

## CYTOLOGICAL DIAGNOSIS OF ETHMOID CARCINOMA IN A CROSS BRED COW WITH CONCURRENT THEILERIOSIS

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### SUMMARY

This report describes a case study on concurrent occurrence of ethmoid carcinoma and theileriosis in a five year old cross bred cow in a private farm at Kannur district of Kerala. The Holstein Friesian crossbred cow had an anamnesis of intermittent oral breathing, epistaxis, exophthalmia and respiratory distress. Physical and clinical examination of the animal revealed presence of space occupying mass within the nasal cavity. Hematological examination revealed moderate anaemia and presence of theilerial piroplasms within the erythrocytes. Cytological examination of the nasal swabs and washings revealed presence of large sheets of round to polygonal-shaped epithelial cells with ropy chromatin, multiple nucleoli, moderate anisocytosis and anisokaryosis. Some other cells had moderate bluish cytoplasm with multiple vacuoles. Thus, on the basis of clinical, hematological and cytological examination, this case was diagnosed as ethmoid tumour with concurrent theileriosis.

**Keywords:** Cattle, Ethmoid tumour, Kerala, Theileriosis

Ethmoid carcinoma is an important bovine malignant neoplasm arising from the mucosa lining the ethmoturbinate bone. These types of tumours were first recorded in cattle in Kerala during 1960s by Rajan *et al.* (1972). Since then, the state of Kerala has an established endemic state and hence often referred as enzootic or endemic ethmoidal tumours (Stinson and Reznik, 2017). It is thought to occur due to some hereditary reasons or involvement of a virus or a carcinogenic mycotoxin (aflatoxin) based on epidemiological features of these tumours (Rajan, 1987). The condition has been recorded in many species like buffaloes, pigs, horses, sheep, goats, deer, other wildlife etc. (Balasubramaniam *et al.*, 2015; Pramod *et al.*, 2014; Zaruby *et al.*, 1993; De las Heras *et al.*, 2003; Rajan *et al.*, 1982; Rajan, 1987). These tumours arise unilaterally or bilaterally in the ethmoid turbinates and they have great potential for further expansion, invasion and protrusion into adjacent structures like paranasal sinuses, common nasal meatus and nasopharynx causing compression of the surrounding structures (De las Heras *et al.*, 1991; Zaruby *et al.*, 1993). Theileriosis is one of the economically important arthropod borne haemoprotozoan diseases of cattle especially of the cross-bred cattle in the tropical countries. *Theileria annulata*, responsible for bovine tropical theileriosis, is widely reported from various states of India. However in Kerala, *Theileria orientalis*, responsible for oriental theileriosis, previously considered as a benign or mild disease has been

reported, which emerged as a fatal disease causing fever, anemia, jaundice, laminitis, enteritis and abortions in bovines (Aparna *et al.*, 2011; McFadden *et al.*, 2011). A prevalence of 16 percent has been reported in cattle population of north Kerala which was suspected to be maintained through domestic-sylvatic interaction between herbivores through the tick vectors, *Haemaphysalis* sp. (Nair *et al.*, 2011). Economic impact of theileriosis in India due to *T. annulata* has been estimated to be \$384.3 million (Kumar *et al.*, 2018). This paper describes the clinical, hematological and cytopathological features of ethmoid tumour in a naturally infected cow with concurrent theileriosis from Kannur district, Kerala.

A five year old female crossbred Holstein Friesian cattle, maintained in a farm at Kottiyoor, Kannur district, Kerala was presented with history of intermittent oral breathing and epistaxis (Fig. 1a), facial abnormalities, exophthalmia (Figs. 1b and 1c), respiratory distress, loss of appetite, fever (103 °F) and decreased milk production. The symptoms of intermittent unilateral discharge from the left nostril persisted more than 2 months prior to presentation, which varied from blood-tinged to foul smelling mucopurulent nature. The animal had occasional open mouth breathing along with presence of mucopurulent nasal discharge and anorexia. Intermittent cessation of nasal discharge resulted in resumption of nasal breathing and thereby resumption of proper feed intake. Intermittent anorexia led to extreme emaciation and debility; that the

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Fig. 1. Five year old cross bred Holstein Friesian cow on initial presentation with epistaxis (1a), facial deformity and exophthalmos (1b and 1c)

initial weight (450 kg) was considerably reduced to one half (200kg). Percussion of the left frontal and maxillary sinuses revealed duller sounds than the right frontomaxillary sinuses indicating the presence of space occupying mass within the sinuses.

