## CASE REPORT

# CONGENITAL AND ACQUIRED OCULAR ABNORMALITIES IN A DOG: CLINICAL DESCRIPTION AND MANAGEMENT

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## ABSTRACT

Congenital ocular malformations, though rare, are clinically significant anomalies in veterinary ophthalmology. The most commonly observed congenital ocular anomalies in cats and dogs include microphthalmia, colobomatous defects, palpebral agenesis, and dermoids, which may occur either independently or in combination. This case report details the clinical evaluation, diagnosis, and surgical management of a dog presenting with two congenital ocular anomalies, concurrently with an acquired disorder. A one-year-old male Anatolian Shepherd Dog was referred to the Ankara University, Faculty of Veterinary Medicine, Animal Hospital Ophthalmology Clinic with bilateral conjunctivitis and prolapse of the third evelid gland. Ophthalmic examination revealed a well-defined dermoid lesion at the lateral canthus of the upper eyelid in the left eye, accompanied by palpebral agenesis located posterior to the dermoid tissue. The dermoid involved the bulbar and palpebral conjunctiva as well as the dorsal corneal surface. Surgical intervention was performed to excise the dermoid tissue and correct both the third eyelid gland prolapse and palpebral agenesis. Additionally, the prolapsed third eyelid gland in the right eye was surgically repositioned. The postoperative period was uneventful, and the patient was monitored for three months without complications. This report highlights the successful simultaneous surgical correction of ocular dermoid, palpebral agenesis, and third eyelid gland prolapse in a single procedure, demonstrating an effective approach for managing complex congenital ocular anomalies in dogs.

**Keywords:** Eyelid coloboma, ocular dermoid, ocular malformation, third eyelid gland prolapse

## **INTRODUCTION**

Congenital malformations ocular are rare but clinically significant anomalies. These malformations are thought to result from abnormal embryonic development, with genetic and environmental factors-such as exposure to toxic substances, nutritional deficiencies, and hypo- or hypervitaminosis A-also contributing to their formation (Cognard et al., 2023; Saraiva and Delgado, 2020). The most frequently observed ocular anomalies in cats and dogs include congenital microphthalmia, colobomatous defects, palpebral agenesis, and dermoid formations. Many of these structural abnormalities require surgical intervention and, in some cases, may even lead to permanent blindness in affected animals (Ofri, 2017).

Dermoids are congenital anomalies defined as the presence of histologically normal cutaneous tissue in an ectopic location due to aberrant tissue development during the embryonic period (Cathelin et al., 2022). Ocular dermoids are characterized by the presence of ectopic tissuesuch as skin, hair follicles, blood vessels, nerves, fibrous tissue, fat, and occasionally sweat glandson the cornea, conjunctiva, or eyelids (Balland et al., 2015). These abnormal structures, though rare across different animal species, have been reported in dogs (Badanes and Ledbetter, 2019), cats (Cathelin et al., 2022), horses (Makra and Jakab, 2018), cattle (Kumar et al., 2020), and guinea pigs (Wappler et al., 2002).

Third eyelid gland hyperplasia, also known as nictitating membrane gland prolapse or cherry eye, is an acquired condition most commonly observed in dogs, but has also been reported in cats, rabbits, various bird species, and wild animals. It occurs due to the displacement of the lacrimal gland of the third eyelid from its anatomical position and is clinically characterized by a visible red mass at the medial canthus. Although its exact etiology remains unclear, breed predisposition and environmental irritants are thought to contribute to its development (Cook, 2021; Oguntoye et al., 2022). This case report describes the concurrent occurrence of a rare ocular dermoid, coloboma, and third eyelid gland hyperplasia in a dog, detailing the clinical presentation, diagnosis, and treatment. It aims to emphasize the coexistence of congenital and acquired ocular disorders in veterinary ophthalmology, offering insights into their clinical management and therapeutic approaches.

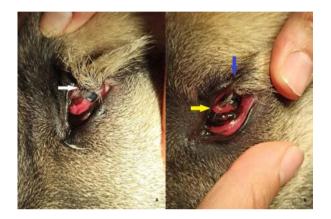
#### **CASE DESCRIPTION**

A one-year-old male Anatolian Shepherd Dog was presented to Ankara University Faculty of Veterinary Medicine Animal Hospital Ophthalmology Clinic with complaints of bilateral conjunctivitis and third eyelid gland prolapse. According to the history obtained from the owner, the dog had experienced persistent eye problems since puppyhood, exhibited reluctance to open its eyes, and had continuous ocular discharge despite regular cleaning. The dog was owned and lived in a rural area with a garden. It weighed approximately 40 kg and was fed a homemade diet.

