

RE# MJVR – 0003-2015

PIGMENTARY KERATITIS IN DOGS – A STUDY ON INCIDENCE IN 83 CORNEAS

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ABSTRACT. Objective: To evaluate the incidence, etiology and progression of Pigmentary keratitis in dogs. **Materials and Methods:** A total of 83 corneas from 55 dogs of different breeds, sex and age were selected for the study. Signalment, anamnesis, nature of discharge and duration of illness was collected from all the animals. The progression of pigmentation was assessed by dividing the cornea in to four quadrants. Pigmentation grading, extent of pigmentation and mean pigment density were calculated by dividing the cornea in to 24 sectors. Schirmer tear test (STT), fluorescein dye test (FDT), tonometry, and slitlamp biomicroscopy and Corneal impression cytology were done. **Results:** Among the 55 animals, 51 dogs were Chinese Pug (92.7%) and the mean age was 33.13 ± 3.12 months. Among 55 animals, 28 were females (50.9%) and left cornea was affected in 44 animals (53.01%). The

mean duration of the disease as noticed by the owner was 07.21 ± 0.65 months. Most of the owners were totally unaware about the condition of the eye. Among 83 corneas, 40 (35%) showed pigmentation in all the sectors. 29 animals (53%) were affected with keratoconjunctivitis sicca (KCS) followed by 13 animals (24%) affected with entropion. The mean value of random blood sugar was 107.84 ± 0.99 and the mean intraocular pressure in the animals under the study was 40.64 ± 2.38 . The mean value of pigmentation grading, extent of pigmentation and mean pigment density was 32.59 ± 2.27 , 15.67 ± 0.83 and 1.37 ± 0.07 respectively. The mean value of Schirmer tear test was 10.31 ± 0.58 and under high power microscopy, Leishman's stained corneal impression cytology revealed infiltration of neutrophils in all the slides. **Conclusion:** It was concluded that Chinese pugs under the age of 3 years

are mostly affected and females and left eye is mostly affected. All the animals with pigmentation is having KCS.

Keywords: dog, pigmentary keratitis, KCS, pigmentation grading, STT, glaucoma

INTRODUCTION

The cornea, which comprises one-fifth of the fibrous tunic of the eye, in healthy conditions, is transparent in order to transmit light freely. The transparency of the cornea depends on number of features like its avascular nature, dehydrated state, unmyelinated nerves fibers, lack of pigmentation, non-keratinised epithelium, well organised lamellae in corneal stroma and the interval between collagen fibrils (1). The loss of transparency of the cornea is the first sign of corneal disease and when it is lost, due to any reason, the animal will become visually impaired or even blind.

The corneal pigmentation usually happens as a sequelae to chronic superficial keratitis or neovascularisation of cornea (panus) subsequent to chronic and repeated corneal irritation. The chronic phase of superficial keratitis is characterized by epithelial and stromal pigmentation associated with infiltrates of histiocytes, plasma cells and degranulated mast cells (2). When there is chronic inflammation of cornea, it will cause the underlying epithelium to become hyperkeratinized.

A high incidence of pigmentation of cornea in brachycephalic breeds like Chinese pugs is reported (3,4,5,6). Allgoewer and Hoecht (2010) reported

chronic superficial keratitis and subsequent pigmentation in German shepherd and its crosses and a high incidence of chronic superficial keratitis in German shepherds, Belgium shepherds, greyhounds and more rarely in Beaucerons, collies, poodles and Siberian huskies were also reported (3).

The exact reason for the development of pigmentary keratitis is still obscure. Hence, the study was undertaken to evaluate the incidence of pigmentary keratitis, its etiology and progression of pigmentation in dogs.

MATERIALS AND METHODS

The dogs with ophthalmological complaints specific to cornea, presented to University Veterinary Hospital, Kerala, India for the period from January 2011 to June 2014, were screened for the evaluation for corneal pigmentation. Detailed examination of the selected 55 dogs presented with corneal pigmentation of different ages, breeds and sexes were conducted. Among 55 dogs, 28 were having bilateral pigmentation and 27 had unilateral affection. A total number of 83 corneas were evaluated for pigmentation. Signalment, anamnesis, nature of discharge and duration of illness were collected. The progression of pigmentation was assessed after dividing the cornea into four quadrants *viz.* ventro-medial, ventro-lateral, dorso-medial and dorso-lateral and the quadrant which affected with pigmentation was observed. Pigmentation grading, extent of pigmentation and mean pigment density

were calculated by dividing the cornea into 24 sectors (2). Schirmer tear test (STT), fluorescein dye test (FDT), tonometry and slitlamp biomicroscopy were done in all the corneas. Corneal impression was made for cytology and stained with Leishman's stain and examined under high power of microscope.