Blood sample, nasal swab and nasal washings were collected for hematological and cytological examinations, respectively. Hematology revealed moderate anaemia (6.5 g%) and rest of the parameters were unremarkable as given in Table 1. Microscopical examination of Giemsa stained peripheral blood smears demonstrated the typical rod shaped intra-erythrocytic piroplasms (++++) with trailing cytoplasm suggestive of *T. orientalis* (Fig. 2).

Direct nasal smears and cyto-centrifuged preparations of fluid from the bovine nasal washings revealed two types of cell clusters. Sheets of columnar to polygonal-shaped cells containing vacuoles in cytoplasm with moderate anisocytosis and anisokaryosis (Fig. 3a) were observed. These cells had round nuclei with rosy chromatin, multiple nucleoli and a small amount of slightly basophilic

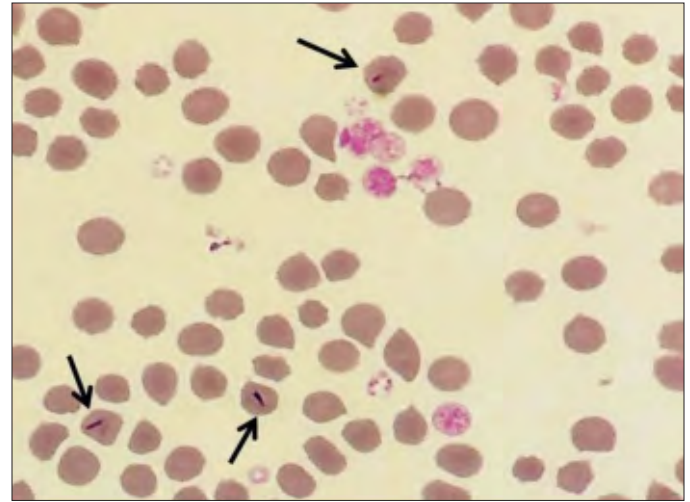


Fig. 2. Giemsa-stained thin blood smear showing characteristic rod shaped intra-erythrocytic piroplasms (black arrows). Giemsa  $\times 1000$

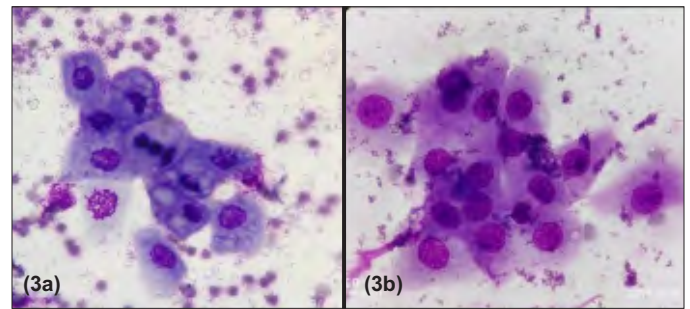


Fig3. Cytological smear from the nasal washings from the cow showing clusters of round to polygonal-shaped epithelial cells. Giemsa  $\times 1000$

cytoplasm. Acinar-like arrangements having secretory products were evident within the cell cluster indicative of glandular origin. Similarly, large clusters of round to polygonal-shaped epithelial cells with distinct cell boundaries with round nuclei showing rosy chromatin, distinct nucleoli with a small to moderate cytoplasm with squamous differentiation. (Fig. 3b) Hence, the cytopathologic interpretation suggests the case as adenocarcinoma with moderate squamous differentiation.

