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Short Communication

ANTERIOR UVEITIS AND CORNEAL OPACITY IN YOUNG CALVES INFECTED WITH *THEILERIA ANNULATA* - REPORT OF TWO CASES

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ABSTRACT: Theileriosis is one of the crucial vector-transmitted diseases in cross-bred dairy cattle in India and it is commonly caused by *Theileria annulata*. Frequently reported clinical signs in theileriosis were pyrexia, lymphadenopathy, conjunctival petechiae, and anemia. The purpose of the present communication report the anterior uveitis and bilateral corneal opacity in young crossbred calves due to theileriosis. Two Jersey crossbred calves aged between 22 to 40 days were presented to the clinic with a history of inappetence, pyrexia, severe tick infestation, corneal opacity, and proptosis. Ultrasonography of the eye revealed anterior uveitis and peripheral blood smears revealed the presence of piroplasms of *Theileria* in the erythrocytes and further confirmation was done by PCR assay. The calves were treated with injections of buparvaquone, flunixin meglumine, and vitamin A along with eye drops containing gatifloxacin, flurbiprofen, and carboxy methyl cellulose sodium.

Keywords: Calf, Theileriosis, Corneal opacity, Anterior uveitis.

Theileriosis is an important vector-borne protozoan disease of cross-bred dairy cattle in India, caused by *Theileria annulata* [1]. It causes severe economic loss to the dairy industry [2]. Clinical manifestations in young calves exhibit per-acute to acute or sub-acute to chronic forms and these depend on the effect of the pathogen on lymphoid tissues and the susceptibility of the hosts [3, 4]. The commonly reported clinical manifestations were pyrexia, generalized lymphadenopathy, anemia, anorexia, cachexia, respiratory distress, and petechiae in conjunctiva. Uveitis is defined as inflammation of the uveal tract and anterior uveitis is characterized by epiphora, conjunctival erythema, and corneal edema [5]. Documentation on the occurrence of ocular abnormalities due to theileriosis in young calves was very limited in cattle [6, 7]. Hence present communication reports the anterior uveitis, bilateral corneal opacity, and proptosis due to theileriosis in young calves.

The study

Two Jersey crossbred young calves aged between 22 to 40 days was visited by the Department of Veterinary Medicine, College of Veterinary Science, Proddatur with complaint of inappetence, pyrexia, prominent cloudiness of eyes, and severe tick infestation. Clinical examination revealed enlargement of prescapular lymph nodes, tachypnea (128 and 120 breaths/minute), tachycardia (167 and 180 beats/minute), increased rectal temperature (103.4°F and 102.8°F), proptosis and bilateral corneal opacity (Fig. 1 and Fig. 2). Ocular ultrasonographic examination was carried out with an ultrasound machine (Aloka Alpha 6) utilizing a 7.5 MHz linear transducer after padding the eyeball with ultrasound gel over the cornea [8]. Peripheral blood was collected for preparation of blood smears and examined under a 100x objective lens after staining with Leishman's stain. Whole blood and serum were for hematological and serum biochemical examinations. Further confirmation of the theileriosis was done by PCR assay using the extraction of total genomic DNA by using a QIAamp DNeasy blood Kit as per the procedure and the DNA was stored at -20°C [9]. DNA amplification was carried out by polymerase chain reactions of *T. annulata* merozoite-piroplasm surface antigen (Tams1) (F 5-GTAACCTTTAAAAACGT-3'), and (R5'-

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GTAACCTTTAAAAACG-3'); the end product was stained with ethidium bromide and visualized under 1.5% agarose gel under UV trans-illumination [10].

