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دراسات تشريحية وأكلينيكية على جهاز الصرف الدمعي في الجمل وحيد السنم

أشرف صبحي ، فتحي مكادي*

درس في هذا البحث جهاز الصرف الدمعي في الجمل من كلا الناحيتين التشريحية والاكلينيكية ولقد استخدمت رؤوس عشرة جمال للدراسة التشريحية حيث حقنت خمسة رؤوس بمادة اللاتكس ، بينما استخدمت الخمسة رؤوس الأخرى للدراسات الاشعاعية • هذا ولقد استخدمت للدراسة الجراحية ستة جمال حية حيث أختبر ما اذا كان جهاز الصرف الدمعي لديها مسدودا ، كذلك كيفية تصريف الدموع •• وذلك لتأكيد النتائج التشريحية •

ولقد وجد أن النقطتان الدمعيتان تغيبان في الجمل كما أن القناتان الدمعيتان تكونان مسدودتين • ومن هنا فان عملية غسيل العين من جهاز الصرف الدمعي مستحيلة بالإضافة الى أنه من المحتمل أن هذا الجهاز قد لا يؤدي وظيفته كمصرف للدموع •

*: قسم : الجراحة - كلية الطب البيطري - جامعة أسيوط •

Dept. of Anatomy & Histology,
Faculty of Vet. Med., Assiut University,
Head of Dept. Prof. Dr. H. Badawi.

**ANATOMICAL AND CLINICAL STUDIES ON THE LACRIMAL
SYSTEM IN THE CAMEL (CAMELUS DROMEDARIUS)**
(With 3 Figs.)

By
A.S. SABER and F.M. MAKADY*
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SUMMARY

The lacrimal drainage system in the camel was studied from both the anatomical and clinical point of views. Ten camel heads were used for the anatomical study. Five heads were injected with latex and the rest were used for the radiological studies.

For the surgical study six camels were used for evaluating patency of the nasolacrimal drainage system and tear drainage.

In the camel the lacrimal puncta are absent, and the two lacrimal canaliculi are not patent. Hence, retrograde flushing of the eye ball is impossible and the nasolacrimal drainage system may be non functional.

INTRODUCTION

Lacrimal drainage system in the domestic animals comprises two puncta lacrimalis, two lacrimal canaliculi, lacrimal sac, nasolacrimal orifice (PRINCE, *et al.* 1960 and SISSON and GROSSMAN, 1966). This system serves as a conduit for tears from the eye to the nasal vestibule.

GELATT, *et al.* (1970), LUNDVALL and CARTER (1971) and GELATT (1981) concluded that chronic epiphora in the domestic animals is ordinarily not due to overproduction of tears, but rather to congenital and acquired affections that interfere with drainage through the nasolacrimal system. These affections such as atresia of the nasolacrimal meatus or orifice, absence or displacement of the lacrimal puncta, stenosis or obliteration of the nasolacrimal duct, tumours and inflammation of the ducts and sac were recorded in the dog, cat, horse, cattle and donkey (FAHMY, 1972; GELATT, *et al.* 1972; FOUAD, *et al.* 1973; GELATT, *et al.* 1970; GELATT, 1981; LATIMER and WYTMANN, 1984 and LAVACH, *et al.* 1984).

Description of the lacrimal drainage system and evaluation of its function were found necessary and mandatory to serve as a reference for the radiographical and clinical features for the diseases which might be encountered in the lacrimal drainage system in the camel.

The present work aims to study the lacrimal drainage system of the one-humped camel both anatomically and radiographically as well as to evaluate its patency and tear drainage by using fluorescein passage test and retrograde flushing.

* Dept. of Surgery, Fac. of Vet. Med., Assiut University.

MATERIAL and METHODS

Ten camel heads were used in this study. For the anatomical description, five fresh heads were injected through the nasal opening of the nasolacrimal duct with coloured latex. The heads were then formalized for four days before cut sagittaly to detect the course of the nasolacrimal system. For the dacryocystorhinogram study five fresh heads were used. The nasal orifice of the nasolacrimal duct was cannulated with a 18 gauge needle, then a 3-5 ml. of 40% iodized poppy seed oil (40% Lipiodol) was injected. The lateral and dorsoventral positions were used for radiography. The high viscosity of the contrast media permitted maintenance of the material within the nasolacrimal system during radiography. The technical factors for visualization of the entire nasolacrimal system were (F.D. 90, K.V. 50 and M.A.S. 5).

Patency of the nasolacrimal drainage system and tear drainage were clinically evaluated in six camels using fluorescein passage test. Five drops of 2% fluorescein dye was instilled in each eye. Cotton swab was packed to the nostrile and examined every two minutes up to one hour to detect the presence of the dye.