An "Informed Consent Form" was obtained from the animal's owner prior to the examination and surgical procedure. All procedures in this case report were conducted in accordance with national animal welfare regulations, and no additional experimental interventions were performed.

Ophthalmic examination revealed severe purulent discharge and diffuse keratitis and scar tissue affecting the entire corneal surface of the left eye. Closer inspection identified a conjunctival dermoid measuring approximately 3 cm in length, originating from the lateral conjunctival fornix of the upper eyelid. This dermoid was covered with numerous hairs that irritated the corneal surface. Upon careful removal of the hairs to assess the cutaneous structure, the dermoid was found to extend toward the bulbar conjunctiva in the temporal canthal region, further progressing beneath the upper eyelid to involve the limbal area and a 4 mm-diameter region of the corneal surface. Additionally, a small dermoid fragment, a few millimeters in size, was detected on the palpebral surface at the lateral canthus of the upper eyelid, with long hairs protruding from it. Further detailed examination revealed the presence of palpebral agenesis, as the upper eyelid was incompletely developed up to the lateral canthus (Figure 1). Despite severe keratitis in the left eye, the visual response was positive, and the direct pupillary light reflex was normal in both eyes.

Surgical intervention was planned for the animal, which did not have any abnormalities in complete



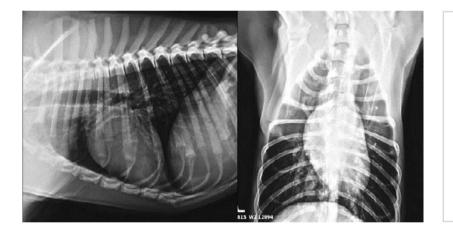
blood count (performed using a Mindray BC-5000 Vet hematology analyzer), serum biochemistry (analyzed with a Randox RX Monaco biochemistry analyzer) (Table 1), and thorax radiographs, except for mild tracheitis observed on the radiograph, with no other pathological findings noted (Figure 2). The reference intervals for the evaluated blood parameters were obtained from the respective devices.

Figure 1 (A) A corneal dermoid located near the lateral canthus of the upper eyelid. The dermoid tissue, characterized by long hairs emerging from its surface, extensively involves the bulbar conjunctiva. Additionally, its margin extends into the dorsal quadrant of the cornea (white arrow). (B) Retraction of the long hairs laterally reveals palpebral agenesis toward the lateral canthus of the upper eyelid (blue arrow). Concurrently, third eyelid gland hyperplasia is observed (yellow arrow)

Parameters	Unit	Values	Reference Interval (min - max)		
Serum Biochemistry					
Blood urea nitrogen	mg/dL	19.50	15.00-59.00		
Creatinine	mg/dL	1.17	0.50-1.50		
Alanine aminotransferase (ALT)	IU/L	34.50	0.00-50.00		
Alkaline phosphatase (ALP)	IU/L	46.00	0.00-130.00		
Aspartat aminotransferase (AST)	IU/L	23.00	0.00-40.00		
Creatin kinase (CK)	IU/L	85.10	0.00-200.00		
Glucose	mg/dL	104.00	65.00-118.00		
Cholesterol	mg/dL	321.00	125.00-250.00		
Hematological Parameters					
White blood cell count (WBC)	10 <sup>9</sup> /L	6.03	6.00-17.00		
Neutrophils	10 <sup>9</sup> /L	3.90	3.60-12.30		
Lymphocytes	10 <sup>9</sup> /L	1.26	0.83-4.91		
Monocytes	10 <sup>9</sup> /L	0.59	0.30-2.50		
Eosinophils	10 <sup>9</sup> /L	0.28	0.10-19.00		