RESULTS

A total number of 83 corneas with pigmentation were studied. Among the 55 dogs, 51 were Chinese Pug (93%), 2 were Lahsa Apso (4%) and 1 each Cocker Spaniel (2%) and Bull Mastiff (2%). The age of dogs, under the study, ranged from 2 months to 10 years with a mean value of 33.13 ± 3.12 months. 29 (53%) animals were aged between 1 to 3 years followed by 17 (30.9%) animals below 1 year of age, 8 (15%) animals above 5 years of age and 2 (4%) animals were between 3 to 5 years of age. Among 55 animals, 28 were females (51%) and 27 (49%) were males. Left cornea was affected in 44 animals (53%) and right cornea was affected in 39 animals (47%). The mean duration of the disease as noticed by the owner was 07.21 ± 0.65 months. Most of the owners were totally unaware about the condition of the eye and 5 (11%) owners reported that their pet is blind. 12 (27%) owners reported discoloration of the eye of their pet. 8 (18%) dogs had undergone treatment for corneal ulceration and under medication prior to presentation with the complaint of discoloration of the affected eye. Most of

the dogs were having purulent discharge from the eye at the time of presentation. Motile blood parasites were not observed in any of the dogs under the study.

Among 83 corneas, 40 (35%) showed pigmentation in all the sectors with varying pigmentation score and mean pigment density. Pigmentation of medio-ventral quadrant of cornea was the most affected quadrant in the study. Detailed ophthalmic examination of the corneas and adnexa of the animals affected with corneal pigmentation revealed that 29 animals (53%) were affected with keratoconjunctivitis sicca (KCS), 13 animals (24%) with entropion, 6 animals (11%) with periorbital dermatitis and subsequent entropion, excess nasal fold in 5 (9%) animals (Figure 1) and trichiasis in 2 (4%) animals. The mean value of random blood sugar (RBS) was 107.84 ± 0.99 which was in normal range. 5 animals (8%) showed RBS values above normal range suggestive of hyperglycemia and diabetes (mean value 220 ± 0.76). The mean



Figure 1. A pug with excess nasal fold

intraocular pressure of animals under the study was 40.64 ± 2.38 and this was higher than the normal range and suggestive of glaucoma.

The mean value of pigmentation grading in 83 corneas was 32.59 ± 2.27 . Among 83 corneas only 5 corneas (6%) showed pigmentation grade of 72 (fully pigmented). The values of pigmentation grading ranged from 8 to 72. The mean value of extent of pigmentation was 15.67 ± 0.83 . Out of the 83 corneas, 26 corneas (31%) showed pigmentation extending in all the sectors. The values of extent of pigmentation ranged from 4 to 24. The mean value of mean pigment density was 1.37 ± 0.07 . Out of the 83 corneas, 8 corneas (10%) showed mean pigment density of 3. The values of mean pigment density ranged from 0.3 to 3.

The mean value of Schirmer tears test (STT) was 10.31 ± 0.58 which was below normal range suggestive of keratoconjunctivitis sicca (KCS). The values ranged from 2 to 24. Out of 83 corneas, 36 corneas (43.3%) showed STT value less than 10. Under high power of microscope, corneal impression cytology revealed infiltration of neutrophils in all samples. Degenerative changes and presence of necrotic debris were noticed in few samples and presence of squamous cells was noted in samples of 5 corneas.

DISCUSSION

The popularity and increase in the number of Chinese pug may be the reason

for over-representation of this breed for ocular conditions affecting cornea (7). The presence of shallow orbits, excessive prominence of the globe, decreased corneal sensitivity, reduced tear film stability (8) the inherited corneal insufficiency, poor corneal reflex and lack of protective eye consciousness (9) were suggested as reasons for the high incidence of corneal lesions in pugs. Chronic pigmentary keratitis was considered to be an old age condition of eye in dogs and in the present study, the mean age of the animals affected with pigmentation was 33 months. Azoulay (2014) reported pigmentary keratitis in dogs with mean age of 7 years with a range from 3-14 years. Spontaneous Chronic Corneal Epithelial Defects (SCCED) and pigmentation was reported in middle aged to older dogs averaging 8 to 9 years of age. A high incidence of corneal pigmentation in females than males were reported (2,3,10) and this was contradicted by many (7,11). Bilateral affection of cornea was more and affection of left eye was predominant in the study and supported by many authors (3,7).