The nasolacrimal system was flushed in a reterograde fashion in other five camels. The head was firmly restrained, topical anaesthetic ointment was applied to the nasolacrimal duct orifice. The duct was cannulated with a blunt 18 gauge needle. The nasolacrimal apparatus was flushed with 5-10 ml. of sterile isotonic saline coloured with fluorescein dye and the outflow of the solution from the eye was observed.

RESULTS

In the camel a typical lacrimal drainage system is not present as both the lacrimal punctae are absent.

The lacrimal sac is funnel-shaped (about 8 mm. long and 7 mm. wide) and is situated in the fossa sacci lacrimalis. The sac opens dorsally with two openings leading into two minute blind lacrimal canaliculi (Fig. 1/14). The lacrimal canaliculi end blindly after a course of about 10 mm. This is affirmed by flushing of saline, latex and lipiodol retrogradly through the nasal opening of the nasolacrimal duct without appearance of these solutions anywhere in the conjunctiva. The lacrimal sac is continuous rostroventromedially with the nasolacrimal duct.

The nasolacrimal duct could be divided topographically into caudal, middle and rostral parts. The caudal part from the lacrimal sac to pass through the thin-walled osseous lacrimal canal for about 4 centimeters. The middle part of the duct is about 14 cm. long and 3-4 m. wide. It exits from the osseous lacrimal canal at the level of the caudal column of the second molar tooth to run, at first, rostroventrally for about 2.5 cm. in a shallow groove on the nasal surface of the maxilla. Then after, the duct runs slightly rostradorsally to assume again the rostroventral direction. The duct lies laterally on the periostium of the maxilla, and is covered medially by the nasal mucosa and ventral nasal concha.

The rostral part of the nasolacrimal duct runs on the premaxilla for about 4 cm. to open in the vestibule of the nasal cavity, about 4 cm. rostroventral to the alar fold and about 1 cm. from the external nostril. The nasal opening of the nasolacrimal duct is hardly noticeable and is about 2 mm. wide.

Fluorescein dye test was negative in all tested camels. Within one hour several examinations of the cotton swabs revealed that no traces of fluorescein dye can be detected at the nostril.

LACRIMAL SYSTEM IN THE CAMEL

Retrograde flushing is impossible in all examined camels. The nasolacrimal system could not be flushed after repeated attempts. Washing solutions were flushed back through both duct openings and does not reach the eye.

DISCUSSION

NEUMANI (1911) mentioned that in the camel the osseous lacrimal canal is shorter and narrower than in the horse. LEESE (1927) cleared in the same animal that the bony duct which carries the upper part of the lacrimal canal emerges into the nostril under cover the lower scroll of the posterior turbinate bone. These findings agree with the description of the nasolacrimal duct of this study. JAMDAR (1965) described the osseous lacrimal canal of the camel as very short and ends about one and half inches from the lacrimal fossa and is later continued by a groove.

McLEOD (1958) in cattle and HARE (1975) in dog and cat reported that the nasolacrimal duct opens on the ventral surface of the alar fold. However, in cattle DIESEM (1975) stated that the duct opens near the lateral wall of the nostril and it is difficult to see because it lies on the medial surface of the alar fold of the ventral nasal concha. In ovines, DIESEM (1975) mentioned that the nasolacrimal duct terminates in the dorsal aspect of nostril while in mule the duct opens on the lateral part of the floor or on the lateral wall of the nostril. NICKEL, *et al.* (1979) cleared that the opening of the nasolacrimal duct in the domestic animals is located on the floor of the nostril at the junction of the skin and mucosa. They described (also HARE, 1975 in the dog) a second opening for the nasolacrimal duct which is occasionally present in the pig and often in the dog, on the lateral surface of the ventral nasal concha near its caudal end. KRISHNAMURTHY, *et al.* (1981) agreed with GELLAT and TITUS (1974), SINHA and GALHOUN (1966) and SISSON and GROSSMAN (1966) that the nasolacrimal duct opens on the lateral wall of the nostril in donkeys, under the alar fold in dogs, and on the medial aspect of the alar fold of the ventral turbinate in buffaloes, ox, sheep and goat. BERG (1974) mentioned that the nasolacrimal orifice in the domestic animals is situated more lateral than that in horse and that in dog, this orifice is situated at the rostral end of the alar fold. In the camel the nasolacrimal duct opens like the majority of the domestic animals rostroventral to the alar fold and is difficult to detect.

Absence of the lacrimal puncta in camel is considered to be a permanent anatomical feature in all examined specimens. The presence of such condition in other domestic animals is considered to be a congenital anomaly (MAGRANE, 1971 and GELATT, 1981).

Fluorescein passage test is performed for detection of the patency of the nasolacrimal system. A negative reading indicated no passage of the dye within five minutes. Positive dye passage indicated that the nasolacrimal system was functional (MAGRANE, 1971 and BRYAN and MICHELSON, 1978). In the present findings, within one hour fluorescein dye did not appear at the nostril. This indicates that the nasolacrimal system may be non functional or the fluorescein passage test is not a dependable means of examination of tear drainage and patency of the drainage system in camel.

