

Original Research Article

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Evaluation of Superficial Keratectomy for the Management of Pigmentary Keratitis in Pug Dogs

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ABSTRACT

Keywords

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The study was performed to evaluate the efficacy of superficial keratectomy for management of pigmentary keratitis in 8 healthy pugs that were presented with ophthalmological complaints specific to cornea. After a detailed ophthalmic examination, eight dogs with confirmed pigmentary keratitis were included in our study. All dogs showed progressive corneal pigmentation despite long term topical anti-inflammatory treatment with artificial tears and cyclosporine 2% BID, so surgery was planned. Animals were pre-medicated intramuscularly with combination of Atropine (0.04mg/kg), Acepromazine maleate (0.02mg/kg) and Butorphanol (0.2mg/kg) body weight. Propofol (4mg/kg body weight) was used for induction and anaesthesia was maintained with 1 to 2% Isoflurane. Surgically a layer of diseased cornea was removed with Beaver blade No.6400 and area was treated as a sterile corneal ulcer. Post-operatively complications included hyperemia, neovascularization, oedema, fibrosis and re-pigmentation. However recurrence of pigmentation was the major complication seen which limits the successful outcome of keratectomy.

Introduction

Pigmentary keratitis may also be termed as corneal melanosis or corneal pigmentation (Maggs, 2008). Variety of causes such as distichiasis, ectopic cilia, nasal fold trichiasis, insufficient tear production etc. cause irritation or chronic inflammatory response of the cornea and gradually lead to migration of the pigment (Westermeyer *et al.*, 2009). Immune-mediated insult due to ultraviolet rays in the sunlight seems to modify cornea

specific antigens leading to the initiation of auto-immune processes (Williams *et al.*, 1995). As a part of a wound-healing response after corneal trauma or with tear film deficiencies melanosis may also develop (Stiles *et al.*, 1995). Apart from gross eye examination, melanosis should only be used where corneal pigment (melanin) has been histologically identified as other compounds such as iron, adrenochromes and hemochromes can also cause corneal pigmentation (Spiteri *et al.*, 2012).

Till date no standard treatment has been determined and specific therapy chosen for pigmentary keratitis depends on the etiology. The goal of all therapies is to delay progression which in mild affected cases can be achieved by topical treatment with corticosteroids and cyclosporine (Esson 2015). Superficial keratectomy is recommended in patients that are nonresponsive to medical treatment which otherwise will lead to corneal vascularization, pigmentation and eventually blindness. In this technique depending on the corneal disease, epithelia and variable amounts of anterior stroma are excised and removed. The procedure involves the entire cornea or only a specific part of the cornea and postoperatively the wound is treated medically as corneal ulcer. Present study was undertaken to evaluate the efficacy of superficial keratectomy for management of pigmentary keratitis in dogs.

Materials and Methods

The dogs with ophthalmological complaints specific to cornea were presented to Veterinary Hospital GADVASU, Ludhiana and were screened for the evaluation for corneal pigmentation. Eight dogs with confirmed melanosis/pigmentary keratitis were included in this prospective study after clearance from animal ethics committee. All dogs showed progressive corneal pigmentation despite long term topical anti-inflammatory treatment with artificial tears and cyclosporine 2% BID. Detailed examination of the selected dogs presented with corneal pigmentation of different ages, breeds and sexes were conducted. The extent of corneal lesions, signalment, anamnesis, nature of discharge and duration of illness were collected. Prior to being subjected to surgery, each dog underwent an ophthalmic examination including Visual assessment (Menace response test, PLR test, and