Results and discussion

Examination of blood smears revealed the presence of piroplasms in the erythrocytes (Fig.3) and it was further confirmed by the PCR assay with the specific amplicon (768 bp) of *Theileria annulata* merozoite-piroplasms surface antigen. Ocular ultrasonography revealed the anechoic vitreous humor without any echoic deposits; hyperechoic and missed type lines of the anterior and posterior lens capsules surrounded the anechoic lens. The contents in the anterior chambers with the hyperechoic dot-like materials which indicative of anterior uveitis (Fig. 4 and Fig. 5). Haematological study revealed the reduced hemoglobin (g/dL) 5.28 and 6.18, packed cell volume (%) 17 and 21, total erythrocyte count ($\times 10^6$ /µL) 3.11 and 3.38, mean corpuscular volume (fL) 54.7 and 62.1, mean corpuscular hemoglobin (pg) 17 and 18.3, mean corpuscular hemoglobin concentration (g/dL) 31.1 and 29.4, total leucocyte count ($\times 10^3$ /µL) 5.08 and 6.11, neutrophils (%) 22 and 26, lymphocytes (%) 63 and 60, eosinophils (%) 7 and 8, monocytes (%) 8 and 6. Serum biochemical parameters revealed serum total protein (g/dL) 7.38 and 7.13, albumin (g/dL) 1.62 and 1.99, globulin (g/dL) 5.76 and 5.14, AST (IU/L) 501 and 466, bilirubin (mg/dL) 2.85 and 2.37, blood urea nitrogen (mg/dL) 42.33 and 38.4, creatinine (mg/dL) 2.43 and 3.29, calcium (mg/dL) 7.38 and 6.67, phosphorous (mg/dL) 3.28 and 2.98, glucose (mg/dL) 63.82 and 58.84 respectively in calves 1 and 2 on the day of presentation. Both the calves were administered with an injection of buparvaquone at a dose rate of 2.5 mg/kg body weight intramuscularly on the day of presentation; an injection of flunixin meglumine @ 1 mg/kg intramuscularly daily for 3 days and advised three doses of vitamin A injection @ 2 ml (600000 IU) intramuscularly at weekly intervals [11], eye drops contacting gatifloxacin (0.3% w/v), flurbiprofen (0.03% w/v) and carboxy methyl cellulose sodium (0.5% w/v) twice in a day for a week. Deltamethrin spray (1.25% EC), was applied over the calves to control tick infestation. Post-therapeutic improvement of the condition was enquired about through phone conversation and noticed the normal activity and a reduction in proptosis but opacity persisted by the third day. Further, both calves were advised to continue with topical eye drops but owners are not interested in continuing the medication because both the calves were blind even after therapy.

Documented clinical and hematological changes were in association with the previous studies [12]. Development of pyrexia, anemia, anorexia, and emaciation might be due to the release of inflammatory cytokines by the infected red blood cells. In the present study, theileriosis was identified by the demonstration of piroplasms in red blood cells, and further confirmation was done by PCR assay. Calves showed severe anemia due to the overproduction of cytokines and reactive oxygen species, which is a significant feature of theileriosis [13]. Oedema and proptosis are due to the infiltration of inflammatory cells with the accumulation of glycosaminoglycan and the enlargement of extraocular muscles [14]. Different types of cytokines are going to activate the lymphocytes and can cause the proliferation of fibroblast cells further causing the release of free oxygen radicals which can play a major role in the ocular signs. In cattle, the development of the ocular abnormalities due to theileriosis was limited, and corneal opacity by the invasion of the cornea, lens, and iris by leucocytes. Buparvaquone is considered the drug of choice for the treatment of theileriosis and it acts mainly on the macroschizonts and intraerythrocytic piroplasms. The reported viral diseases that can cause ocular signs in cattle were a). Infectious bovine rhinotracheitis (IBR) with signs of conjunctivitis, ocular discharge, chemosis, conjunctival injection, and multiple white foci over the palpebral and bulbar conjunctiva; b). Bovine virus diarrhea - Mucosal disease (BVD-MD) with signs of cataracts, chorioretinitis, retinal dysplasia, optic neuritis, retinal hemorrhages, and microphthalmia; c). Malignant catarrhal fever (MCF) with signs of conjunctivitis, anterior uveitis, interstitial keratitis, scleritis, and retinal vasculitis; d). Bovine leukemia virus (BLV) with signs of the orbital tumor as lymphosarcoma with exophthalmos [15]. The reported parasitic infections with ocular signs were microfilariosis, thelaziosis, and trypanosomosis [16, 17, 18].

Ocular ultrasonography is useful for the evaluation of intraocular abnormalities and for identifying localized lesions of different types of infectious diseases. The contents in the anterior chambers with the hyperechogenic dot-like materials in the eyes which indicative of anterior uveitis [19]. In the case of anterior uveitis, signs like lymphocytic vasculitis, uveitis, and keratitis were indicative of immunologically mediated diseases of the eyes. Mononuclear infiltration and accumulation of fibrin in the anterior chamber and vitreous is considered anterior uveitis and was associated with antigen-antibody responses. The

Fig. 1. Enlarged prescapular lymph node and corneal opacity.