Table 1 Hematological and serum biochemistry parameters of the dog

Parameters	Unit	Values	Reference Interval (min - max)
Basophils	10 <sup>9</sup> /L	0.00	0.00-0.12
Neutrophils	%	64.60	52.00-81.00
Red blood cells (RBC)	10 <sup>12</sup> /L	6.97	5.10-8.50
Haemoglobin (HGB)	g/dL	17.50	11.00-19.00
Hematocrit (HCT)	%	47.50	33.00-56.00
Mean corpuscular volume (MCV)	fL	68.20	60.00-76.00
Mean corpuscular hemoglobin (MCH)	pg	25.20	20.00-27.00
Mean corpuscular hemoglobin concentration (MCHC)	g/L	36.90	30.00-38.00
Red cell distribution width – standard deviation (RDW-SD)	fL	34.70	33.20-46.30
Platelets (PLT)	10 <sup>9</sup> /L	150.00	117.00-490.00
Mean platelet volume (MPV)	fL	12.70	8.00-14.10



**Figure 2** Thoracic radiographs of the dog in ventrodorsal (V/D) and laterolateral (L/L) views. The images illustrate the thoracic cavity, including cardiac silhouette and pulmonary fields

General anesthesia was performed. Induction was achieved with propofol (4 mg/kg, IV, Polifarma, Turkiye), followed by maintenance through orotracheal intubation and administration of isoflurane via a circle breathing system. Analgesia was provided with butorphanol (0.2 mg/kg, SC, Richter Pharma, Austria). During surgery, the animal was perfused with Ringer's lactate solution and cephalosporin (25 mg/kg, IV, Tumekip Med, Turkiye) was administered.

Surgical intervention for the ocular dermoid was performed first. Under an operating microscope, the affected tissue was excised from the palpebral conjunctiva, ensuring complete removal of all hair follicles. To achieve this, the conjunctival dermoid was initially incised along its perimeter while preserving the integrity of the palpebral and bulbar conjunctiva. Throughout the procedure, anatomical structures at the lateral conjunctival junction and bulbar conjunctiva were carefully maintained. Subsequently, the fine dermoid tissue on the corneal surface was excised up to the limbal region.

Following complete tissue removal, the exposed conjunctival area was closed with simple continuous sutures using absorbable multifilament 6-0 polyglycolic acid suture (Dogsan, Turkiye). After dermoid excision, the upper eyelid agenesis



**Figure 3** Preoperative (**A**) and postoperative 0. day (**C**) and 15. day (**D**) view of ocular malformations. (**B**) The removal of the corneal dermoid reveals a more distinct corneal scar tissue (white arrow). Third eyelid gland hyperplasia is prominently visible on the bulbar surface of the eyelid (blue arrow). Palpebral agenesis is clearly noticeable (yellow arrow)

became more pronounced in the affected eye. The defect was repaired by creating a new margin from the intact upper eyelid border using simple continuous subcuticular sutures. Care was taken to prevent inward rotation of the skin toward the eye, minimizing the risk of irritation from future hair growth (Figure 3). Histopathological examination confirmed the excised tissue as a dermoid.

Finally, the prolapsed third eyelid gland was repositioned using the modified Morgan pocket technique. Two parallel incisions were first made dorsally and ventrally on the conjunctival tissue overlying the prolapsed gland. A sub-conjunctival pocket was then created by dissecting beneath the incision line using Stevens tenotomy scissors. The conjunctival tissue between the incision lines was excised, and the gland was secured within the pocket using monofilament absorbable 5-0 polydioxanone suture material (Katsan, Turkiye) with the Schmieden suturing technique. Care was taken to position the starting and ending knots on the palpebral surface of the nictitating membrane, leaving a 3-4 mm gap at both ends of the suture line. At the end of the procedure, a sterile swab moistened with physiological saline was gently

pressed against the third eyelid for one minute to reduce postoperative swelling.

During the postoperative period, amoxicillin (25 mg/kg, PO, Deva, Turkiye) was administered for seven days. Additionally, topical tobramycin and steroidal anti-inflammatory eye drops were applied twice daily, while topical sodium hyaluronate and artificial tear lubricant gel were used three times daily. An Elizabethan collar was placed to protect the eye throughout the 15-day follow-up period.

Postoperative monitoring was conducted via phone communication and photographs, as the owner did not return for in-person evaluations. At the secondand fourth-week follow-ups, as well as at the three-month postoperative assessment, no signs of discomfort were observed, and no complications such as ocular pain or irritation were reported.