Palpebral test), Schirmer tear test, Ultrasonography (12 and 18mHz) and Intraocular pressure measurement (Tono-Pen VET, Medtronic Solan, Jacksonville, FL, USA). The adnexa, the cornea, and the anterior segment (in mild and moderate cases) were examined by slit-lamp biomicroscopy. Severity of pigmentation was recorded as mild i.e. <25% of cornea (Fig. 1); moderate i.e. 25–50% of cornea; severe i.e. 50–75% of cornea; or complete pigmentation i.e. 100% cornea. Anaesthetic protocol included premedication with combination of Atropine @ 0.04mg/kg (Pyrolate® Neon Laboratories Ltd, Mumbai, India), Acepromazine maleate @ 0.02mg/kg (Ilium- Acepril-10® Troy Laboratories Pvt. Ltd, Australia) and Butorphanol @ 0.2mg/kg body weight (Butodol® Neon Laboratories Ltd, Mumbai, India) by intramuscular route. Induction was performed with Propofol @ 4mg/kg body weight (Neon Laboratories Ltd, Mumbai, India) given slowly by intravenous route “to effect” up to endotracheal intubation. Anaesthesia was maintained with 1 to 2% Isoflurane (Forane® Aesica Queenborough Ltd, UK). Acepromazine was either excluded or given at less dose from the premedication regimen of Pug breed dogs.

Patients were placed in lateral recumbency with affected eye in dorsal position. Soft bedding material was kept under the cranium of dogs to elevate and to position the head. Commercially available eye drape with operating window in the centre having dimensions about 5×5cm was used for draping the eye during surgery. Rest of body was covered with sterile drape to achieve proper asepsis during procedure. Two stay sutures with Vicryl 3-0 serving as traction sutures and Liberman’s speculum were used to hold the eye in position. After the onset of general anaesthesia surgical preparation of the eyes were carried out. Affected eyes were retracted out from the bony orbit just

sufficient for exposure and for the ease to carry out the surgery. Full pigment covering the whole cornea was removed in three eyes of three dogs and in five eyes of five dogs partially covered pigment was removed. The periphery of the diseased cornea was encircled with an incision using Beaver blade No.6400 (Fig. 2). The incision was made of sufficient depth to remove the base of the diseased cornea. A continuous stream of 0.9% saline was directed at the leading aspects of the corneal incision as it was performed. Once the lesion was outlined the edge of the keratectomy section was grasped carefully with teeth tissue forceps to permit separation of the diseased cornea from the underlying stroma (Fig. 3). The dissection plane within the stroma was kept in the same parallel lamellae throughout the procedure to prevent progressive deeper dissection into the stroma. Once the diseased cornea was completely separated tags of remaining stroma were carefully cut with the tenotomy scissors to obtain transparency (Fig. 4). Afterwards partial tarsorrhaphy was done with space left for administration of the medications. The histological section of the cornea collected from the healthy dogs, stained with hematoxylin and eosin, showed intact stratified squamous epithelium with distinct basement membrane (Fig. 5a) however at places small discontinuity in the lining mucosa was observed (Fig. 5b). The lesions were distinctly visible in the sections from the dogs with pigmentary keratitis (7). The sections showed thickening of the corneal epithelium and presence of a thick layer of keratin over the stratified squamous epithelium (Fig. 5c and 5d). Discontinuity in lining mucosa were more frequently observed in these animals (Fig. 5d).

Results and Discussion

A total number of eight corneas with pigmentation were studied in eight pugs. Six

out of eight dogs were female and two male. The age of dogs, under the study, ranged from 2 year to 8 years with a mean value of 5.6 ± 0.66 years. Left corneas were affected in 2 animals (25%) and right cornea in 6(75%). The mean duration of the disease as noticed by the owner was 4.40 ± 1.40 months. Most of the dogs were having purulent discharge from the eye at the time of presentation and some with sero-mucoid discharge representing the bacterial infection. Pigmentation of medio-ventral quadrant of cornea was the most affected quadrant in the study with three cases of full thickness involvement. The mean value of Schirmer tears test (STT) was 11.25 ± 2.99 mm which was below normal range suggestive of keratoconjunctivitis sicca (KCS). Out of 8 corneas, 5 corneas (62.5%) showed STT value less than 10. Blood picture revealed no abnormal changes. The intraocular pressure of animals under the study was 22.5 ± 1.26 mmHg and this was within the normal range. In cases with pigmentary keratitis corneal thickness ranged from 0.1cm to 0.2cm in ultrasonographic study of canine cornea (Fig 6). Tarsorrhaphy suture were removed after 15 days and eyes were evaluated for surgical outcome. Clinical examination showed initial opacity over the operated corneal surface after two weeks of surgical intervention. Soon the surgical area turned into an ulcer along with hyperemic crests which took longer time to heal (Fig. 7). Prominent neovascularization was observed in almost all cases till complete healing of the ulcer. In three cases postoperative ocular inflammation remained profound despite sticking to the routine medical treatment. This was seen especially in the cases involving higher degree of surgical trauma during keratectomy. In two cases excessive granulation tissue and hyperemia was evident after five weeks post-surgery which was controlled medicinally (Fig. 8). Slight corneal melanosis started to develop from the limbal margins in nasal quadrant in