Fig. 2. Bilateral corneal opacity and proptosis.

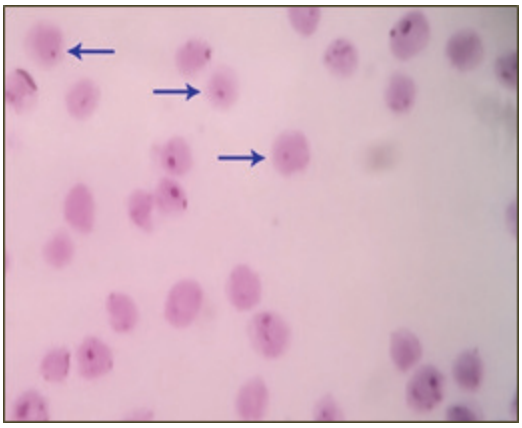

Fig. 3. Presence of intra erythrocytic piroplasms of *Theileria* (1000x).

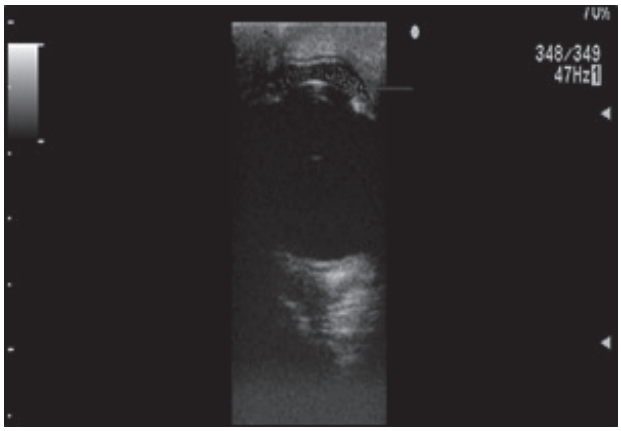

Fig. 4. Ultrasonography of eye - infiltrates in the anterior chamber of eye.

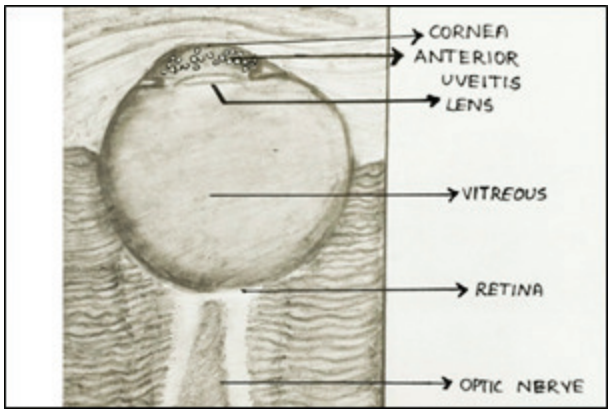

Fig. 5. Sketch diagram depicting the anterior uveitis.

reported complications of anterior uveitis were macular edema, retinal scarring, glaucoma, cataracts, optic nerve damage, retinal detachment, and permanent loss of vision [5]. In the present study, loss of vision was noticed even after starting medications it might be due to a delay in the presentation of cases to the clinic. Early intervention can provide a favorable prognosis. In the previous reports, few authors reported eyeball bulging, hyperemia of the conjunctiva, edema of the eyelid, and chemosis due to theileriosis [20] but in the present study report of anterior uveitis, proptosis, and corneal opacity were documented. Very limited reports on the ocular findings in young calves with theileriosis and most of large animal practitioners may overlook the ocular signs in conjunction with fever, lacrimation, enlargement of superficial lymph nodes, and anemia in theileriosis.

As theileriosis is a vector-borne disease, control of vectors can reduce all forms of theileriosis. The use of different acaricides to control the ticks is advocated,

but the development of resistance to the drugs is becoming a great problem that requires alternative approaches [21, 22, 23].

Conclusion

Present communication reports the rare clinical fining as bilateral corneal opacity and anterior uveitis in young calves due to theileriosis.

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