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RESEARCH ARTICLE

Surgical Correction of Ocular Dermoids in Dogs: 22 Cases

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Summary

In this study, the treatment results of cases brought to the Istanbul University Faculty of Veterinary Medicine, Department of Surgery with a complaint of ocular discharge and diagnosed with ocular dermoids accompanying chronic epiphora, blepharospasm, keratitis, have been evaluated. The study includes 26 eyes with ocular dermoids, belonging to 22 dogs of different breed, sex and age. Due to the type and the localization of the dermoids surgical excision and superficial keratectomy of dermoids was carried out followed by pedicle conjunctival flap and/or tarsorrhaphy and medical treatment. The localization and treatment procedures for ocular dermoids and the need for further studies to determine the prevalence, species and breed distribution, as well as good clinical outcome, have been discussed.

Keywords: *Ocular dermoid, Choristoma, Superficial keratectomy, Conjunctival flap, Dog*

Köpeklerde Oküler Dermoid ve Cerrahi Sağaltımı: 22 Olgu

Özet

Bu çalışmada; İstanbul Üniversitesi Veteriner Fakültesi Cerrahi Anabilim Dalına gözyaşı akıntısı şikayetiyle getirilen ve kronik epifora, blefarospazm ya/ya da keratitisle birlikte seyreden oküler dermoid tanısı konulan olguların sağaltım sonuçları değerlendirilmiştir. Çalışmanın materyalini farklı ırk, yaş ve cinsiyette olan 22 köpeğin 26 gözü oluşturmaktadır. Sağaltımda, dermoidlerin tip ve lokalizasyonuna bağlı cerrahi eksizyon ya/ya da süperfisiyal keratektomiyi takiben pedikküllü konjunktival flap ya/ya da tarsorafi ve medikal sağaltım uygulanmıştır. Bu çalışmayla; oküler dermoidlerin lokalizasyonu, sağaltım seçenekleri, ırk, cinsiyet dağılımı ve prevalansı belirlemek ve uygulanan sağaltım yöntemlerinden elde edilen klinik sonuçların meslek pratiğine aktarılması amaçlanmıştır.

Anahtar sözcükler: *Oküler dermoid, Koristoma, Süperfisiyal keratektomi, Konjunktival flep, Köpek*

INTRODUCTION

A dermoid is a choristoma that is a histologically normal tissue in an abnormal location [1-3]. Choristomas are benign congenital over-growths of heterotopic coetaneous tissue in an inappropriate place [2,4-9]. Ocular dermoids are choristomatous malformations that involve the ocular and periocular tissues [4]. Dermoids of the orbit are usually cystic and are called ocular dermoid cysts [7,9]. Ocular dermoids are composed of dermis-like connective tissue containing skin, hair follicles, blood vessels, nerves, smooth muscle, fibrous tissue, sebaceous and sweat glands, adipose tissue, covered by keratinised stratified squamous epithelium [1,4,5,10]. Cartilage and bone are rarely seen [2,5]. However not all of the cutaneous appendages need to be present in each case [7].

Dermoids were first described in humans in 1742 [4]. Although they are well documented in humans [11], they have been reported less frequently in the animal species [9]. Dermoids are sporadic and relatively uncommon [12]. Ocular dermoids have been observed in several domestic animals, including dogs [4,6,13-15], cats [16], horses [10], cattle [17,18], sheep [8], guinea pigs [5], rabbits [19,20], birds [21] and also in wild animals like wildebeest [7].

Congenital ocular abnormalities, such as ocular dermoids, are those noted at birth or within a few weeks of life and they may occur accompanying ocular malformations [2,16]. The precise developmental mechanisms involved in the pathogenesis of ocular dermoids are not known. Numerous factors can

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influence ocular development during gestation and the early neonatal period, when portions of the eye continue to mature [7,16]. The association of a dermoid with other ocular anomalies has been reported in up to 30% of cases in humans but has not been determined in any animal species [4]. In dogs, there appears to be a breed predisposition to ocular dermoids in the German shepherd dog (GSD), Saint Bernard (SB), golden retriever and dachshund [4,22]. It is commonly believed that, this disease is generally congenital, but not hereditary [6]. They are reported to be inherited in the Burmese cat and perhaps, the GSD, SB and dachshund [4,12,23].