## DISCUSSION AND CONCLUSION

Although the etiology and pathophysiology of ocular abnormalities have not yet been fully elucidated, it is believed that many of these conditions result from developmental abnormalities occurring during the embryonic period (Cook, 2021). In cats and dogs, abnormalities such as microphthalmia, dermoids, and agenesis typically manifest individually, although it is rarely the case that multiple anomalies may occur together (Saraiva and Delgado, 2020; Berkowski et al., 2018).

Eyelid agenesis, also referred to as eyelid coloboma, most commonly affects the upper eyelid in dogs. Although its pathophysiology remains unclear, it is widely regarded as a result of abnormal differentiation during the embryonic period (Cathelin et al., 2022). Palpebral agenesis is a high-risk anomaly primarily due to the eyelids' inability to fully protect the ocular surface. This defect leads to rapid evaporation of the aqueous layer of the tear film and inadequate distribution of the lipid layer, resulting in corneal and conjunctival dryness. Consequently, severe keratoconjunctivitis and serious complications, such as corneal opacity and vision loss, may develop (Ofri, 2017; Demir and Karagozoglu, 2019). Therefore, timely medical and surgical intervention is crucial for the management of eyelid agenesis (Whittaker et al., 2010). In the present case, given the dog's age, the intervention was delayed. Chronic, thick scar tissue had developed on the cornea of the left eye due to persistent irritation from the hairs associated with the dermoid. Although the animal retained visual function, the extensive corneal opacity in this eye resulted in significant vision impairment. Despite postoperative treatment aimed at improving corneal health, the scar tissue remained unchanged, indicating permanent damage.

In the surgical management of eyelid agenesis, it is essential to restore the region in alignment with its anatomical structure. This approach not only ensures the success of the procedure but also mitigates potential postoperative complications. The choice of surgical method is dictated by the defect size. Small defects, constituting less than 25% of the eyelid, are amenable to direct repair, whereas most lesions are unsuitable for primary repair. Larger defects necessitate more intricate reconstructive techniques, such as advancement and rotational flaps (Demir and Karagozoglu, 2019; Whittaker et al., 2010). In the presented case, given that the defect size was less than one-third of the eyelid length, the dermoid was meticulously delineated from the surrounding tissue, excised, and removed. The area was subsequently closed in accordance with its anatomical position. Due to the absence of the eyelid margin, particular attention was given during the procedure to prevent the eyelid from turning towards the bulbar surface.

Ocular dermoids are referred to as choristomas by some researchers due to their occurrence on the ocular surface, whereas those affecting the eyelids are termed hamartomas (Dubielzig et al., 2010). However, some authors have proposed that, given the lack of clear distinction in most dermoids, such as conjunctiva-palpebral dermoids, they should be described as choristo-hamartomas. In dogs, dermoids can be observed on the conjunctiva and/ or corneal surface, particularly in the temporal region. This congenital anomaly is believed to be associated with genetic factors, and certain dog breeds, including the German Shepherd, Dalmatian, Saint Bernard, Basset Hound, and Dachshund, are predisposed to this condition. Ocular dermoids have been anatomically classified in various ways. The most commonly encountered form is conjunctiva-corneal dermoids, which affect both the conjunctiva and cornea, whereas conjunctiva-palpebral dermoids, affecting both the conjunctiva and eyelid, are rarer. Dermoids that exclusively affect the corneal surface have been classified into three distinct types. The first type, the most common and least severe form, comprises dermoids covering the limbal or epibulbar surface. The second type includes dermoids that cover nearly the entire cornea, extending into the stroma but not affecting the Descemet's membrane or corneal endothelium. The third type consists of dermoids that cover the entire corneal surface and layers and may even extend into the eye. When dermoid tissue affects only the conjunctiva, the prognosis is favorable; however, involvement of the cornea renders the prognosis uncertain, depending on the depth and extent of the lesion. If dermoids are not removed, the long hairs on the tissue may irritate the cornea and conjunctiva, leading to clinical symptoms such as corneal ulceration, pigmentation, epiphora, keratitis, and blepharospasm (Balland et al., 2015). In the presented case, the dermoid tissue was observed to form laterally to the eyelids, as noted by many researchers. The involvement of the palpebral, conjunctival, and corneal tissues indicated that the case should be more accurately described as a corneo-conjunctival-palpebral dermoid.

