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A Clinical Case of Congenital Colloid Goiter in a Lamb Herd

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Abstract

Goiter can occur in humans, mammals and birds due to hyperplasia and hypertrophy of thyroid follicular cells. It is often found as a congenital condition in goat kids and lambs. We present a clinical case of congenital colloid goiter in 92 lambs of the Vakla Marishka sheep breed, raised in the region of Western Bulgaria. The characteristic pathoanatomical and histopathological changes in the thyroid gland described by us have accurate diagnostic and differential diagnostic value in colloid goiter from other pathological conditions. In order to prevent goiter in the flock and newborn lambs, it is necessary to avoid plants containing goitrogens and diets with low iodine content. As well as to continuously add multivitamin-mineral premixes to the balanced rations of ruminants.

Key Words: Congenital Goiter; Lambs; Pathology; Hypothyroidism

Introduction

The thyroid gland is located in the cranial part of the ventral cervical region under the larynx and has two glandular lobes that are situated mediolaterally to the trachea. Iodine is of great importance for its function, which is the production of Triiodothyronine (T3) and Thyroxine (T4), as well as calcium-phosphorus homeostasis in the body [1]. Thyroid hormones play a vital role in thermoregulation, metabolism and energy production, growth and development of newborns, reproductive health, the immune system, muscle function, and regulation of the cardiovascular system [2]. According to [3] iodine deficiency in the body leads to an enlargement of the thyroid gland, a condition known as goiter. Rosol and Greone [4] consider genetic defects in the enzymes that synthesize thyroid hormones as another possible cause of its occurrence.

Goiter can occur in humans, mammals and birds due to hyperplasia and hypertrophy of thyroid follicular cells. It is often found as a congenital condition in goat kids and lambs. Functionally it is expressed by hypothyroidism leading to disturbances in the body's thermoregulation, reduced cardiac output and arrhythmias leading to mortality in newborns [5]. According to [6], cases of congenital hypothyroidism are associated with multiple late abortions, stillbirths, and postpartum death. Newborns are underdeveloped and weak. Sometimes without hair and subcutaneous edema of the head and neck. Born to mothers with iodine deficiency develop goiter and have clinical signs of hypothyroidism. A permanent macro lesion in aborted or newborn animals was bilaterally enlarged thyroid glands.

According to [7] goiter can be primary due to iodine deficiency in the diet and secondary, which is caused by watering with water high in calcium, nitrates, pastures poor in iodine, goitrogenic plants such as some types of clover, or excessive iodine intake. According to [8] white clover pastures contain cyan glucosides, which are goitrogenic and often cause goiter in ruminants. Other authors such as [9] report that iodine deficiency in the herd may also be accompanied by vitamin A and selenium deficiencies. According to [10] and (Singh et al., 2002), goiter in lambs and kids is diagnosed after birth. It leads to high mortality in newborns due to impaired thermoregulation, reduced surfactant secretion in the pulmonary alveoli, reduced cardiac output and arrhythmia.

Other authors have suggested that iodine deficiency leads to difficult births and stillbirths, as well as mortality of newborn lambs, making them susceptible to heat stress and hypothermia

[11]. Sargison et al., [12] have also observed a high rate of early embryonic mortality in pregnant ewes. We present a clinical case of congenital colloid goiter in 92 lambs, analyzing the observed macroscopic and microscopic changes in the thyroid gland, with a view to their application in the pathomorphological diagnosis of thyroid pathology.

Case Description

The reported clinical case describes congenital colloid goiter in all 92 newborn lambs, which occurred with 90% lethality in a private sheep farm in Western Bulgaria. Pathoanatomical and histopathological diagnostic studies were performed.