about one month and gradual increase in melanosis covering the operated cornea again was observed. High degree of recurrence was observed almost in all cases which were managed thereafter with immune-modulator drugs. Pigmentary keratitis comprises of progressive deposition of pigment on the corneal and conjunctival surface which occurs in response to chronic irritation/ inflammation

(Maggs2008). Melanocytic cell migration from the limbal and perilimbal tissues leads to corneal pigmentation involving the corneal epithelium or stroma. Other signs of keratitis include corneal vascularization, stromal inflammatory cell infiltration, and granulation tissue formation (Bellhorn and Henkind 1966).

Fig.1 Mild pigment deposition over the medial cornea in a pug



Fig.2 Demarking of the pigmented area with Beaver 6400



Fig.3 Grasping of the superficial diseased corneal layer

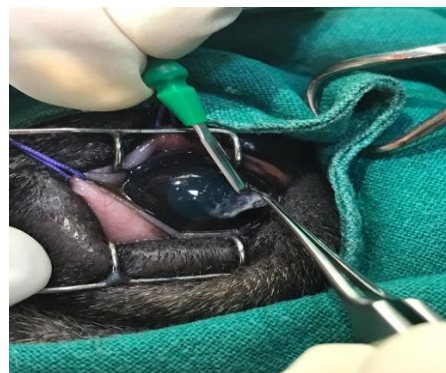


Fig.4 Superficial keratectomy performed in a diseased corneal area



Fig.5 Section of Cornea of dogs stained with Haematoxylin &Eosin stain showing (a) Cornea of control dog showing intact epithelial lining; (b) Cornea of control dog showing epithelial lining with erosion at one place. (c) Cornea of dog showing thicker epithelial lining with layer of keratin; (d) Cornea of dog showing epithelial lining with a layer of keratin with discontinuity in outer surface. Haematoxylin & Eosin stain x400

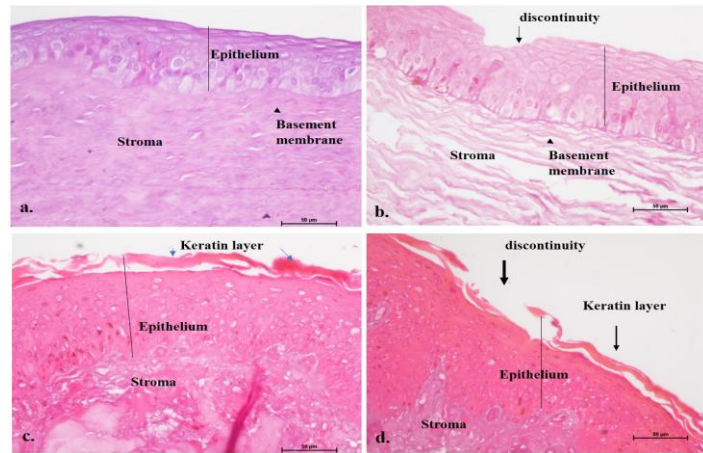


Fig.6 Pigmentary keratitis along with iritis in a 8 year old pug with increased corneal thickness of 0.17cm



