

Case Report

Histopathology of the ocular dermoid in a bull of the Ukrainian grey breed (clinical case)

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Abstract. Dermoid cysts (choristomas) are non-tumoral growth of skin with a normal structure that appear in atypical parts of the body. A 6-month-old calf (bull) of the Ukrainian grey breed was diagnosed with a pigmented neoplasm of a rounded shape with hair on the dorso-medial edge of the lower eyelid of the left eye. Upon immobilization and anesthesia, the neoplasm was surgically removed and histopathology was carried out. Microscopically, the base of the neoplasm consists of dense unstructured fibrous connective tissue, externally covered with a multilayer keratinized epithelium. In the deep layers, hair follicles, end parts of the sweat and sebaceous glands are localized. An area of chronic inflammation with ulceration characterized by epithelial desquamation and cellular infiltration of the connective tissue base was identified. In this case, an ocular dermoid was diagnosed in a calf of the Ukrainian grey breed.

Keywords: Dermoid cysts; Surgical intervention; choristoma; cornea; histopathological study; calf.

Гістопатологія очного дермоїду у бичка української сірої породи (клінічний випадок)

Анотація. Дермоїдні кісти (хористоми) – це непухлинні розростання шкіри з нормальною структурою, які з’являються в нетипових для цього частинах тіла. У 6-місячного теляти (бичок) української сірої породи на дорсо-медіальному краї нижньої повіки лівого ока діагностовано пігментоване новоутворення округлої форми з волоссям. Після іммобілізації і знеболення новоутворення видалено хірургічним шляхом та досліджене гістопатологічно. Мікроскопічно основа новоутворення побудована щільною неоформленою волокнистою сполучною тканиною, ззовні вкрите багат шаровим зроговілим епітелієм. В глибоких шарах локалізовані волоссяні фолікули, кінцеві відділи потових і сальних залоз. Виявлена ділянка хронічного запалення з виразкуванням, що характеризувалася десквамацією епітелію і клітинною інфільтрацією сполучнотканинної основи. У даному випадку у теляти української сірої породи був діагностований очний дермоїд.

Ключові слова: дермоїдна кіста; хірургічне втручання; хорістома; рогівка; гістопатологічне дослідження; велика рогата худоба.

Introduction

Dermoids are benign neoplasms based on skin cells, skin glands, and hair follicles with hair growing from them. These benign neoplasms are diagnosed in almost all animal species, from carnivores to large ungulates (Gelmetti et al., 2010). For example, in some dog breeds (Dachshund, shepherd's dogs, St. Bernards), inheritance of dermoids is traced as recessive trait, while in other breeds hereditary causes have not yet been proven (Williams & Davies, 2017). It is believed that the cause of dermoids formation is a failure in embryogenesis during the initial stage of fetal development. Dermoid cyst is a tumour of a dysontogenetic nature, developing where the processes of skin fusion and the growth of embryonic cavities and fissures occur as a result of detachment of embryonic ectoderm particles and their immersion in deeper tissue layers. Dermoids or dermoid cysts can be located in any organs and tissues of the animal's body, and in order to find them, specific

examination methods are required (Hillyer et al., 2003; Greenberg et al., 2012). As for ocular dermoids, they are easy to detect during a visual inspection of the animal. Typically, an ocular dermoid (dermoid cyst) is a neoplasm of elastic consistency, rounded in shape, not connected to the skin, located in the inner or external canthus of the eyelid. Dermoids are often located on the eyelids and look like thickened skin areas. Hair in these areas may differ from the primary eyelid fur in colour, length, and growth direction. Conjunctival dermoid cysts are areas of skin covered with hair located on the eye mucosa, they can be both pigmented and not coloured. Corneal dermoids are located on the transparent part of the eyeball, and are a piece of skin covered with hair (Yeruham et al., 2002; Williams & Davies, 2017; Cathelin et al., 2021).

