Research Article

CLINICAL STUDY ON OCULAR SQUAMOUS CELL CARCINOMA IN CATTLE

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Abstract: Bovine ocular squamous cell carcinoma is the most economically important and malignant tumour affecting large animals. The study was undertaken to determine the of ocular neoplasms based on animal characteristics like age, sex, circumocular apigmentation, type of grazing. Gross examination of ocular tumor was carried out with respect to involvement of eye, site of ocular tumor, size of tumour, clinical symptoms and appearance of tumour. Tumors were surgically excised on standard surgical procedure and subjected to histopathological examination. Most of the ocular neoplasms diagnosed were squamous cell carcinoma on histopathology, mostly located in the nictitating membrane involving third eyelid cartilage. Based on the keratinization, squamous cell carcinoma is classified as well differentiate squamous cell carcinoma (75%) and poorly differentiate squamous cell carcinoma (25%).

Keywords: *Cattle, Histopathology, Squamous cell carcinoma*

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Introduction

Bovine ocular squamous cell carcinoma (OSCC) also called "Cancer eye" represents the most economically important and malignant tumour among tumours affecting large animals. The economic impact includes whole carcass condemnations of about 12.6% [5]. The aetiology and predisposition of the disease is multifactorial, includes genetic susceptibility, breeds with circumocular apigmentation, age, ultraviolent radiation, viruses like Bovine Papilloma Virus and Bovine Herpes Virus [1].

Ocular squamous cell carcinoma is most common in the areas, where cattle located in warm and dry summer, autumn and where the mean daily sunlight period over the year is 8 to 10 hours [10]. The ocular squamous cell carcinoma is classified as, well differentiated, moderately differentiated and poorly differentiated based on presence and intensity of keratinization, squamous differentiation of neoplastic cells and island formation in cattle [2, 4].

The most common sites of development of ocular squamous cell carcinoma are third eyelid and palpebral conjunctiva. It develops through a series of premalignant stages called plaques, and papilloma in turn eventually develops into carcinoma. The carcinomas will appear nodular, cauliflower like growth with bloody, ulcerated, friable and foul smelling. History, clinical symptoms, exfoliative cytology, histopathology of tumour sample has high diagnostic importance in diagnosis of this tumour. Treatment of ocular squamous cell carcinoma depends on location of tumour and degree of invasion into the surrounding tissues.

Surgical procedures include eyelid wedge 2 resection, third eyelid resection and enucleation. It is typically performed by excising satisfactory surgical margin of 0.5-1.0 cm. Surgical treatment is not a complete cure for this disease and recurrence rates of about 40-50% could be expected even after using surgical treatment. Prevention of recurrence is achieved by use of adjunctive therapy with or without surgical excision [6]. The current investigation based on clinical signs and histopathology was carried out to determine the ocular neoplasms of cattle in and around Hassan.

Materials and methods

The study was conducted on the clinical cases of cattle with third eyelid tumors, presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Hassan. Diagnosis was done based on the clinical signs and histopathological findings. Clinical signs and symptoms, nutritional status and type of husbandry, climatic conditions, age, sex and breeds of animals, as well as the size, location, shape, colour and any changes related to the tumours were recorded. Twelve female animals with ocular neoplasm were randomly selected for the study and divided into two groups of six cattle each. Animals were selected for sugery and adjuvant therapy after routine clinical, hemato-biochemical and ophthalmic examination. Surgical excision of the tumor was performed aseptically under sedatives and nerve blocks with standard surgical procedure. Alterations in haematological parameters and serum biochemical parameters were estimated on the day of surgery, 1st, 15th,30th and 60thday postoperatively. Tissue samples collected by excision from cases of growths in eye were fixed immediately in 10% Neutral Buffered Formalin for histopathological studies. Representative samples from the growths were processed by routine paraffin embedding technique. Sections of four to five-micron thickness were cut using. These sections were then stained with routine haematoxylin and eosin method. All tumours were histologically classified with regard to microscopic features, especially according to the degree of differentiation, either into well differentiated squamous cell carcinoma or poorly differentiated squamous cell carcinoma. Cases were observed for six months for recurrence.

