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HISTOLOGICAL INVESTIGATIONS OF THE NICTITATING MEMBRANE (PALPEBRA III) IN THE NEW ZEALAND RABBIT

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Yeni Zelanda Tavşanlarında Üçüncü Göz Kapağı (Palpebrae tertia) Üzerinde Histolojik Araştırmalar

Özet

Membrana Nictitans'ın yapısına baktığımızda corneal ve palpebral yüzeyleri çok katlı yassı epitel tarafından oluşturulur. Kuşak şeklinde bir hyalin kıkırdak membran'ın ortasında bulunur. Membranın iki kısmı vardır. Bunlar palpebral ve corneal kısımlarıdır.Palpebral kısım kıkırdağın üst tarafında bulunur. Corneal kısım ise cornea'ya dönük olan kısımdır. Bu her iki yüzey karşılaştırıldığında sıkı yapılı ve düzensiz ve bağdoku içinde birçok farklılıklar gözükür. Palpebral yüzde, düzensiz bağdoku tarafından kuşatılan iskelet kas demetleri longitudinal ve vertikal yönde seyrederler. Yağ hücreleri gruplar halinde veya dağınık olarak buluru. Ayrıca bir kuşak gibi seröz ve müköz bezlerde bulunurlar. Buna karşılık corneal tarafta ise çizgili kas iplikleri hariç bu belirtilenlere ilaveten lenf folikülleri dikkati çeker.

Anahtar kelimeler: Anatomi, tavşan, palpebra tertia

Summary

The corneal and palpebral sides of nictitating membrane (NM) consisted of a multi-layer flat epithelium. Belt-like hyaline cartilage present in the middle of the membrane The membrane has two parts; they are palpebral part which takes place on the upper side of the hyaline cartilage and corneal part which faces the cornea. When corneal and palpebral parts of the membrane are compared many differences are seen in the tightly structured and dense irregular connective tissue The membrane shows wavy appearance in the medial eye angle. In the palpebral surface; skeletal muscle bundles which are surrounded by dens irregular connective tissue run both longitudinally and vertically. Fat cells are seen groups or in disperse in the same side in addition to belt-shaped serous and mucous glands. Except skeletal muscle, lymph follicles were seen additionally in the corneal side when you compare it with the palpebral side.

Key words: Anatomy, rabbit, nictitating membrane

Introduction

Structure of palpebra tertia has been studied in different animals. NM as 'third eyelid' is present in vestigial form as plica seminularis conjunctivae in man. Human embryos and foetuses show that it is relatively large up to the 6th fetal month, after which it no longer grows at a rate corresponding to that of the eyeball. Finally, only a rudiment remains. When compared to that of humans, the NM of the domestic animals is relatively well developed. The NM is well developed m domestic mammals (Getty 1975; Schramn et al. 1994). It can be seen in the nasal angle of the eye as a duplicator conjunctiva extending between the upper and lower lids. Every time the palpebra tertia is closed, it spreads to the middle of the cornea and is then pulled back into the ocular angle when the eye is reopened (Craige 1969; Barone 1986; Schramn et al. 1994; Taşbaş 1996). Nictitating membrane is one of the accessory organs of the eye (Çalışlar 1978; Koch and Berg 1992). In the other hand nictitating membrane is very poor in rats (Greene 1963). Goblet cells at free edges provide glikocalice and hydration. In this way while the movement of the NM, secretion forms on the surface of the cornea (Moore at al. 1987). The goblet cells on the palpebral surface are more numerous then on the comeal surface (Schramn at al. 1994). In the cattle and pigs there are two glands under the epithel tissue which produce secretion (Taşbaş 1996). In dogs serous glands consist of a superficial portion but there is no deep portion (Getty 1975). The epithelial cells of the corneal as well as the palpebral surfaces are densely studded with short microvilli. The

microvilli of the corneal surface are irregularly distributed (Schramm et al,1994). The cat is only animal containing muscular fibers in its palpebrae (Taşbaş 1996). NM contains smooth muscle fibers (Kosterlitz et al. 1964; Ceccarelli et al. 1972; Marshal 1980). These muscular fibers play role in movements of the NM (Thompson 1961; Marshall 1980; Schramm et al. 1994). According to Getty (1975), the lid does not move with the aid of muscles. The innervation of the nictitating membrane has been clearly demonstrated (Thompson 1961; Jaboreno 1968; Ceccarelli et al. 1972; Horwitz and Kaufman 1979). Corneal surface of me NM plays an important role in cleaning and protection of the eye (Moore et al. 1987; Taşbaş 1996). The glands of third eyelid may be confused with the lymphoid tissue on the bulbar of the NM (Getty 1975; Nagpal et al. 1991; Racket 1991; Schramm et al., 1994).

Material and Methods

In this research, 15 White New Zealand Rabbits of different sex (10-14 months) were used. The nictitating membrane of the animals that anaesthetized by an appropriate anesthesia, were exposed by dissecting from the medial eye angle. Specimens were fixed m Bouin's and formalin (%70) solutions for light microscopy. They were embedded in paraffin and cut in 7 μm thick sagittal and transversal section. The preparations were stained with PAS and Mallory's triple (Bancroft, 1984). They were examined under light microscopy and photographed.