Despite the fact that dermoids are usually benign formations, they create certain inconveniences for animals. Thus, dermoids on the eyelids often lead to their deformation and inversion, as well as spoil the appearance of the animal. Conjunctival and corneal

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dermoids, due to constant irritation of the eyeball with hair, induce the development of conjunctivitis, keratitis or corneal ulcers, which, in turn, impairs vision (Badanes & Ledbetter, 2019).

Dermoid cysts in animals are surgically removed. Conjunctival and corneal neoplasms in small animals are usually removed using surgical microscopes by means of microsurgical techniques (Lee et al., 2005). Surgeries to remove uncomplicated dermoids are performed in a scheduled manner, the postoperative period is usually 14 days and the transparency of the eye is fully restored (Cathelin et al., 2021).

Dermoids in small pets are more fully described and studied than in ungulates. In farm animals, the life span is relatively short, since they are sold for meat, so it is quite difficult to establish the actual picture of their tumour affliction. Grey Ukrainian cattle are a meat and dairy breed, and in the past it was also used for labour, a variety of grey steppe breed of southeaster Europe (Sidashova et al., 2020). It is a natural domestic gene pool object on the verge of extinction and has been granted the first protection category status (Kozyr et al., 2020; 2022). In the scientific literature, there are no descriptions of cases of ocular dermoids in this breed of cattle. In this regard, the clinical case that we observed in the bull of the Ukrainian grey breed is of both practical and scientific interest. Such cases are of interest to veterinary specialists and scientists dealing with ungulates on farms, in zoos and wildlife rehabilitation centres.

Materials and methods

A 6-month-old grey Ukrainian bull was studied. The animal was kept together with adult animals (its parents) in the same pen in the "Try Vedmedi" ("Three Bears") private zoo in the village of Khashcheve, Novomoskovskiyi district, Dnipropetrovsk region of Ukraine.

On the left eye of the animal, a neoplasm covered with hair was found. Irritated cornea caused constant significant tear-shedding and distress of the animal (Fig. 1). The size of the neoplasm increased over time. The owner was concerned about the size of the neoplasm and the pronounced epiphora and blepharospasm. Otherwise, the calf looked healthy and consumed food well. No conservative treatment was performed.

Diagnostic examination and surgical treatment were carried out by specialists of the "Biosvit" veterinary centre (city of

Dnipro). Upon the removal of the neoplasm, it was preserved in 10% formalin solution, and further histopathological studies were carried out at the Department of Anatomy, Histology and Pathomorphology of Animals of the Dnipro State Agrarian and Economic University (Dnipro, Ukraine). After standard embedding of the material in paraffin, thin histological sections were cut, followed by hematoxylin and eosin staining. During the microscopy of the histological specimen, a specific focus was on the degree of epidermal keratinization and pigmentation, the thickness of the epidermis, the presence of epidermal appendages.

Results

Clinical signs

During the ophthalmologic evaluation of the left eye, a pigmented neoplasm of a spherical shape covered with hair was found on the lower eyelid (Fig. 1).

One side of it is attached to the mucous membrane from the dorso-medial edge of the lower eyelid, and the other side – to the cornea in the medial canthus of the eye. The hair directly touched the cornea, which irritated the eyeball and led to significant tear-shedding. The animal was being observed for some time, but the neoplasm increased in size, discomforted the animal, so it was decided to remove the neoplasm surgically.

Surgical and therapeutic treatment

The animal was previously isolated from other animals. The calf was sedated for subsequent surgical manipulations by means of remote injection with an immobilizing drug. 4 ml of 2% xylazine solution and 0.25 ml of zoletil (Zoletil 100 (Virbac)) were used for sedation. In 15 minutes, the animal calmed down, lay down, and almost did not resist during surgery. To secure the animal a strong rope was thrown around its horns and muzzle, and its was held by the nasal septum with fingers.