Results
Clinical Studies

In the present study, most of the animals presented were black and white Holstein-Friesian dairy cows with circumocular apigmentation. Environmental conditions in these areas are warm and dry in summer and autumn and relatively cold in winter, with history of more than 6 – 8 hours grazing time.

Table-1 *Signalment and observations of cattle with ocular tumours*

Case No.	Breed	Age (Years)	Sex #	Affected eye	Feeding pattern	Symptoms	Gross appearance	Circumocular pigmentation
1	HF cross breed	5	Female	Right	Grazing outside for 6-8 hours	Epiphora	Papillomatous and pedunculated mass	Present
2	HF cross breed	6	Female	Left	Grazing outside for 6-8 hours	Epiphora	Cauliflower like appearance	Absent
3	HF cross breed	10	Female	Left	Grazing outside for 4 hours and stall feeding	Epiphora	Papule like appearance	Present
4	HF cross breed	6	Female	Right	Grazing outside for 4-6 hours and stall feeding	Epiphora	Cauliflower like appearance, crumbles on touching	Present
5*	HF cross breed	4	Female	Left	Grazing outside for 6-8 hours	Epiphora	Cauliflower like appearance	Absent
6	Non-descript	5	Female	Right	Grazing outside for 4-6 hours	Epiphora	Nodular hard mass	Present
1	HF cross breed	6	Female	Right	Grazing outside for 4-6 hours	Mucopurulent discharge	Cauliflower like appearance	Absent
2	HF cross breed	8	Female	Left	Grazing outside for 6-8 hours	Epiphora	Cauliflower like appearance	Absent
3	HF cross breed	4	Female	Left	Grazing outside for 4-6 hours	Epiphora	Cauliflower like appearance	Present
4	HF cross breed	6	Female	Right	Grazing outside for 6-8 hours	Bleeding was observed	Ulcerated hard mass	Absent
5	HF cross breed	7	Female	Left	Grazing outside for 5-6 hours	Epiphora	Papillomatous like growth	Present
6	Non-descript	7	Female	Left	Grazing outside for 6-8 hours	Epiphora	Cauliflower like appearance	Present

Table-2 *Showing the surgical treatment performed, histopathological diagnosis and sequelae of treatment*

SNo	Groups	Cattle No	Surgical treatment	Histopathological diagnosis	Sequelae of treatment
1	Group A	1	Tumour was excised including third eyelid	Well differentiated SQCC	No recurrence
2		2	Tumour was excised including third eyelid	Poorly differentiated SQCC	No recurrence
3		3	Tumour was excised including third eyelid	Well differentiated SCC	No recurrence
4		4	Tumour along with 0.5cm of healthy tissue was excised	Poorly differentiated SCC	No recurrence
5		5	Tumour was excised including third eyelid	Well differentiated SCC	Recurrence after 4 months after the Surgical excision
6		6	Tumour along with 0.5cm of healthy tissue was excised	Well differentiated SCC	No recurrence
7	Group B	1	Tumour was excised including third eyelid	Well differentiated SCC	No recurrence
8		2	Tumour along with 0.5cm of healthy tissue was excised	Well differentiated SCC	No recurrence
9		3	Tumour was excised including third eyelid	Poorly differentiated SCC	No recurrence
10		4	Tumour along with 0.5cm of healthy tissue was excised	Well differentiated SCC	No recurrence
11		5	Tumour along with 0.5cm of healthy tissue was excised	Well differentiated SCC	No recurrence
12		6	Tumour was excised including third eyelid	Well differentiated SCC	No recurrence

Fig-1 Gross appearance of ocular tumour in cattle

Cases were presented with clinical signs of epiphora, mucopurulent and bleeding. Gross appearance of the tumour mass was observed to be cauliflower like growth in most of the cases followed by papillomatous, papule, fleshy and nodular growths with varying sizes [Table-1] and [Fig-1].