The herd consisted of 170 young ewes and 92 newborn and growing lambs from 24 hours after birth to 70 days of age of the Vakla Marishka sheep breed. The mothers were dewormed for ecto- and endoparasites, and vaccinated preventively against infectious diseases during pregnancy. The animals were raised in barn conditions without being taken out to pasture, the daily ration of one sheep was 500 gr of granulated feed and meadow clover hay. During pregnancy, they did not receive additional vitamins, microelement premixes to the ration, as well as rock salt. In all newborn lambs, local edema was observed in the ventral cervical region having an elastic consistency (Figure 1). The lambs were stunted, refused to stand upright, were depressed, lifeless, and refused to suckle colostrum. When measuring the internal body temperature, it ranged from 37.6°C to 38.3°C degrees, and within a few days the lambs were lethal. Attempts were made to feed colostrum and orally administered colistin sulfate in combination with injectable multivitamins, but without success. Only single lambs reached 70 days of age, but were visibly lagging behind in growth and development. Late abortions were observed in 11 ewes, where the aborted fetuses were malformed with local edema around the larynx. Despite attempts to feed colostrum and treat for a period of 23 days, 82 lambs died between 24 and 72 hours after birth. Seven lamb carcasses, aged between 1 and 3 days, weighing 3-4 kg, were provided for autopsy and subsequent diagnostic tests by the owner of the sheep farm.

Figure 1: Newborn lamb refusing to stand, subnormal temperature and with focal edema localized to the ventral cervical region (arrow).

After the pathological examination, tissue samples for histopathological studies measuring 1 cm x 1 cm were obtained from both lobes of the diffusely enlarged thyroid gland. The materials for pathohistological examination were fixed in 10% neutral buffered formalin for 48–72 hours and embedded in paraffin. Sections with a thickness of 4 μm were prepared from the obtained paraffin blocks using a "Leica" RM 2235 microtome and stained conventionally with hematoxylin-eosin (H/E).

Also, samples from parenchymal organs (lung, liver, spleen and kidney), blood from the heart and a ligated section of the small intestine were used for bacteriological studies. Cultures were prepared on blood agar with 5% sheep erythrocytes, McConkey agar, trypticase-soy broth, selenite broth. All of these cultures were incubated at 37°C for 24 hours under aerobic conditions. Zeisler blood sugar agar and fluid thioglycolate medium (Difco Laboratories) were used for isolation of anaerobic microorganisms, and the cultures were cultured for 24-48 hours at 37°C under anaerobic conditions.

Results and Discussion

Macroscopic findings

In the pathological examination of seven lamb carcasses, according to the standard autopsy protocol for ruminants, the following changes were noted on external examination: catarrhal discharge from the nostrils, sunken eyeballs and pale mucous membranes, undersized carcass, meconium staining in the pelvic limbs and tail. A limited edema was observed in the area of the larynx, the size of an apple - about 8 cm in diameter, in some lambs

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reaching the submandibular space. With a hard-elastic consistency and motionless on palpation. In a section of the skin in the ventral cervical region, the underlying tissues were edematized, and both lobes of the thyroid gland were many times enlarged in all seven lambs autopsied. The cut surface of both lobes was edematous with a violet color and single cystic formations with sizes reaching 5 mm in diameter (Figure 2&3). The mandibular lymph nodes were not reactive. In 5 newborn kids with congenital goiter [7] described symmetrically enlarged thyroid lobes. No nodular and cystic lesions were found on section of the gland, but the color was dark red to reddish brown. Özlem et al., [7] reported that they observed delayed growth and development in newborn kids with goiter, as well as lack of hair, which we did not observe in our case. The diagnosis of congenital goiter was made based on macroscopic and microscopic changes in the thyroid gland in the autopsied 5 kids. When opening the abdominal cavity, we observed about 300 ml of yellowish fluid, the organs were in a preserved topographic position. The serous was intensely red, and the spleen was of normal size. The abomasum was filled with gases, as were the small and large intestines. On section, the contents showed traces of milky coagulum and scanty watery fluid. The intestinal mucosa was locally hyperemic with a shiny appearance; the mesenteric lymph nodes were not enlarged. The liver and kidneys had rounded edges and a friable appearance; the gallbladder was full of bile juice. On examination of the chest cavity, the costal pleura was pale, there was no presence of foreign content. The bronchial and mediastinal lymph nodes were not reactive, there were no visible changes in the thymus. On section of the trachea and main bronchi, there was the presence of scanty cloudy foamy fluid mixed with air bubbles. Local areas of emphysema were observed peripherally on the lung wings, the parenchymal was not compacted on palpation.