The operating field was treated with an antiseptic solution, 1 ml of 2% lidocaine solution was infiltrated under the eyelid conjunctiva. In a minute, the neoplasm was gripped with tweezers and pulled away. Afterwards, to prevent bleeding, its base was stitched with a thin resorbable suture. After that, the neoplasm was carefully removed. The eye was washed again with an antiseptic and the affected area was treated with tetracycline eye ointment.

For waking up the animal from anesthesia, it was intramuscularly injected with 2 ml of a solution of atipamezole

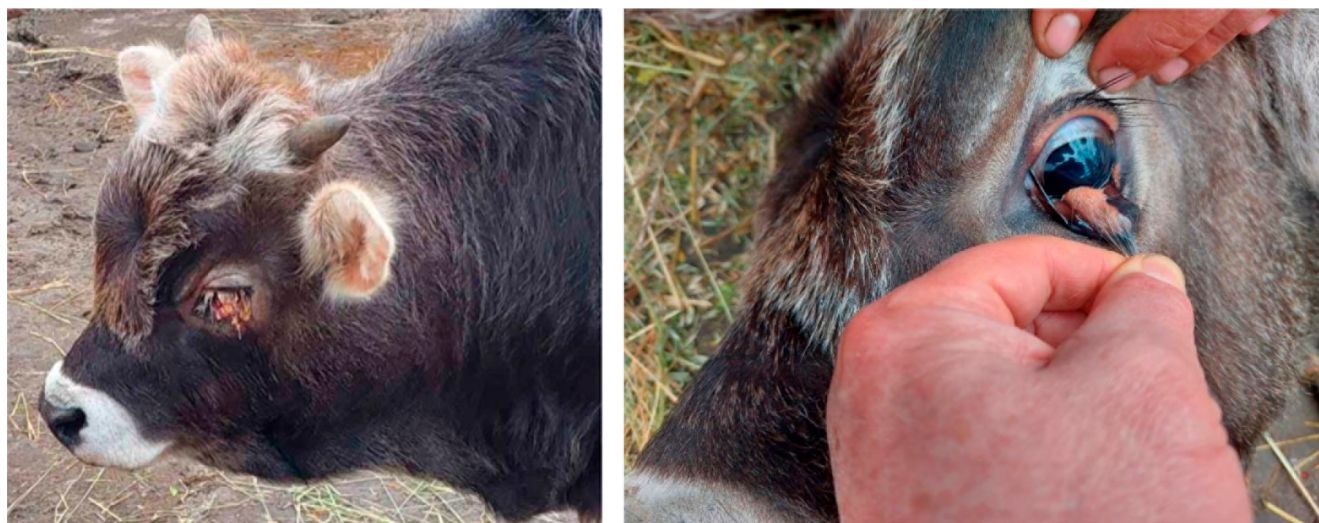


Fig. 1. General appearance of the ocular dermoid in a calf.



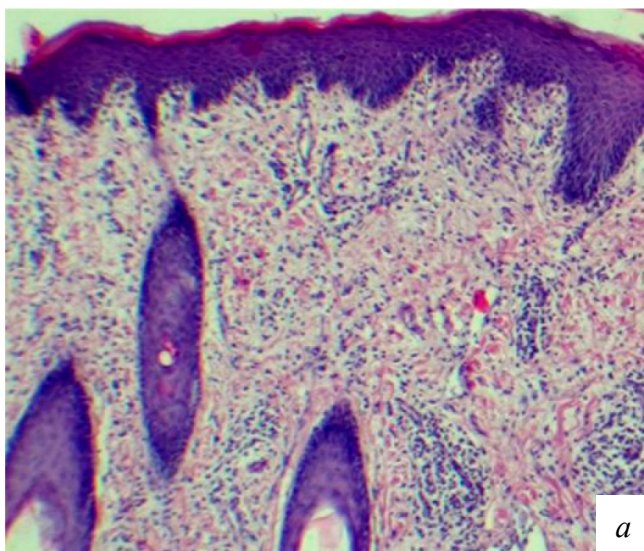
Fig. 2. Macroscopic appearance of the removed calf's neoplasm.

hydrochloride, a selective blocker of alpha-2-adrenoreceptors. In 15 minutes, the animal returned to full consciousness, got up and behaved naturally, in 30 minutes it began to eat, its chewing function restored.