Results

Nictitating membrane is connected to the eye's medial corner. it is a concave membrane. The membrane surface is surrounded by stratified, squamous nonkeratinized epithelium. It is highly wavy at the beginning of the medial eye angle. (Fig.1). Goblet cells take place between the epithelium cells. It was determined that the number of Goblet cells which give was positive reaction is higher on the corneal surface then palpebral surface (Fig. 2). Eyelids are basically made of dense irregular connective and hyaline cartilage tissues. Histologically there are differences in palpebral and corneal parts; in palpebral surface; tissues that take place within the dense irregular connective tissue are skeletal muscle tissue, adipose tissue, serous and mucous glands. Lined skeletal muscle fibers were found under the epithelium (Fig. 3). Muscle fibers running longitudinally and horizontally are more abundant at the connection point at the middle eye angle of the NM. Within the dense irregular connective tissue, adipose tissue was seen either in group or disperse. Mucous and serous glands form a wide layer. Mucous glands and its channels were easily distinguished by positive reaction of PAS negative. The hyaline cartilage in the middle of the membrane can be readily determined with its perichondrium containing excessive blood vessel. Under the cartilage tissue there are again adipose tissues, serous and mucous glands. Lymph follicles are at the bottom serous and mucous glands (Fig.4) These follicles characteristic for corneal surface and they are connected to the corneal epithelium.

Figure 1. Part of the horizontal section near the limbus
C: corneal surface P: palpepral part (cut) L: lymph follicle on the corneal surface T: cartilage F: adipose cells. Mallory's triple X66.

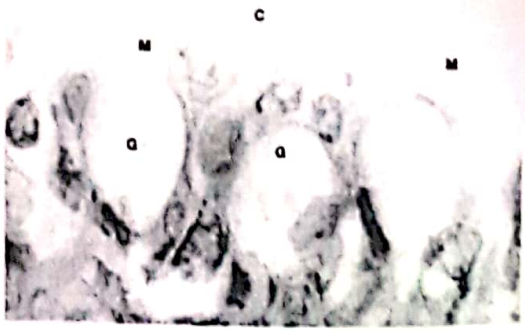

Figure 2. The same NM as in figure 1, at its base
C: corneal surface G: Goblet cells M: cliated border Mallory's triple X1650.

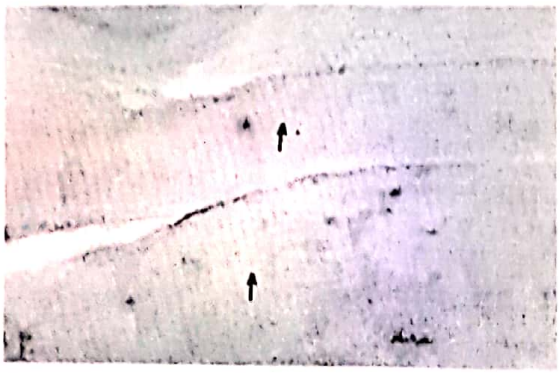

Figure 3. Large arrows: Fibers extending to the ctriated muscle Mallory's triple X1650.

Figure 4. Part of the horizontal section near the palpepral surface
Large arrow: Serous glands and spilling canals Mallory's triple X165

Discussion

Nictitating membrane in Rabbits has a well developed epithelial formation It has been reported that the nictitating membrane develops much less in rats, according to other species third eyelids (Greene 1963). In this study we found that all our study materials have well developed nictitating membrane. It has been reported that the medial surface of the nictitating membrane was covered with the connective tissue (Racket 1991; Taşbaş 1996). We found that this surface of the nictitating membrane is also covered with the stratified squamous nonkeratinized epithelium.

According to Taşbaş (1996), the only type of animal containing muscle fibers in its nictitating membrane is cat. It has been reported that NM has smooth muscle fibers (Kosterlitz et al. 1964; Ceccarelli et al. 1972; Horwitz and Kaufman 1979; Marshall 1980; Schramn et al. 1994). However, we also found skeletal muscle tissue in NM of rabbits.

As Schramn et al. (1994) reported an excess of lymph follicles at the corneal side. They have also stated mat its tight connection with the corneal epithel indicates that it looks like a lymphoepithelial character. This data is parallel with our results. As relevant literatures (Getty 1975; Moore et al. 1987; Schramn et al. 1994) goblet cells are quite intense at the corneal side. These data are quiet similar to our results. According to Schramn et al. (1994), the movements of the nictitating membrane can be divided into active and passive phases. The active phase is initiated by the contraction of smooth muscle. The passive phase is initiated by the reduction of the nervous stimuli which relaxes the muscle fibers. Form our study we could suggest that movement of NM in rabbits that is arranged by the contraction of skeletal muscle fibers.

As a conclusion a further research on nictitating membrane by histocemically and functionally could be done.

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