissue.
- Granuloma of tuberculosis through hematogenous infection.
- Infiltration of lymphocytes leading to lymphofollicular reaction in follicles.
- Atrophy or absence of ova.

SALPINGITIS

Salpingitis is the inflammation of oviduct or fallopian tube characterized by congestion, catarrhal or purulent exudates leading to distended lumen.

Etiology

- Mycoplasma
- Streptococci
- Tuberculosis (Mycobacterium tuberculosis)
- Trichomoniasis (Trichomonas foetus)

Macroscopic and Microscopic features

- Congestion, abscess formation.
- Fibrosis, hardness of the oviduct.

- Occlusion of lumen due to inflammatory exudate which is toxic to ova as well as sperms leading to sterility.
- Suppurative inflammation
- Infiltration of neutrophils, macrophages and lymphocytes
- Proliferation of fibrous tissue.
- Debris of desquamated cells.
- Hydrosalpinx which denotes a cystic dilatation of a part of the oviduct containing clear fluid.
- Accumulation of pus in oviduct is termed as Pyosalpinx.

Epoophoron: It consists of intercommunicating, short, closely packed, acinar structures in the loose connective tissue of mesovarian attachment at either pole of ovary.

Rete ovarii: It consists of tubular network of anastomosing canals, separated by thick bands of connective tissue at the hilus.

Anovular cords: These cords originate either from groups or nests of epithelial cells which never had oocytes from normal follicles in the early stages of development replacing the follicles.

Parovarian Cysts: These are present in the vicinity of ovary in mesosalpinx and vary in size.

Double External Os: It is the presence of a dorso-ventral band adjacent to external cervical os giving an impression as though two cervical openings are there.

Pneumo Vagina: It is common in mares. It is mainly due to the vice of crib biting. The mare makes an inspiratory effort holding something hard in its mouth. Due to this and already existing negative pressure of the uterus, vulva is unable to keep back the external air from entering the vagina, air enters the vagina and causes ballooning of the vaginal wall. Along with air, urine and dung also gain entrance into the vaginal cavity. The contamination of vagina leads to vaginitis, cervicitis and endometritis.