Histopathological studies

On histopathological assessment of neoplastic cells, the squamous cell carcinoma was categorized histologically considering the arrangement of neoplastic cells, the number of mitotic cells, presence or absence of epithelial cell nests and keratin pearl formation [Table -2].

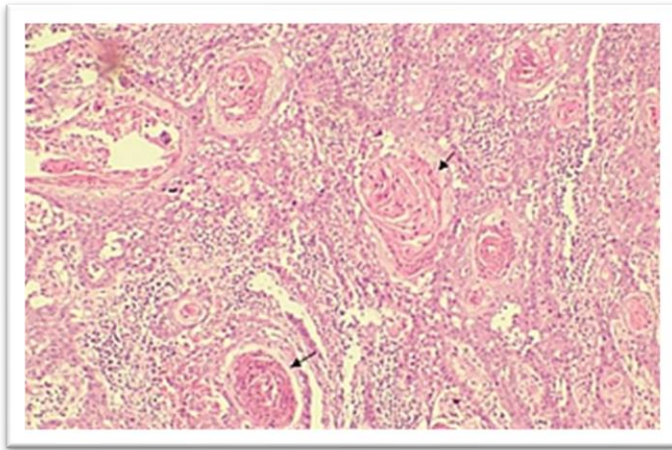Priyanka N., Nagaraja B.N., Shilpa V.T., Rajashailesha N.M. and Vinuthan M.K.
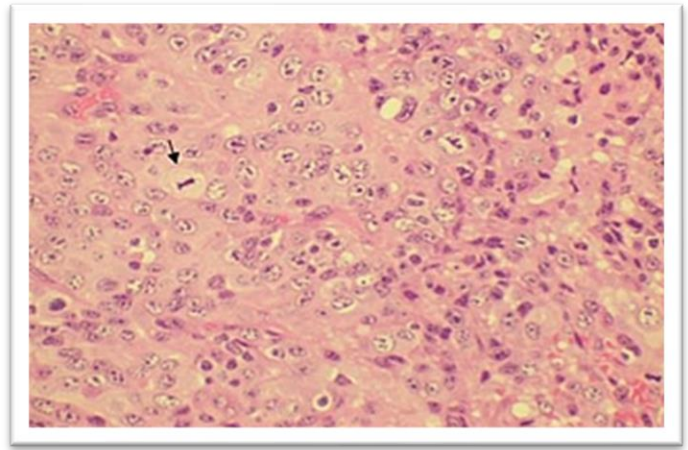
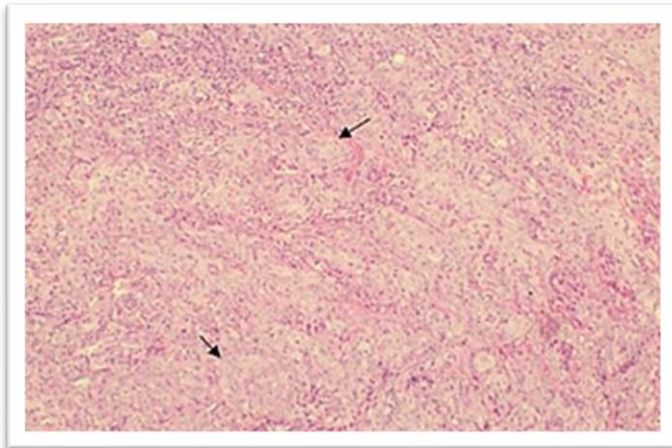Fig-2 Well differentiated SQCC