Ocular dermoids may affect the eyelids, conjunctiva (bulbar and palpebral), nictitating membrane or cornea [4-6,23], or may be seen as an inclusion cyst within the orbit [5]. Corneal dermoids have been classified into three broad types by Mann [11]. The first type is limbal or epibulbar dermoid, the most frequent and least severe form, which most commonly occurs at the lateral canthus. The second type is a large dermoid covering almost all of the cornea, which may extend deep into stroma but not the descement's membrane or corneal endothelium. Assessment of depth of involvement of the corneal mass can be made by ultrasound biomicroscopy. The third type of dermoid involves the entire corneal diameter [4].

The most common site of corneal dermoids in the dog is at the temporal canthus. And most of them are unilateral [22]. The tissues irritate the eye and associated structures. The hairs on the lid may point towards the eye. Therefore, patients suffer from chronic epiphora, blepharospasm and keratitis [6].

Ocular dermoids are best treated by surgical (keratectomy and/or conjunctivectomy) excision when the animal is old enough to undergo general anesthesia [22-24]. If the cornea is involved, the procedure of choice is superficial keratectomy (SK). There are two common ways to perform a superficial keratectomy. These are, Complete Incision Keratectomy (CIK) and Partial Incision Keratectomy (PIK). In the first method, an initial corneal incision is made that completely surrounds the lesion, in the second method a small corneal incision is made adjacent to the lesion to be removed [23,24]. Before performing a SK, determining the depth of the lesion using an operation microscope will help in planning the surgery [23]. For keratectomies that are extensive or reaching to 50 to 75% of the corneal thickness, the use of a conjunctival flap or other supportive surgery is additionally required to protect the cornea, prevent perforation and promote healing. The bulbar pedicle flap created from the bulbar conjunctiva is the most frequently used method by the veterinary ophthalmologist. This method has some advantages including; the graft can cover any part of the cornea, vision can usually remain while the graft is in place, the graft moves in relation to the eye and tension is created with the eye lid [23]. The conjunctival flaps will adhere to the corneal lesion and epithelialisation surrounding the flap will occur. Three to 8 weeks after placement of the flaps, the blood supply should be interrupted by cutting the base of the flap at the limbus. This can usually be done with topical anesthesia. Cutting off the blood supply will allow the conjunctival graft to recede and will lessen the resulting corneal scar. Naturally, an opaque scar will be left in the damaged cornea. Beside these techniques, after the excision of dermoids in dogs, canine amniotic membrane transplantation for corneal reconstruction is another treatment option which has been reported in literature [25].

In this study, a total of 26 cases diagnosed with ocular dermoid, a disorder rarely seen in dogs, were evaluated. The aim of the study is to assess breed and sex distribution and present to veterinary practice the clinical results obtained from the treatment methods used.

MATERIAL and METHODS

The material of the present study composed of 26 eyes with ocular dermoids from 22 dogs of different breeds that were brought to the clinics of Department of Surgery Faculty of Veterinary Medicine, Istanbul University. The breeds of the dogs were: 10 German Shepherds, 4 crossbreeds, 1 Dogo Arjentina, 1 Turkish Shepherd Dog, 1 Gordon Setter, 1 Doberman Pincher, 1 French Bulldog, 1 Golden Retriever, 1 Labrador Retriever, and 1 Rottweiler. 17 dogs were female while the remaining five dogs were male. The ages of the patients varied between 1-month and 11-months-old.

Systematic ophthalmic examinations were carried out on the dogs with complaints including chronic epiphora, ocular discharge and blepharospasm. After the examination, uni- or bilateral locations of the dermoids were determined as corneal, corneoconjunctival, and conjunctival.