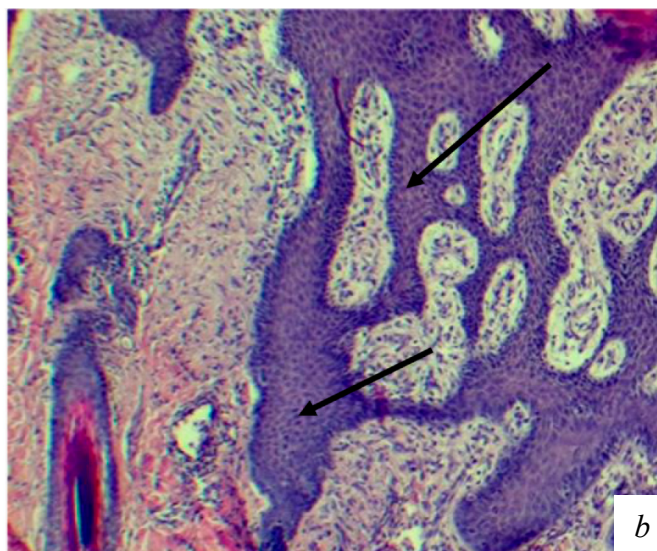
Postoperative therapy included tetracycline ophthalmic ointment application twice a day for 10 days, which was placed under the lower eyelid.

Histopathological analysis

The histologically removed neoplasm fragment consists of dense unstructured fibrous connective tissue that formed the base. Externally, the fragment is covered with a multilayer squamous keratinized epithelium with local growth into the underlying connective tissue. One edge of the neoplasm is covered with hair, numerous hair follicles, end sections of sweat and sebaceous glands are located in the connective tissue base. On the other edge, an area with severe chronic inflammation and ulceration was found. The surface of the pathologically affected area is covered with purulent-necrotic exudate with desquamated epithelium. Subepithelial connective tissue is infiltrated by neutrophils and lymphocytes.

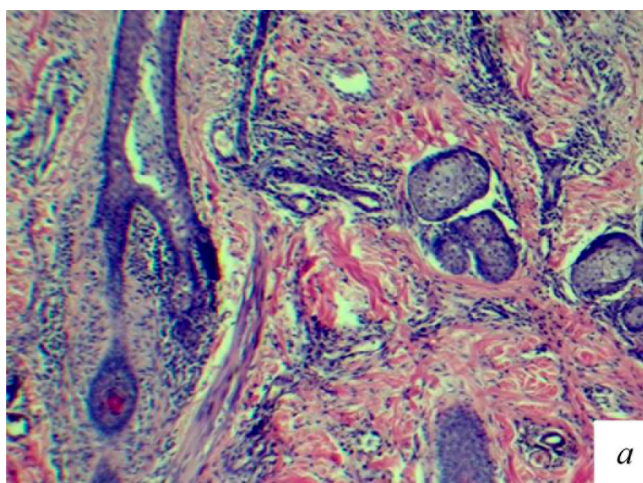


a

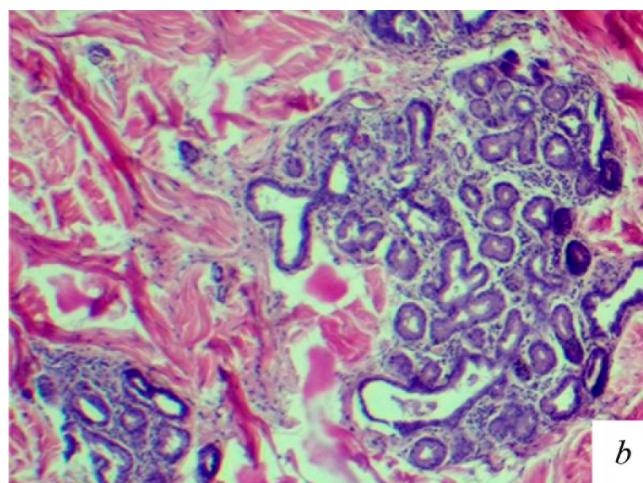


b

Fig. 3. Surface part of the ocular dermoid (*a*). Multilayer squamous epithelium growing into a thick connective tissue stroma (*b*).
Hematoxylin and eosin, ×100.