Fig.7 (a) Medial corneal opacity 15 days post-operative, (b) Marginal stromal hyperemia 30 days post-operative,(c) Recurrence of corneal pigmentation after 60days post-operative

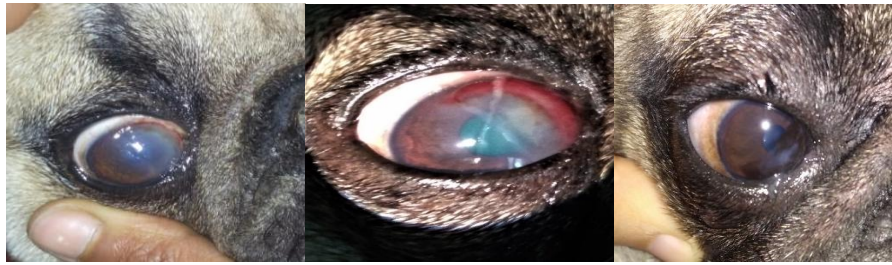
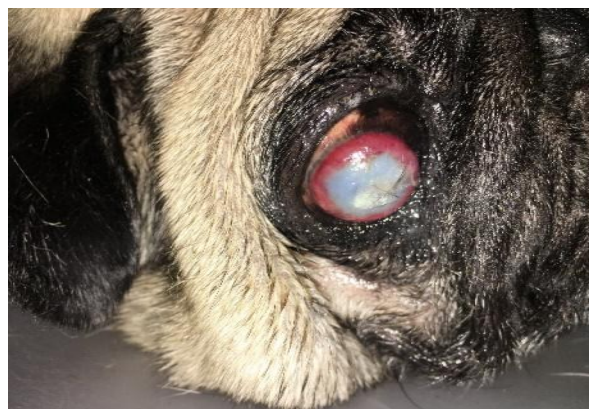


Fig.8 Corneal fibrosis and hyperemia after superficial keratectomy (30days PO)



The popularity and increase in the number of pug may be the reason for over-representation of this breed for ocular conditions affecting cornea (Krecny *et al.*, 2014). A high incidence of corneal pigmentation in females than males were reported (Azoulay2014) and this was contradicted by many (Tamilmahan *et al.*, 2013). Azoulay (2014) reported pigmentary keratitis in dogs with mean age of 7 years ranging from 3-14 years. Spontaneous Chronic Corneal Epithelial Defects (SCCED) and pigmentation was also reported in middle aged to older dogs averaging 8 to 9 years of age. Bilateral affection of cornea was more and affection of left eye was predominant and supported by many authors unlike our study which involved right eye affections (Krecny *et al.*, 2014). In the present study, it could be observed that pigmentation started mostly from the ventro-medial quadrant and progressed centrally. This could be due to increased irritation of the ventromedial quadrant of cornea from concurrent conditions like entropion,

trichiasis and periorbital dermatitis which were affecting ventro-medial quadrant of cornea (Renwick 1996). Kerato conjunctivitis sicca (KCS) affecting 5 animals was the most commonly occurring concurrent ophthalmic affection along with pigmentary keratitis and was supported by many (Williams and Mann2013). The mean value of STT were 11.25 ± 2.99 mm 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, periorbital dermatitis, KCS had resulted in hyperkeratinisation of the stratified squamous epithelium and subsequent corneal pigmentation (Labella *et al.*, 2013). Blood picture revealed no abnormal changes suggestive of no systemic infection. The mean value of intraocular pressure (IOP) as measured with TonopenVet on the day of presentation was 22.5 ± 1.26 mmHg which suggested no glaucomatous changes in the eyes. Ultrasonographic evaluation revealed no gross changes in the anterior and posterior eye

chamber of the eye except mild iritis which could be due to corneal inflammation/ irritation. Increased corneal thickness justifies the melanin pigment deposition.

From the study, it was concluded that superficial keratectomy was found to be an easy and effective technique for surgical management of pigmentary keratitis in dogs. However, the recurrence of pigmentation about 3-4 weeks after surgery was a major complication which warrants further studies for effective management of the condition.

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