Prior to surgery, routine clinical examinations were performed, followed by blood analysis. Depending on the general condition and age of the patient, anaesthesia induction was carried out using xylazine/ketamine HCl or propofol. Following endotracheal intubation, general anaesthesia was achieved with 4% isoflurane and maintained at 2%. The patients were placed on the operation table with the affected eye uppermost and their heads were positioned for the surgeon to operate with ease. In order to determine the width and particularly the depth of the lesion, an operation microscope was used.

Following asepsis and antisepsis of the ocular bulbus, the lateral canthus was opened up via canthotomy and eye retractors were put in place. Once fixation of the eye was established, the corneal, corneoconjunctival and/or conjunctival tissue was resected using a cornea knife. Lesions on the cornea were removed via lamellar superficial keratectomy (partial incision keratectomy) *(Fig.1)*. In order to encourage re-epithelization and vascularisation, fluorescein -positive corneal defects, larger than 25% of the corneal surface, were closed with a bulbar pedicle graft using simple interrupted sutures. Cases with defects less than 25% of the cornea were treated with tarsorraphy alone. Conjunctival defects were closed using simple interrupted sutures.

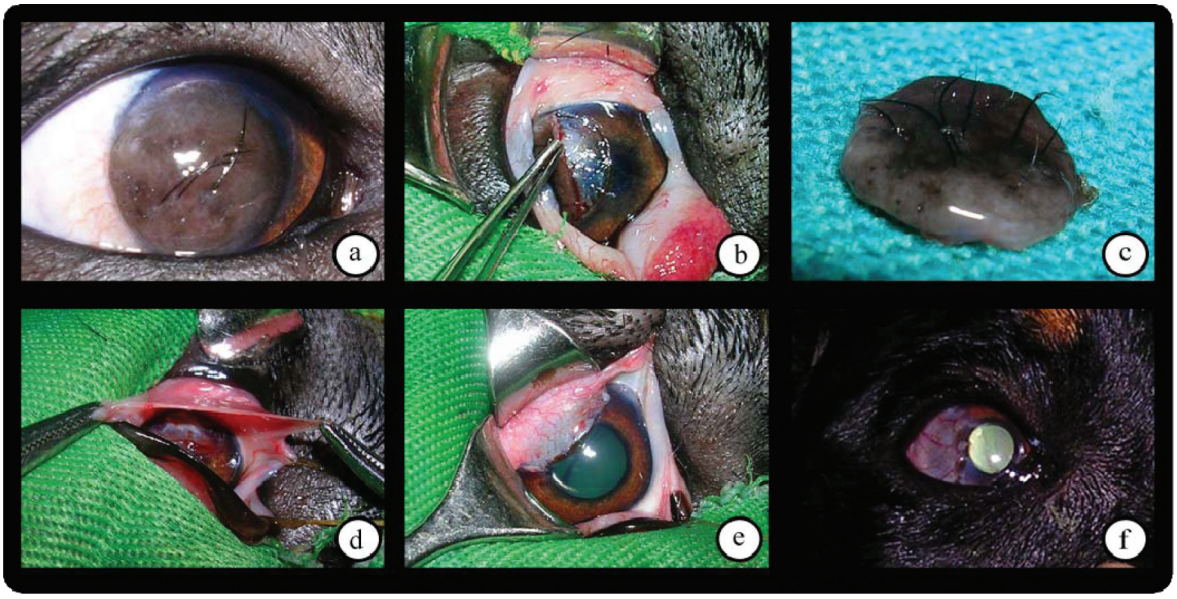

Fig 1. Case no. 6: 5-months-old Dobermann Pincher, **a-** Before excision of the corneal dermoid, **b-** Superficial keratectomy, **c-** The excised dermoid, **d,e-** Preparing the pedicle conjunctival flap, suturing to the cornea, **f-** Postoperative follow-up at 2nd week