Retrograde flushing of the eye ball in camel is impossible due to absence of lacrimal puncta, thus flushing of the eye ball in camel can be performed only by direct instillation of cleansing solution by eye dropper syringe or plastic irrigating bottle or by application of subpalpebral lavage apparatus in the superior conjunctival cul-de-sac.

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LEGEND

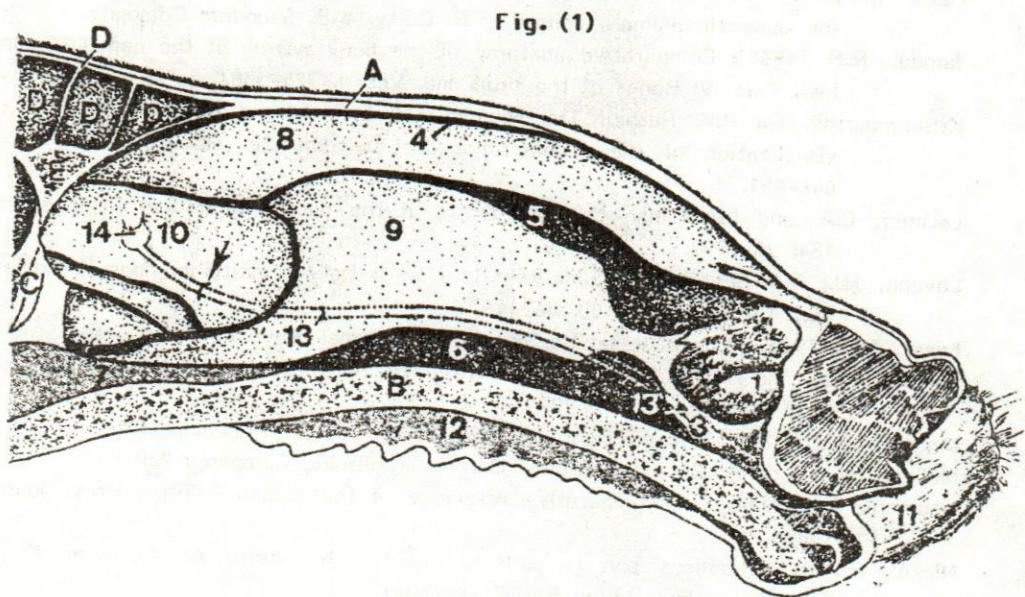
Fig. (1): Nasal cavity of the camel (diagram).

A: Nasal bone, B: Osseous palate, C: Sphenoid, D: Frontal, D': Frontal sinus, E: Ethmoid.
 1: Left nostril, 2: Alar fold, 3: Basal fold, 4: Dorsal, 5: Middle, and 6: Ventral nasal
 meatuses, 7: Nasal septum (part), 8: Dorsal, 9: Ventral, and 10: Middle nasal conchae,
 11: Upper lip, 12: Hard palate, 13: Nasolacrimal duct, 13': Its external opening,
 14: Lacrimal sac. (Arrow indicates the end of the osseous lacrimal canal).

Fig. (2): Latex preparation of the nasolacrimal duct of the camel. Metric scale is shown.

Fig. (3): Radiograph of the lacrimal drainage system of the camel.

1: Lacrimal canaliculi, 2: Lacrimal sac, 3,4,5: The caudal, middle and rostral parts
 of the naso-lacrimal duct. (The system is reterogradly injected with 40% Lipiodol).



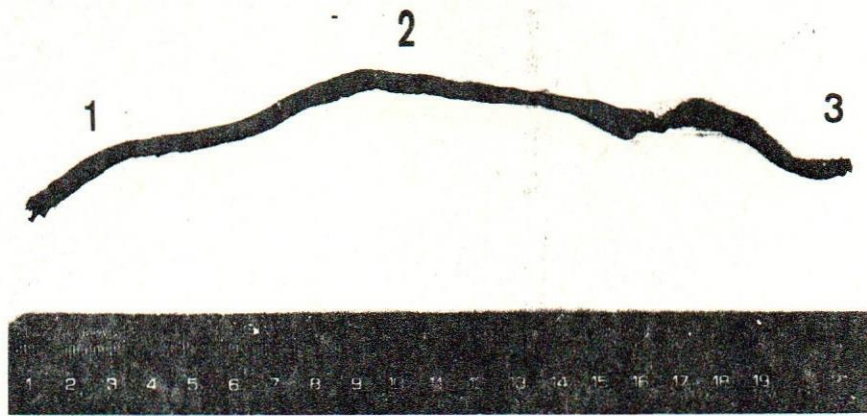


Fig. (2)



Fig. (3)