a



b

Fig. 4. Deep layers of the dermoid. The connective tissue stroma contains numerous, large, well-developed hair follicles and other accessory structures (sweat and sebaceous glands). *Hematoxylin and eosin. a – ×100; b – ×400*

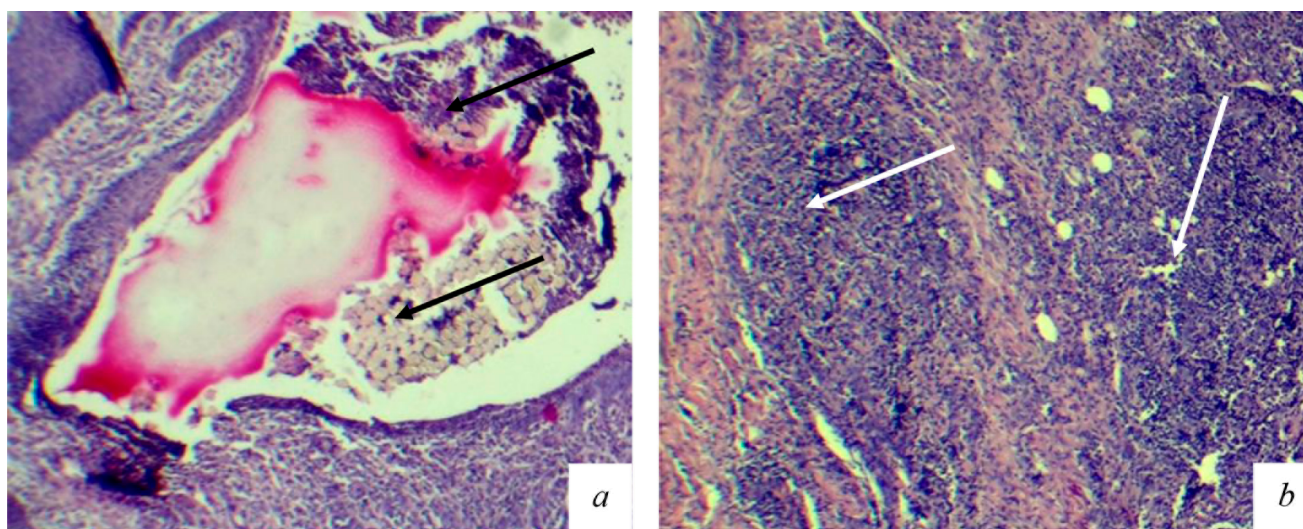


Fig. 5. The area of chronic purulent inflammation of the dermoid: *a* – area with pronounced chronic inflammation and ulceration and desquamated epithelium (black arrow); *b* – infiltration of deep layers by neutrophils and lymphocytes (white arrow).
Hematoxylin and eosin. ×100

Follow-up checks on days eight and sixteen and a control examination four months later showed that the wound had healed without complications and that the eye and appendages appeared normal. No signs of scarring or regrowth were found.

Discussion

Eye dermoids are relatively rare occurred in cattle where the prevalence is estimated nearly 0.002% (Yeruham et al., 2002). Despite this, they have been reported in many cattle breeds worldwide (Barkyoumb, & Leipold, 1984; Kilic et al., 2012; Sarangom et al., 2015; Prasath et al., 2019; Ahmad et al., 2020). The dermoid consists of ectodermal (keratinized squamous epithelium, hair, sebaceous and sweat glands) and mesenchymal elements (dense unstructured fibrous connective tissue, adipose and even cartilage tissue) combined in different proportions (Castro et al., 2006).