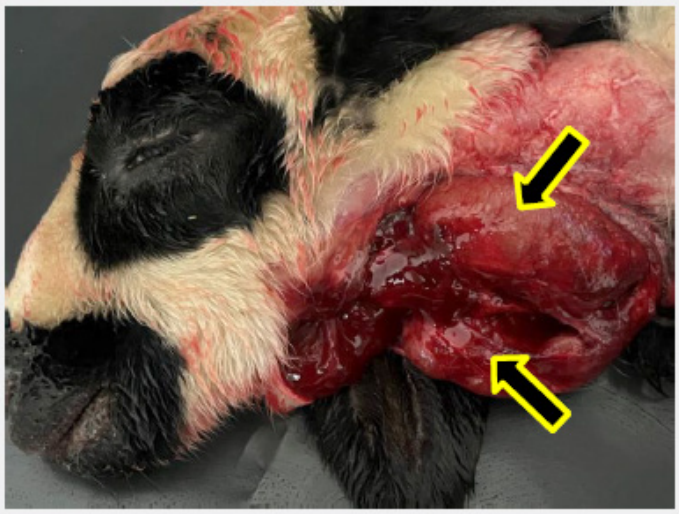

Figure 2: Thyroid gland with bilaterally enlarged lobes (arrows), lamb with colloid goiter.

Figure 3: Diffusely enlarged left and right lobes of the thyroid gland of a lamb with colloid goiter (red arrows). Edematized cut surface with single cysts in the glandular parenchyma (black arrows).

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Microscopic findings

Micro lesional changes in both lobes of the thyroid gland were expressed in dilatation of the follicles and their filling with colloidal matter mixed with desquamated glandular epithelial cells. The majority of the follicles had severely thinned and torn walls due to the pressure atrophy that had occurred due to the excessive amount of produced colloid, which had an eosinophilic color. (Figure 4). In individual follicles, the glandular epithelium was hypertrophied and hyperplastic, in places indented into the lumen of the follicles. In a large part of the epithelial cells, processes of vacuolization, disintegration, desquamation and necrobiosis were observed (Figure 5). In contrast, we [13] observed single enlarged hyperplastic follicles, and multiple ones with papillary indentations into the lumen. Similar changes to those found by us in the thyroid gland of autopsied lambs have been described in children with goiter by Bhardwaj [14]. Single blood vessels of small size were observed between the individual follicles. Analyzing the pathohistological changes in both lobes of the thyroid gland, we made a pathohistological diagnosis – colloid goiter. Similar to us [15] and [16] have diagnosed congenital goiter in goats after observing microscopic changes in the thyroid parenchyma. Which proves the reliability and application of histopathological examination in cases of goiter in animals. Nourani and Sadr, [16] describe the pathomorphological changes in goiter with follicular cell proliferation. Western authors [17] reported on a histopathological analysis of 49 glands from cattle with goiter. They classified the morphological changes in the follicles into four grades, which have significant diagnostic value in the disease. They described that normal thyroid follicles in cattle are round to oval, covered with a single layer of cuboidal epithelium. And in goiter, the hyperplastic follicles had hypertrophied columnar cells with an oval nucleus located at the basal pole.

