University of Mosul
Lecture No.: 5
College of Veterinary Medicine
Date:8/10/2024
Unit of Scientific Affairs
Website:

Lecture title: RUMINAL TYMPANY (BLOAT)

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Summary:

Ruminal tympany is abnormal distension of the rumen and reticulum caused by excessive retention of the gases of fermentation; either in the form of persistent foam mixed with the rumen contents or as free gas separated from the ingesta. Normally, gas bubbles produced in the rumen coalesce, separate from the rumen contents to form free gas above the level of the contents, and finally are eliminated by eructation.

ETIOLOGY

A. Primary Ruminal Tympany (Frothy Bloat)

- ✓ Primary ruminal tympany or frothy bloat is caused by the production of stable foam that traps the normal gases of fermentation in the rumen.
- ✓ The essential feature is that coalescence of the small gas bubbles is inhibited and intraruminal pressure increases because eructation cannot occur.
- ✓ Soluble leaf proteins, saponins and hemicelluloses are believed to be the primary foaming agents and to form a monomolecular layer around gas rumen bubbles and prevent their coalescence.
- ✓ Bloat is most common in animals grazing legume or legume-dominant pastures, particularly alfalfa, and red and white clovers, but also is seen with grazing of young green cereal crops. Because these plants are more rapidly digested and may release a greater amount of small chloroplast particles that trap gas bubbles and prevent their coalescence.
- ✓ Frothy bloat also is seen in feedlot cattle, and less commonly in dairy cattle, on high-grain diets. The cause of the foam in feedlot bloat is uncertain but is thought to be either the production of insoluble slime by certain species of rumen bacteria in cattle fed high-carbohydrate diets.
- ✓ In some cases of vagus indigestion characterized by ruminal hyperactivity the secondary bloat may be of the frothy type because of ruminal hyperactivity.

B. Secondary Ruminal Tympany (Free-Gas Bloat)

- ✓ Physical obstruction to eructation occurs in esophageal obstruction caused by a foreign body (potatoes, apples, turnips, kiwifruit), by stenosis of the esophagus, by pressure from enlargements outside the esophagus, such as tuberculous lymphadenitis or bovine viral leucosis involvement of bronchial lymph nodes, or by obstruction of the cardia.
- ✓ Hypocalcemia in milk fever of cattle is commonly associated with secondary free-gas bloat caused by ruminal atony, which is reversible following treatment with calcium salts.
- ✓ Interference with esophageal groove function in vagal indigestion and diaphragmatic hernia may cause chronic ruminal tympany.
- ✓ This also occurs in other lesions, such as those caused by infection of the esophageal groove or the reticular wall.
- ✓ There also may be interference with the nerve pathways involved in the eructation reflex.

PATHOGENESIS

1. Normally, gas bubbles produced in the rumen fluid coalesce, separate from the rumen contents to form pockets of free gas above the level of the contents, and are finally eliminated by eructation.
2. In frothy bloat, the gas bubbles remain dispersed throughout the rumen contents, producing an abnormal increase in the volume of the ruminoreticular contents and, consequently, inhibiting eructation.
3. In free-gas bloat, the gas bubbles coalesce and separate from the rumen fluid, but the animals cannot eructate the pockets of free gas because of abnormalities of the reticulorumen or esophagus.
4. Frothiness of the ruminal contents interferes with function of the cardia and inhibits the eructation reflex. Rumen movements are initially stimulated by the distension, and the resulting hypermotility exacerbates the frothiness of the ruminal contents. Terminally there is a loss of muscle tone and ruminal motility.
5. In addition, the pressure exerted by the distended rumen on the diaphragm is very high, which results in reduced lung capacity and death from hypoxia.

CLINICAL FINDINGS

Bloat is a common cause of sudden death (or found dead) in cattle.

A. In primary pasture bloat

1. Obvious distension of the rumen occurs quickly, sometimes as soon as 15 minutes after going on to bloat-producing pasture, and the animal stop grazing.
2. The distension is usually more obvious in the upper left paralumbar fossa, but the entire abdomen is enlarged.
3. There is discomfort and the animal may stand and lie down frequently, kick at its abdomen, and even roll. Frequent defecation and urination are common.
4. Dyspnea is marked and is accompanied by mouth breathing, protrusion of the tongue, salivation, and extension of the head, when sever bloat.
5. The respiratory rate is increased up to 60 breaths/min. Occasionally, projectile vomiting occurs and soft feces may occure.
6. Ruminal contractions are usually increased in strength and frequency in the early stages and may be almost continuous, but the sounds are reduced in volume because of the frothy nature of the ingesta.
7. Later, when the distension is extreme, contractions are decreased and may be completely absent.
8. If animals are treated by trocarization or the passage of a stomach tube, only small amounts of gas are released before froth blocks the cannula or tube.