While the conjunctiva of the upper eyelid was most prominently affected, the absence of hair on the dermoid tissue affecting the limbal portion of the cornea was considered fortunate, given the animal's age. This absence resulted in less irritation to the cornea over an extended period. Another notable observation in the dermoid structure was the clear demarcation between the boundary of the tissue on the upper eyelid and the boundary of the agenesis, with only a few millimeters of separation. The fact that the dermoid had not progressed into the deeper layers of the cornea facilitated the easy removal of the lesion.

Although the exact etiology of third eyelid gland prolapse is not fully understood, it is believed to be influenced by genetic and congenital factors in dogs. Large breeds, particularly Cane Corso, Neapolitan Mastiff, and Lhasa Apso, are known to be predisposed to gland prolapse (Mazzucchelli et al., 2012). Deformation of the fascia retinaculum, which holds the gland in its anatomical position, is also considered a potential contributing factor in the etiology (Oguntoye et al., 2022). Additionally, eye irritants may trigger an irritative process in the third eyelid gland, which is covered by lymphoid tissue-rich conjunctiva (Mazzucchelli et al., 2012). In the present case, the animal's breed, the Anatolian Shepherd Dog, a giant breed, could have predisposed it to the bilateral development of third eyelid gland hyperplasia. More importantly, the animal's living environment, particularly the dirt floor causing significant dust exposure, likely contributed to severe eye irritation throughout the day.When these two factors are combined, the development of gland prolapse becomes inevitable. The occurrence of prolapse in an eye without ocular anomalies weakens its connection to these anomalies. However, further research is required to explore the genetic predisposition for this condition.

In conclusion, this study exemplifies the simultaneous management of complex congenital ocular anomalies, demonstrating the successful surgical treatment of an ocular dermoid, palpebral coloboma, and third eyelid gland hyperplasia in a single surgical procedure.

#### **CONFLICT OF INTEREST**

The authors declared that there is no conflict of interest.

#### **AUTHORS CONTRIBUTIONS**

A.U.: Data collection and processing, literature review, writing. D.U.: Conception, design, writing. I.E.: Supervision, writing, critical review.

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## KONGENITALNE I STEČENE OČNE ABNORMALNOSTI KOD PSA: KLINIČKI OPIS I TRETMAN

## SAŽETAK

Kongenitalne očne malformacije, iako rijetke, predstavljaju klinički značajne anomalije u veterinarskoj oftalmologiji. Najčešće kongenitalne očne anomalije kod mačaka i pasa su mikroftalmija, kolobomatozni defekti, palpebralna agenezija i dermoidi, koji mogu nastati neovisno ili u kombinaciji. Ovaj prikaz slučaja opisuje kliničku evaluaciju, dijagnosticiranje i operativni tretman psa sa dvije kongenitalne očne anomalije, zajedno sa stečenim poremećajem kod jednogodišnjeg mužjaka anatolskog ovčarskog psa koji je upućen na Kliniku za oftalmologiju Bolnice za životinje Veterinarskog fakulteta Univerziteta u Ankari zbog bilateralnog konjunktivitisa i prolapsa žlijezde trećeg kapka. Oftalmološki pregled pokazao je dobro definiranu dermoidnu leziju na lateralnom kantusu gornjeg kapka lijevog oka, zajedno s palpebralnom agenezijom posteriorno od dermoidnog tkiva. Dermoid je uključivao bulbarnu i palpebralnu konjunktivu, kao i dorzalnu kornealnu površinu. Proveden je operativni tretman u svrhu ekscizije dermoidnog tkiva i korekcije prolapsa žlijezde trećeg kapka i palpebralne agenezije. Osim toga, prolaps žlijezde trećeg kapka u desnom oku je operativno repozicioniran. Postoperativni period je protekao mirno, a pacijent je praćen tri mjeseca, pri čemu nisu uočene nikakve komplikacije. Ovaj prikaz slučaja prikazuje uspješnu istovremenu operativnu korekciju očnog dermoida, palpebralne agenezije i prolapsa žlijezde trećeg kapka u samo jednoj proceduri, demonstrirajući učinkovit pristup tretmanu kompleksnih kongenitalnih anomalija kod pasa.

Ključne riječi: Kolobom očnog kapka, očni dermoid, očna malformacija, prolaps žlijezde trećeg kapka