Şekil 1. Olgu no. 6: 5 aylık Dobermann Pincher, **a-** Korneal dermoidin eksizyonundan önce, **b-** Süperfisiyel keratektomi, **c-** Eksize edilen dermoid, **d,e-**Konjunktival flebin hazırlanışı ve ve korneaya dikilmesi, **f-** 2 hafta sonraki postoperatif görünüm

Histopathologically, tissue samples were fixed in formalin-saline solution. After being routinely processed they were then embedded in paraffin. Sections of 4-5 mm in thickness were taken using a rotary microtome and then stained with hematoxylin&eosin to be evaluated by light microscopy.

In the post-operative period, ciprofloxacin ophthalmic drops (Siprogut®, Bilim, İstanbul/ Turkey) were administered for 10 days. In cases where a flap had been applied, flap connections were terminated at the end of week 2. In order to increase the resolution of the developing granulation tissue and decrease scar tissue, dexamethasone sodium phosphate (Onadron®, ophtalmic, İ.E.Ulugay, İstanbul) was also added to the treatment. The eye was protected from damage by placing an Elizabethan collar on the patients for 3-4 weeks in the post-operative period.

RESULTS

Following examination, 4 patients were diagnosed with bilateral and the other 18 with unilateral ocular dermoids. Of the cases, 16 were corneal (Mann tip II), 7 conjunctival (Mann tip I) and 3 cornea-conjunctival (Mann tip I-II). None of the cases exhibited a Type III lesion. In Case No. 20 with bilateral dermoids, one dermoid was observed in the medial angle of the left eye and 2 more in the lateral angle *(Fig. 2a)*. In 6 of the cases, in addition to ocular dermoids, entropion, follicular conjunctivitis, iris-to-iris bilateral persistent pupillary membrane (PPM) *(Fig. 2b,c)*, hyperplasia of the Harder gland and pigmentation in the cornea was also observed. All lesions except PPM were treated at the same time. Three cases were not operated on due to the owners' refusal.

Gender distribution revealed that 17 of the cases (77%) were female.

The mean age of the patients was 4.5 months.

Breed distribution showed that 11 of the cases (50%) were German Shepherd dogs *(Table 1)*. It was discovered that the sire of 4 of the patients known to be littermates had also been brought to the clinic with the same complaint two years previously.

Except one (Case No. 22) all the unilateral dermoids were located on the right eye.

Post-operative follow-up examinations of the patients were carried out on days 7, 14, 21 and at weeks 4 and 5. Patients that had undergone tarsorraphy had their sutures removed on day 7. Cases given conjunctival flaps had the flaps released on day 14.

In the follow-up examinations of the patients carried out on days 14 and 21, epithelization of the cornea was seen to be complete *(Table 2)*.

Histological examination revealed characteristics of normal epidermis with a keratinizing squamous epithelium with melanin pigmentation *(Fig. 3a-d)*. Beneath the epithelium there was dense connective tissue. The corneal mass contained numerous, well-developed hair follicles and deep and superficial adnexal structures.

Temporary opacity was observed in all of the corneal dermoid cases. The cornea started to regain its transparency between weeks 4 and 5. Case No. 18 exhibited recurrence on two occasions and was re-operated on *(Table 2)*.