An intranasal mass in cattle may be related to chronic inflammatory conditions like foreign body reaction or granuloma and neoplasms like ethmoidal adenocarcinoma, fibrosarcoma, schwannoma, osteoma, osteosarcoma, myxoma, ossifying fibroma etc. (Balasubramaniam *et al.*, 2015; Kumar *et al.*, 2016; Singh *et al.*, 2016). Neoplasms of the nasal passages and paranasal sinuses in large animals account for less than 0.1% of all respiratory neoplasms (Sato *et al.*, 2017). These are not uncommon in ruminants and incidence in individual herds or flocks may be sufficient to indicate an infectious etiology. The location of lesions is usually in front of the ethmoid bone which is mostly unilateral but may be bilateral sometimes with the

**Table 1**

**Haematological changes in the affected cow**

| Parameters                  | Observed values | Reference values | Key findings     |
|-----------------------------|-----------------|------------------|------------------|
| Haemoglobin (g/dl)          | 6.5             | 8-15             | Moderate anaemia |
| PCV (%)                     | 17.4            | 24-46            |                  |
| RBC count (millions/cu.mm)  | 3.31            | 5.0-10           |                  |
| WBC count (thousands/cu.mm) | 4.7             | 4.0-12           |                  |
| Neutrophil (%)              | 17              | 15-33            |                  |
| Lymphocytes (%)             | 69              | 45-75            |                  |
| Monocyte (%)                | 8               | 0-8.0            |                  |
| Eosinophil (%)              | 6               | 0-20             |                  |
| Platelet (lakhs/cu.mm)      | 0.82            | 1.0-8.0          |                  |

appearance of adenocarcinomas of moderate malignancy. It may generally progress towards the brain in the advanced aggressive stages completely filling the nasal sinus causing severe respiratory distress, protrusion of eyeball, nervous signs etc. (De las Heras *et al.*, 1991; Radostits *et al.*, 2000). It is reported that the disease is common in the age groups of 6-9 years (Stinson and Reznik 2017). However in this case, affected animal is of five years old with clinical signs of respiratory distress, exophthalmia and epistaxis. Rajan (1987) reported that the disease occurrence is high in cross bred cattle in accordance with this study. The intermittent oral breathing and respiratory distress may be due to the presence of mass occupying lesions which could have resulted in compression of the surrounding structures like nasal passages. The exophthalmia or protrusion of eye ball, facial abnormalities and epistaxis in this case also indicates tumour growth progressing into the sinus, cribriform plate and the brain as similarly reported by Pramod *et al.* (2014). It could be opined that the stress caused by the tumour growth might have made the animal susceptible to theileriosis (Yam *et al.*, 2018). The loss of appetite, fever etc., might be due to the disease process of the tumour, which would have probably aggravated by concurrent theileriosis. The moderate anemic status may be due to theileriosis or due to loss of blood by epistaxis (Yam *et al.*, 2018). When presented with a suspected case of ethmoid tumour, additional diagnostics like radiography, histopathology, immunohistochemistry and/or polymerase chain reaction (PCR) are required to make a definitive diagnosis. However, in the present case, the case was diagnosed based on the clinical, hematologic and cytologic examinations. Once the diagnosis is arrived, the confirmed patient had been separated from rest of the herd to avoid the spread of the condition. In this case, the animal was treated for theileriosis with Buparvaquone @ 2.5mg/kg intramuscularly once and was found negative on the follow up blood check two weeks later. Euthanasia was not resorted and the animal is maintained under palliative care to satisfy owner's sentiments and the animal is alive till date. It can be concluded that further studies are required to understand the etiology, transmission and epidemiology of the ethmoid tumour in the state.