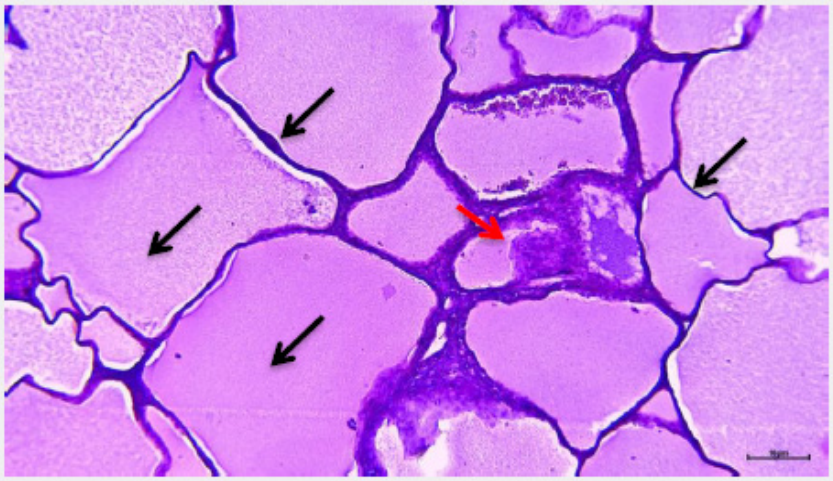

Figure 4: Dilated follicles with thinned walls and excessive colloid (black arrows). Hyperplastic glandular epithelium (red arrow), thyroid gland with colloid goiter, lamb, H/E, bar=10 μm.

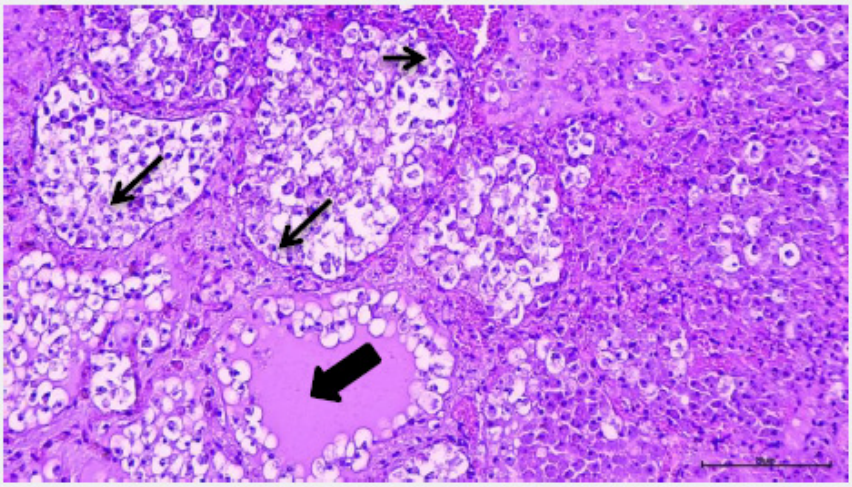

Figure 5: Follicles with vacuolization of the cytoplasm, disintegration and desquamation of the glandular epithelial cells from the basement membrane (black arrows), colloid (large arrow), thyroid gland with colloid goiter, lamb, H/E, bar=10 μm.

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The microlesional changes described by us correlate to some extent with those of researchers such as (Özlem et al., 2005). They diagnosed microscopic goiter in newborn twin and triplet goats. They reported hypertrophy and hyperplasia of follicular cells, with numerous papillary indentations in the lumen of collapsed follicles. Which were lined with multiple layers of hyperplastic follicular cells and overflowing with dense eosinophilic matter - colloid. No pathogenic microorganisms were detected from the microbiological study conducted for the isolation and identification of aerobic and anaerobic microbial pathogens.

Conclusion

In conclusion, the anamnesis data and the results obtained from the conducted studies help to clarify the possible factors that could provoke the appearance of congenital and acquired colloid goiter in ruminants, leading to serious economic losses for farmers in the sheep and goat sectors. The characteristic pathoanatomical and histopathological changes in the thyroid gland described by us have an accurate diagnostic and differential diagnostic value in colloid goiter from other similar pathological conditions. As well as their use in combination with other applicable diagnostic methods such as: ultrasound examination, measurement of T3 (triiodothyronine) and T4 (thyroxine) levels, iodine in the blood, and others. In order to prevent ewes and newborn lambs from goiter, it is necessary to avoid plants containing goitrogens and diets poor in iodine and other major, trace elements and vitamins. As well as to continuously add multivitamin-mineral premixes to the rations of ruminants.

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