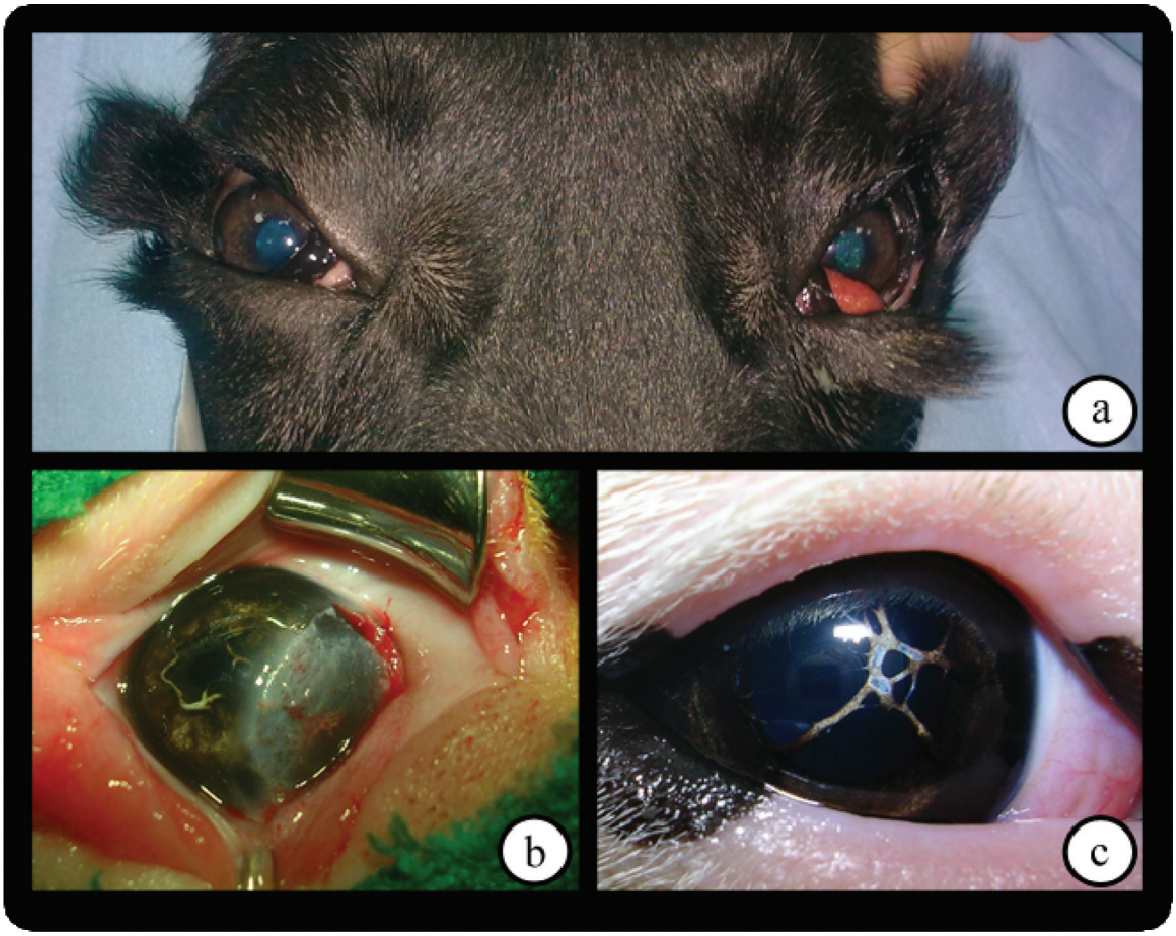

Fig 2. a- Case no. 20: 7-months-old Labrador Retriever, with bilateral dermoids, one in the medial and one in the lateral angle and hyperplasia of the Harder gland on the left eye and 2 more in the lateral angle in the right eye, **b,c-** Case no:9, 4-months-old Dogo Arjantina after superficial keratetomy on the left eye and the right eye with iris-to-iris persistent pupillary membrane (PPM)

Şekil 2. a- Olgu no. 20: 7 aylık Labrador Retriever, bilateral dermoid, sol gözün mediyal ve lateral açısında 1'er adet, sağ gözün lateral açısında 2 adet, sol gözde Harder bezi hiperplazisi, **b,c-** Olgu no: 9, 4 aylık Dogo Arjantina, sol gözde süperfisiyel keratektomiden sonraki görünüm, sağ gözde iristen irise persistent pupillar membran

Conjunctivitis that responded to medication developed in Case Nos. 1 and 20. Follow-up examination of Case No. 10 after day 14 and those of the remaining cases after week 5 could not be done.The patient owners contacted by telephone reported problem-free eyesight in their dogs.