Fig 4 Mitotic cell

Fig-3 Poorly differentiated SQCC

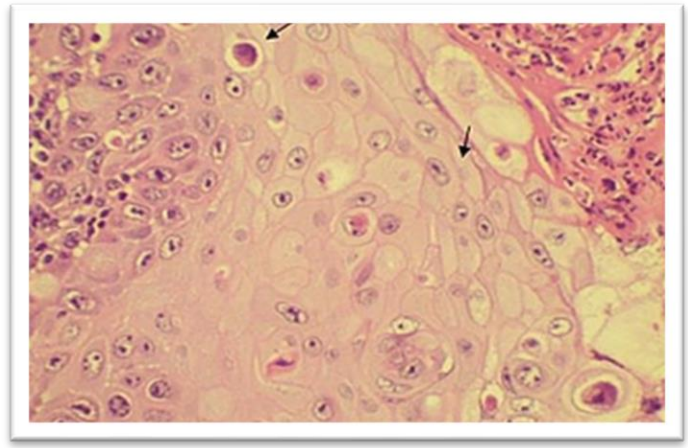Fig-5 Apoptotic cell

Well Differentiated Squamous cell carcinoma

In the present study, nine (75 %) out of 12 cases of SQCC were well differentiated. The well differentiated squamous cell carcinoma were characterized by presence of large polyhedral cells with large nucleolus arranged in cords or whorls with intercellular bridges forming epithelial cell nests and containing concentric laminations of keratin in the form of "Keratin pearls" [Fig-2]. The proliferating cells appeared in large groups without an admixture of stroma. The underlying tissues displayed signs of inflammation consisting of necrosis, haemorrhage with infiltration of large number inflammatory cells consisting of neutrophils and few mononuclear cells at the periphery of the tumour.

Poorly Differentiated Squamous cell carcinoma

In the present investigation, three (25 %) out of 12 cases of SQCC encountered were poorly differentiated. They were characterized by highly anaplastic cells with small hyper chromatic nuclei and with lack of keratin pearl formation [Fig-3]. Necrosis of groups of neoplastic cells at multiple areas as well as individual necrotic cells scattered throughout the tumour mass were observed. The mitotic figures [Fig-4] and infiltrations of inflammatory cells were observed in many areas. Many apoptotic cells [Fig-5] were also observed scattered throughout the microscopic field.

Discussion

The majority of cases of bovine ocular squamous cell carcinoma were observed in areas with warm and dry climatic conditions, despite the fact that incidence of bovine ocular neoplasms varies geographically in our country, the Holstein-Friesian breed is thought to be the most susceptible. Greater exposure to sunlight in warm and dry areas was a predisposing factor, but it must be mentioned that population of Holstein-Friesian's cattle are more among crossbred cows. Ocular squamous cell carcinoma is more in case female cattle.

The crossbreed cows were highly predisposed to ocular squamous cell carcinoma compared to the indigenous breed of cattle due to skin coat colour and hypopigmentation of the periocular tissues especially in HF crossbred cows [7]. The reason for highest incidence in females may be because the cows are kept in herd for breeding purpose as long as they remain productive and healthy for the economy reasons, but the male animals are kept for meat purpose and slaughtered at very young age. In and around Hassan, the families with small land holding uses local cows for draught purpose rather than males and crossbred cows for breeding and milch purpose.

Cattle affected with third eyelid tumour exhibited clinical symptoms like epiphora, mucopurulent discharges or bleeding from tumour appeared like cauliflower growth in most of the clinical cases, this was in agreement with Malalana, et al. (2010) [8], Patel, et al. (2019) [9] and Prasanna (2020). Cauliflower masses and papilloma like growths protruding through the palpebral fissure at the level of nictitating membrane or sclera- conjunctival junction was observed in our studies. Similar findings were observed by Pugliese, et al. (2014) [10] in cattle [11].

Conclusion

In the present study, the ocular cancer was diagnosed as squamous cell carcinoma based on histopathological findings and categorised as Well differentiated Squamous cell carcinoma and Poorly differentiated Squamous cell carcinoma based on intensity of keratinization and degree of anaplastic changes.

Application of research: Clinical study on ocular squamous cell carcinoma in cattle

Research Category: Veterinary Surgery and Radiology

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Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, 573202

Breed name: Cattle

Conflict of Interest: None declared

Ethical approval: Ethical approval taken from Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, 573202, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, 585401, Karnataka, India

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