Localization of ocular dermoids is more often unilateral in the area of the limbus, third eyelid, canthus, eyelid and conjunctiva. There are several reports of bilateral ocular dermoids in calves, describing one or more animals. Of the bilateral cases, inferonasal corneoconjunctival dermoids and nasal canthal dermoids were the most commonly reported (Yeruham et al., 2002). In the described case, the ocular dermoid in the bull of the Ukrainian grey breed was unilateral and localized in the medial corner of the eye on the mucous membrane of the eyelid, attaching to the cornea.

The most likely mechanism of abnormal differentiation of the surface ectoderm is mesenchymal metaplasia. According to Alam & Rahman (2012), bilateral ocular dermoids are genetically transmitted defects in Hereford cattle. Signs of both autosomal recessive and polygenic inheritance were observed. However, the mode of inheritance and the role of the environment in the pathogenesis of these developmental defects remain uncertain.

Histopathology of ocular dermoids indicate that they resemble normal skin covered with keratinized or non-keratinized multilayer squamous epithelium and randomly located hair follicles in a connective tissue base. That is, the tissues of the dermoid are of ectodermal and mesenchymal origin (Badanes & Ledbetter, 2019; Sharma et al., 2022). The presence of some surface additional structures has also been reported (Hillyer et al., 2003; Hashim et al., 2017). Dermoid cysts of the eye in animals can be both non-pigmented and contain varying amounts of the melanin pigment

(Erdikmen et al., 2013; Sharma et al., 2022). More commonly, histologically in ocular dermoids, the presence of a multilayer keratinized squamous epithelium over a thick connective tissue stroma with hair follicles and apocrine sweat glands is described (Sarangom et al., 2015), several hair units in fibrous connective tissue and fat particles in deep layers have been reported (Balland et al., 2015).

The case of an ocular dermoid in a bull described by us, structurally was also formed by connective and epithelial tissue. The latter locally grew into the connective tissue base. In the described ocular dermoid, hair follicles, sweat and sebaceous glands were found. It was the hair that grew on the surface of the dermoid that caused constant irritation of the cornea, tear-shedding and distress of the animal.

Mechanical damage to the neoplasm and normal tissues of the eye may be accompanied by the development of pathological processes in the form of subepidermal inflammation of dermoid tissue, inflammation of the conjunctiva and cornea, and the development of ulcers (Badanes & Ledbetter, 2019). Sharma et al. (2022), describing the histopathology of a clinical case of conjunctival dermoid, showed a multilayer squamous epithelium along with chronic inflammation, periglandular fibrosis, and hemorrhage. Hair follicles, sebaceous and sweat glands with lymphocytic infiltration were found in dermoids in the connective tissue layer (Hatate et al., 2018; Sharma et al., 2022). In the studied clinical case of the ocular dermoid we also found signs of chronic tissue inflammation, which were apparent on the epithelium by purulent-necrotic areas with ulceration, and in the connective tissue stroma – by cellular infiltration.

Consequently, young cattle of Ukrainian grey breeds may have ocular dermoids, their clinical and pathomorphological manifestation is typical and does not differ significantly from that of other breeds of cattle.

Conclusions

The dermoid in the calf of the Ukrainian grey breed is a rare anomaly for the breeding farms within Ukraine. Treatment of dermoid cyst of the eye in cattle is possible only surgically with subsequent monitoring of the affected area. It is the neoplasm and the hair growing from it that causes irritation, which leads to epiphora and blepharospasm, and in the absence of treatment can

cause corneal ulcers. In the structure of the ocular dermoid cyst a dense unstructured fibrous connective tissue with areas containing numerous hair follicles end sections of the sweat and sebaceous glands. Areas with pronounced chronic inflammation and ulcers were also detected.

This study will be of use to veterinarians, as well as scientists in the field of ophthalmology. The described case will contribute to the timely diagnosis and selection of an effective method of treatment of dermoid cyst in ungulates.

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