DISCUSSION

Ocular dermoids are well-documented in humans [4,11] but they have been reported less frequently in animal species [9]. Congenital ocular abnormalities such as ocular dermoids are those noted at birth or within a few weeks of life and may occur accompanying ocular malformations [2,4,16]. The iris-to-iris persistent pupillary membrane encountered in one case (Case No. 9) confirmed this. Although no abnormalities were present in the routine pre-operative assessment of Case No. 20, which had bilateral conjunctival dermoids and various eye lesions, the patient died due to intra-operative cardiac arrest. Necropsy of the patient could not be carried, in accordance with the patient owner's wishes, and it was suspected that this patient may have had other congenital abnormalities.

In dogs, there appears to be a breed predisposition to ocular dermoids in the German shepherd dog (GSD), Saint Bernard (SB), golden retriever and dachshunds [4,22]. It is commonly believed that, this disease is generally congenital, but not hereditary [6]. Considering the breed distribution of the dogs included in this study, the facts that German Shepherd Dogs formed the majority of cases and that similar lesions were encountered in 4 puppies from the same litter, as well as in their sire, confirm the hereditary nature of the condition. For the eradication of the disorder, the authors recommend that German Shepherd Dogs with a history of congenital choristoma should not be used for breeding.

The ocular dermoid observed in the Turkish Shepherd dog in our study is the second case to be reported [14].The present case affords a second example of this condition.

In this study, lateral canthotomy was performed prior to surgical excision of conjunctival dermoids located, in particular,

Table 1. *Age, breed, sex variations, the localization of the dermoids, treatment options and additional ocular lesions of the cases*
Tablo 1. *Olguların ırk, yaş ve cinsiyet dağılımı, dermoid lokalizasyonu, sağaltım yöntemi ve diğer oküler lezyonlar*

No	Age (Month)	Breed	Sex	Side		Treatment	Note
				Right	Left		
1	5	Turkish Kangal	Female	Lateral Canthus	(-)	E	Entropium
2	1	Crossbreed	Female	Cornea + Lateral Canthus	(-)	OR	
3	3	German Shepherds	Female	Cornea	(-)	SK + PCF+T	
4	3	German Shepherds	Male	Cornea + Lateral Canthus	(-)	SK + T	
5	11	Crossbreed	Female	Lateral Canthus	(-)	OR	
6	5	Dobermann Pincher	Female	Cornea	(-)	SK + PCF	Follicular conjunctivitis
7	5	French bulldog	Male	Cornea	(-)	SK + MT	
8	6	Golden Retriever	Female	Medial Canthus	(-)	OR	
9	4	Dogo Arjantina	Female	Cornea	(-)	SK + PCF	Bilateral PPM Follicular conjunctivitis
10	10	Crossbreed	Male	Cornea	(-)	SK + PCF + T	
11	5	German Shepherds	Female	Cornea	(-)	SK + T	
12	3	German Shepherds	Female	Cornea	Cornea	SK + PCF + T (right) SK + MT (left)	
13	3	German Shepherds	Female	Cornea	Cornea	SK + MT (both)	
14	3	German Shepherds	Male	Cornea	(-)	SK + PCF + T	
15	3	German Shepherds	Female	Cornea	(-)	SK + PCF	
16	3	German Shepherds	Female	Cornea + Lateral Canthus	(-)	SK + E + T	
17	2	German Shepherds	Female	Cornea	(-)	SK + T	
18	4	German Shepherds	Male	Lateral Canthus	(-)	E	Recurred twice
19	6	German Shepherds	Female	Cornea	Cornea	SK + PCF + T (right) SK + MT (left)	
20	7	Labrador Retriever	Female	Lateral Canthus	Lateral Canthus, Medial Canthus	E (both)	Prolapse of nictitans gland (Cherry eye), Follicular conjunctivitis EX
21	7	Rottweiler	Female	Cornea	(-)	SK + PCF	Follicular conjunctivitis, Cherry eye
22	5	Gordon Setter	Female	(-)	Lateral Canthus	E	Corneal pigmentation