## REFERENCES

- Aparna, M., Ravindran, R., Vimalkumar, M.B., Lakshmanan, B., Ramesh Kumar, P., Kumar, K.A., Promod, K., Ajithkumar, S., Ravishankar, C., Devada, K. and Subramanian, H. (2011). Molecular characterization of *Theileria orientalis* causing fatal infection in crossbred adult bovines of South India. *Parasitol. Int.* **60**(4): 524-529.
- Balasubramaniam, G. A., Balachandran, P., Arulmozhi, A., Madheswaran, R., Sivaseelan, S., and Srinivasan, P. (2015). Ethmoidal adenocarcinoma with pulmonary metastasis in a buffalo—a case report. *Indian J. Vet. Pathol.* **39**(2): 164-165.
- De las Heras, M., Ortin, A., Cousens, C., Minguijon, E. and Sharp, J.M. (2003). Enzootic nasal adenocarcinoma of sheep and goats. *Curr. Top. Microbiol. Immunol.* **275**: 201-223. doi:10.1007/978-3-642-55638-8\_8.
- De las Heras, M., Garcia de Jalon, J.A. and Sharp, J.M. (1991). Pathology of enzootic intranasal tumor in thirty-eight goats. *Vet. Pathol.* **28**(6): 474-481.
- Kumar, S., Mohmad, A., Parthasarathi, B.C., Fular, A, Gupta, S. and D. Singh. (2018). Current epidemiological status of bovine theileriosis in Indian scenario. *Ann. Clin. Cytol. Pathol.* **4**(1): 1090.
- Kumar, V., Vadalia, J.V. and Bhadaniya, A.R. (2016). Diagnosis and management of nasal granuloma in Gir cattle. *Intas Polivet.* **17**(2): 519-521.
- McFadden, A.M.J., Rawdon, T.G., Meyer, J., Makin, J., Morley, C.M., Clough, R.R., Tham, K., Müllner, P. and Geysen, D. (2011). An outbreak of haemolytic anaemia associated with infection of *Theileria orientalis* in naive cattle. *N.Z. Vet. J.* **59**(2): 79-85.
- Nair, A.S., Ravindran, R., Lakshmanan, B., Kumar, S.S., Tresamol, P.V., Saseendranath, M.R., Senthilvel, K.R.J.R., Rao, J.R., Tewari, A.K. and Ghosh, S. (2011). Haemoprotozoa of cattle in northern Kerala, India. *Trop. Biomed.* **28**(1): 68-75.
- Pramod, S., Vijayan, N., Nair, N.D., Usha, A.P., Gopalakrishna, R., Tirupathi, V. and Lalithakunjamma, C.R. (2014). Gross and immunohistochemical studies on undifferentiated ethmoid carcinoma in an indigenous pig. *Veterinarski. arhiv.* **84**(1): 97-102.
- Radostits, O.M., Gay, C.C., Blood, D.C. and Hinchcliff, K.W. (2000). *Veterinary Medicine* (9<sup>th</sup> Edn.), W.B. Saunders, London.
- Rajan, A. (1987). Carcinoma of the mucosa of the ethmoid in domestic animals. *Ann. Rech. Vét.* **18**(1): 13-17.
- Rajan, A., Sivadas, C.G., Krishnan, N.M. and Maryamma, K.I. (1972): Incidence and pathology of tumors of the paranasal sinuses in domestic animals. *Kerala J. Vet. Sci.* **3**: 83-101.
- Rajan, A., Sreekumaran, T. and Sulochana, S. (1982). Carcinoma of the mucosa of the ethmoid in the Deer (*Axis axis*). *Vet. Pathol.* **19**(4): 458-460.
- Sato, R., Une, Y., Madarame, H., Hanami, H., Kanai, E., Murakami, H., Tsukamoto, A., Suzuki, T., Ochiai, H., Kikuchi, M. and Tanaka, H. (2017). A nasal osteoma with an acute course in a Japanese black heifer. *J. Vet. Med. Sc.* **79**(7): 1220-1224.
- Singh, C.K., Sangwan, V., Anand, A., Gupta, K. and Mahajan, S.K. (2016). Myxoma in the nasal cavity of a Holstein cross bred cow. *Isr. J. Vet. Med.* **71**(4): 45-48.
- Stinson, S.F. and Reznik, G. (2017). Nasal Tumors in Animals and Man Vol. II (1983): Tumor Pathology. CRC Press, Boca Raton. pp. 200-203.
- Yam, J., Bogema, D.R. and Jenkins, C. (2018). Oriental Theileriosis. In: Ticks and Tick-Borne Pathogens. Abubakar, M. and Perera, P.K. (Edts.). IntechOpen. pp.1-31.
- Zaruby, J.F., Livesey, M.A. and Percy, D.H. (1993). Ethmoid adenocarcinoma perforating the cribriform plate in the horse. *Cornell Vet.* **83**(4): 283-289.