B. In secondary bloat

1. The excess gas is present as a free gas cap on top of the ruminal contents.
2. There is usually an increase in the frequency and strength of ruminal movements in the early stages followed by atony.
3. Passage of a stomach tube or trocarization results in the release of large quantities of gas and subsidence of the ruminal distension.
4. If an esophageal obstruction is present, it will be detected when the stomach tube is passed.

CLINICAL PATHOLOGY

Laboratory tests are not necessary for the diagnosis of ruminal tympany.

NECROPSY FINDINGS

1. In cattle that have died from bloat within an hour previously, there is protrusion and congestion of the tongue; marked congestion and hemorrhages of the head and neck, epicardium, and upper respiratory tract; friable kidneys; and mucosal hyperemia in the small intestine.
2. The lungs are compressed and there is congestion and hemorrhage of the cervical portion of the esophagus.
3. The rumen is distended but the contents are much less frothy than before death.
4. A marked erythema is evident beneath the ruminal mucosa, especially in the ventral sacs.
5. Occasionally, the rumen or diaphragm has ruptured.

TREATMENT

1. In life-threatening cases of bloat, an emergency rumenotomy may be necessary; it is accompanied by an explosive release of ruminal contents and, thus, marked relief for the cow.
2. A trocar and cannula may be used for emergency relief of free-gas bloat, although the standard-sized instrument is not large enough to allow the viscous, stable foam in peracute cases to escape quickly enough. A larger-bore instrument (2.5 cm in diameter) is necessary, but an incision through the skin must be made before it can be inserted through the muscle layers and into the rumen. If the cannula fails to reduce the bloat and the animal's life is threatened, an emergency rumenotomy should be performed. If the cannula provides some relief, an antifoaming agent be

administered through the cannula, which can remain in place until the animal has returned to normal, usually within several hours.

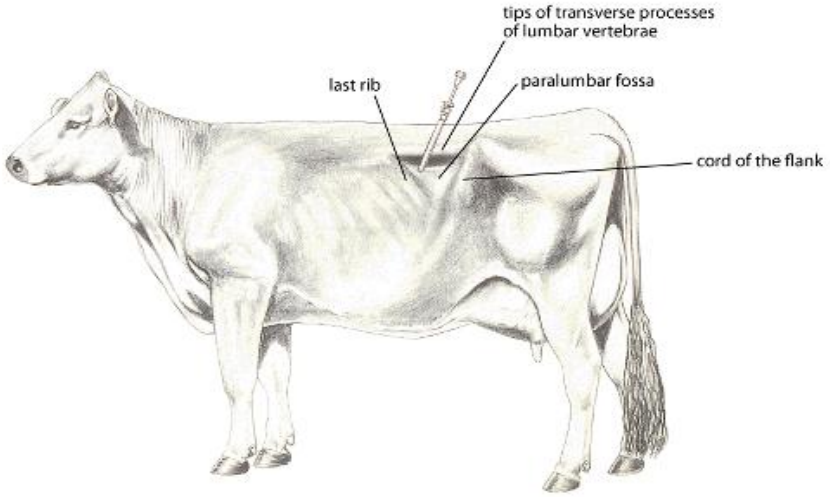

Figure 1: Illustration of cannulation of a cow rumen

3. When the animal's life is not immediately threatened, passing a stomach tube of the largest bore possible is recommended. A few attempts should be made to clear the tube by blowing and moving it back and forth in an attempt to find large pockets of rumen gas that can be released. In frothy bloat, it may be impossible to reduce the pressure with the tube, and an antifoaming agent should be administered while the tube is in place. If the bloat is not relieved quickly by the antifoaming agent, alternative treatment is necessary.
4. A variety of antifoaming agents are effective, including vegetable oils (peanut, corn, soybean) and mineral oils (paraffins), at doses of 250–500 ml. Because they all reduce the surface tension of gas bubbles leading to coalescence of explosive and gas free from its bubble and accumulation in upper part of rumen to allow eructation.
5. Dioctyl sodium sulfosuccinate, a surfactant, antibloat remedy, is commonly incorporated into one of the above oils, which is effective if administered early (1,000 mg, PO via drench or stomach tube, every 24 hours as needed.