SK*= superficial keratectomy,* ***PCF****= pedicle conjunctival flap,* ***E****= excision,* ***T****= tarsorrhaphy,* ***MT****= medical treatment,* ***OR****= owner's refusal*

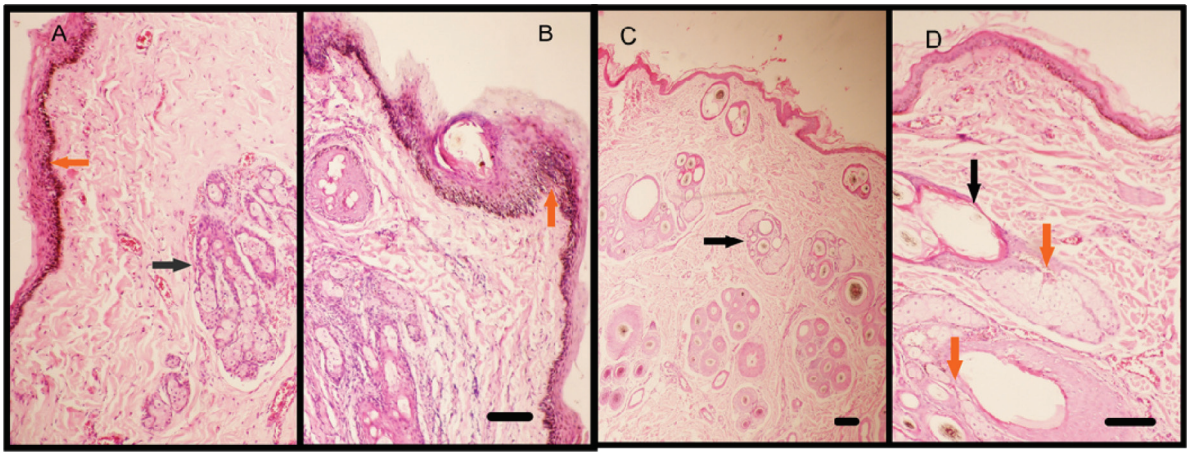

Fig 3. Histopathological view **a,b**, *Orange arrow:* dense melanin pigmentation of basal cells, *Black arrow:* sebaceous glands, *Bar:* 100 µm, **c-** *Black arrow:* hair follicle and sebaceous glands, **d-** *Black arrow:* keratinization in the hair follicle, *Orange arrow:* sebaceous glands

Şekil 3. Histopatolojik görünüm, **a,b-** *Turuncu ok:* epidermisin bazal hücrelerinde yoğun melanin pigmentasyonu, *Siyah ok:* yağ bezleri, *Bar:* 100 µm, **c-***Siyah ok:* kıl folliküleri ve yağ bezleri, **d-** *Siyah ok:* Kıl folliküllerinde keratinizasyon, *turuncu ok:* yağ bezleri, *Bar:* 100 µm

Table 2. *Age, breed, sex variations, the healing time of the corneal and conjunctival defects*
Tablo 2. *Olguların ırk, yaş ve cinsiyet dağılımı, korneal ve konjuntival defektlerin iyilişme süreleri*