In the present study, it could be observed that pigmentation started mostly from the ventro-medial quadrant and progressed centrally. This might be due to increased irritation of the ventro-medial quadrant of cornea from concurrent conditions like entropion, trichiasis and periorbital dermatitis which were affecting ventro-medial quadrant of cornea (12). In many cases the pigmentation started at the periphery and progressed to the centre (13).

The dogs which were under treatment for corneal ulceration were presented with a central scar and peripheral pigmentation near the limbus which slowly progressed towards the centre. When a wound involving the corneal stroma heals there is transformation of keratocytes to fibroblast and collagen which is disorganized and resulted in scar formation. When neovascularization takes place for corneal healing the new blood vessel will carry melanin pigment from the limbal and perilimbal area and get deposited around the central scar and pigmentation results.

Keratoconjunctivitis sicca (KCS) affecting 29 animals was the most commonly occurring concurrent ophthalmic affection along with pigmentary keratitis and was supported by many (2,7,14). Entropion and entropion subsequent to periorbital dermatitis was the second highest concurrent affection or the reason for development of corneal pigmentation. This may be due to the fact that when there is entropion there can be inward deviation of eyelashes which constantly irritate the cornea, resulting in pigmentary keratitis (7). Trichiasis was another condition and this can also result in pigmentation by repeated irritation to the cornea and reported as major reasons for the development of epithelial and stromal pigmentation (15).

Diabetic dogs are predisposed to keratoconjunctivitis sicca because they have significantly reduced corneal sensitivity compared with control dogs (16). In the present study, 5 dogs were diabetic and the

rest of the dogs had random blood sugar values in the upper range and decreased corneal touch sensitivity. Diabetic dogs have a significantly reduced corneal sensitivity in all regions and are prone for development of KCS (17,18). The mean value of STT in diabetic dogs were 5.7 ± 10 which was suggestive of KCS and it was noted that when there was loss of corneal sensitivity, the constant irritation to the cornea by the excess nasal fold, entropion, periorbital dermatitis, trichiasis and KCS had resulted in hyperkeratinisation of the stratified squamous epithelium and subsequent corneal pigmentation (4).

The mean value of intraocular pressure (IOP) as measured with Tonopen-Vet on the day of presentation was 40.64 ± 2.38 and suggestive of glaucoma (19,20). The increase in thickness of the central portions of cornea due to the hyperpigmentation may be a reason for increase in IOP. The deposition of melanin pigment in the iridocorneal angle and subsequent blockage of the filtering mechanism of aqueous humour could be attributed to a high IOP (5).

Leishman's staining was done for the corneal impression cytology and it revealed presence of epithelial cells and infiltration of neutrophils. Degenerative changes and presence of necrotic debris, noncornified corneal epithelial cells were also noted (17,1). Presence of a few squamous cells were noted in 5 corneas (Figure 2).

From the study, it was concluded that decreased corneal sensitivity subsequent to hyperglycemia and KCS and constant

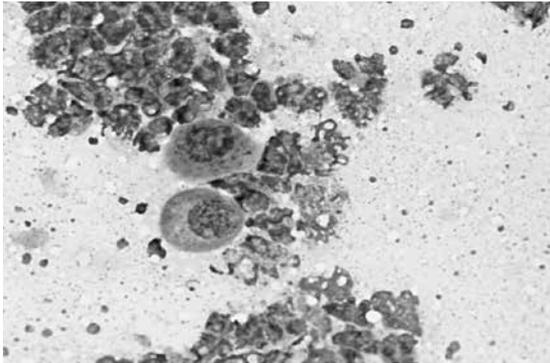


Figure 2. Corneal impression cytology showing squamous cells

irritation of the cornea due to entropion or trichiasis can be the main reasons for the development of pigmentary keratitis in dogs. The increase in IOP which develops secondary to pigmentation and glaucoma is not the reason for the development of pigmentary keratitis.

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