No	Age (Month)	Breed	Sex	Side		Conjunctival Defects[a]	Corneal Defects[b]	
				Right (R)	Left (L)		Epithelialization[c] (Day)	NCT[d] (4.- 5. weeks)
1	5	Turkish Kangal	Female	Lateral Canthus	**(-)**	C	-	-
2	1	Crossbreed	Female	Cornea + Lateral Canthus	**(-)**	OR	-	-
3	3	German Shepherds	Female	Cornea	**(-)**	-	14	(-)
4	3	German Shepherds	Male	Cornea + Lateral Canthus	**(-)**	CH	14	(-)
5	11	Crossbreed	Female	Lateral Canthus	**(-)**	OR		-
6	5	Dobermann Pincher	Female	Cornea	**(-)**	-	14	(+) 5.week (mild cloudiness)
7	5	French Bulldog	Male	Cornea	**(-)**	-	21	(-)
8	6	Golden Retriever	Female	Medial Canthus	**(-)**	OR	-	-
9	4	Dogo Arjantina	Female	Cornea	**(-)**	-	14	(+) 5. week (mild cloudiness)
10	10	Crossbreed	Male	Cornea	**(-)**	-	14	No follow-up
11	5	German Shepherds	Female	Cornea	**(-)**	-	14	(-)
12	3	German Shepherds	Female	Cornea	Cornea	-	14	(-)
13	3	German Shepherds	Female	Cornea	Cornea	-	14 (R) 21 (L)	(-)
14	3	German Shepherds	Male	Cornea	**(-)**	-	14	(+) 5. week (mild cloudiness)
15	3	German Shepherds	Female	Cornea	**(-)**	-	14	(+) 5. week (mild cloudiness)
16	3	German Shepherds	Female	Cornea + Lateral Canthus	**(-)**	CH	21	(-)
17	2	German Shepherds	Female	Cornea	**(-)**	-	14	(-)
18	4	German Shepherds	Male	Lateral Canthus	**(-)**	2x re-operation CH	-	-
19	6	German Shepherds	Female	Cornea	Cornea	-	14	(+) 5. week (mild cloudiness)
20	7	Labrador Retriever	Female	Lateral Canthus	Lateral Kanthus Medial Kanthus	-	-	-
21	7	Rottweiler	Female	Cornea	**(-)**	-	21	(-)
22	5	Gordon Setter	Female	(-)	Lateral Kanthus	CH	-	-

*[a] - conjunctival defects, **CH**- complete healing, **C** - conjunctivitis, [b] -corneal defects, [c] - the time to complete corneal epithelialization, [d] - the time to attain normal corneal transparency*

in the lateral canthus (with the exception of Case No. 4). This technique has not been reported in literature. However, complete excision of the lesion without performing canthotomy was not possible in most cases. The cause of the double recurrence in Case No. 4 suggested that the lesion had not been completely excised due to the lack of a canthotomy. In the light of this experience, the lateral canthotomy technique was added to the surgical procedure in cases where the conjunctival dermoid was located in the lateral canthus, in particular, and no recurrence was observed thereafter.

The findings determined in the microscopical examination of the resected tissue parts were similar to those reported in literature [4,9]. Since these findings have the appearance of normal skin, in the authors' opinion, in order to prevent errors occurring with histopathological diagnosis, when material is sent for examination in cases of this nature, it is imperative to state whether the material has been taken from the cornea, conjunctiva or eyelids.

In the literature review, no information was found regarding sex predisposition in cases of ocular dermoids [22,24]. The female ratio of 77% in this study suggests a female tendency towards ocular dermoids.

Congenital ocular abnormalities such as ocular dermoids are those noted at birth or within a few weeks of life [6]. In this study, the mean age of the patients was determined as 4.5 months. The reason for Case Nos. 5 and 10 being much older than the rest of the patients can be explained by the fact

that these two patients were stray dogs with no owners.

Ocular dermoids usually appear as solitary lesions affecting only one eye [7,22]. In this study, bilaterally located dermoid cases were observed in 4 of the 22 cases this was in keeping with literature.

With the exception of one case (Case No. 10), which could not be followed-up, a link was found between the non-central localization of lesions and recovery without an eyesight-obstructing defect.

In this study, the authors did not evaluate whether any of the dogs were related. Without a history, each animal was diagnosed separately. The higher incidence of cases among certain breeds and the higher incidence in recent years suggest a hereditary predisposition to dermoid development. This study emphasizes the importance of screening for the presence of inherited ocular abnormalities, such as dermoids, especially the German Shepherds prior to breeding.

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