

## Anatomical and Histological Study of the Pecten Oculi in Two Species of Birds (*Milvus migrans* and *Alectoris barbara*)

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### Abstract

This study was conducted on pecten oculi anatomy and histology of the ocular body of the eye in *Milvus migrans* and *Alectoris barbara*. The pecten oculi in both types was vanned type and made up of primary, secondary and few tertiary lamellae. *Milvus migrans* and *Alectoris Barbara*, however, had pleated-type pecten oculi that displayed folded structure. The number of pleats of the pectens was 12 and 17 in *Milvus migrans* and *Alectoris barbara*, respectively. It was situated on the ventral surface of the eye and extends into the vitreous body. Histological sections showed that the demonstrated pecten oculi folds in the *Milvus migrans* and *Alectoris barbara* were composed of large number of capillaries and large blood vessels. The capillaries are surrounded by thick basal membrane with many pigmented cells distributed around the capillaries. They were low in *Milvus migrans* compared to the *Alectoris barbara*.

### المستخلص

جرت الدراسة الحالية للكشف تشريحيا و نسيجيا عن الجسم المشطي للعين في طائري الحدأة و الحجل البربري. وتبين ان هذا الجسم يتكون من صفائح اولية وثانوية وكانت بنية الجسم مطوية تحتوي على العديد من الطيات. وكان عدد الطيات اثني عشر طية في الحجل البري، اما في طائر الحدأة فكانت حوالي سبعة عشر طية. يقع الجسم المشطي في كلا النوعين على السطح البطني للعين ويمتد في الجسم الزجاجي. أظهرت المقاطع النسيجية لطيات الجسم المشطي في عينات الدراسة انها ذات شكل مستطيل وكذلك أثبتت انها تتألف من عدد كبير من الشعيرات الدموية والأوعية الدموية الكبيرة وتحيط الشعيرات الدموية بغشاء قاعدي كثيف، والخلايا الصبغية كثيرة وتتوزع حول الشعيرات الدموية التي كانت منخفضة في الحدأة مقارنة مع الحجل البري.

Key words: pecten oculi; Anatomy; *Alectoris Barbara*; *Milvus migrans*.

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## Introduction

The pecten oculi bird has a special structure in the eye which appears in the form of a dark pigment plate. Its peaks are connected to a non-sensory dense bridge located above and it linked the membrane to the internal limiting membrane of the retina in the Falco. The type of pecten oculi varies between day and night birds [1,2]. It appears in three types: Conical type, as in *Apteryx mantelli*, Vaned type in *Struthio camelus* and *Rhea americana*, and Pleated type found in other birds such as the Japanese bird *Coturnix coturnix japonica* [3,4,5]. The difference in pecten oculi depends on the types of bird with daytime activity [6]. Pecten oculi consists of various forms of connective tissue and a large number of vessels bloody capillary, melanocytes, pericytes and hayalocytes [4]. The bridge in the *Milvus migransh* and the Collared *Alectoris barbara* pecten oculi was contracted connective tissue with many pigment cells [7]. Two bird types were selected based on the difference in the nature of the nutrition. *Milvus migransh* from the Falconidae Falcons family that feeds on rats, field rats, insects, small reptiles and birds. The *Alectoris barbara* is a local bird that feeds on grains, fruits and green plants [7].

## Materials and Methods

A total of four eyes of each bird type were studied. Decapitation was carried out after anesthesia. The eyes were immediately excised from the orbit quarry using fine tweezers and the pecten oculi carefully dissected out and immersed in the fixative (10% formalin solution) with two changes. Segments were washed up by tap water and then processed for a light; sections 5 $\mu$  thick were stained with haematoxylin and eosin and the general features of the tissue were investigated, and then covered with cover slips. This was followed by microscopic examination of the tissues [8,9].

## Results

The pecten oculi is an organ that overlies the optic disc and projects into the vitreous body and extends to the glass fluid in *Milvus migrans* of pleated type with a total of 17 folds. The free part is associated with retina (Fig.1). Light Microscopic investigations showed that the folds of the pecten oculi contain a lot of noodles, blood vessels having thick basement membrane, a little of pigment cell, and plasma fibroblast (Figs. 2, 3).

The bridge consists of a connective tissue containing scattered fibers and many melanocytes and cells generated for fiber and little capillary blood vessels. There is a membrane connecting the bridge inner limiting processes (Fig. 4).

The gross anatomy of the pecten of the *Alectoris Barbara* was studied. It was noted noticed that black, the basal border of pecten has shown attachment to head ostripe shaped optic disc. It has shown pleural number of pectineal folds on the tune of 12 (Fig. 5).

Microscopically the pecten oculi is thin and contains large numbers of large blood vessels and capillaries. Many pigment cells are distributed among blood vessels (Figs. 6-7). Pecten

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oculi is a bridge connecting the folds which of the folds consisting of connective tissue containing a large number of melanocytes and fibroblast (Fig. 7).

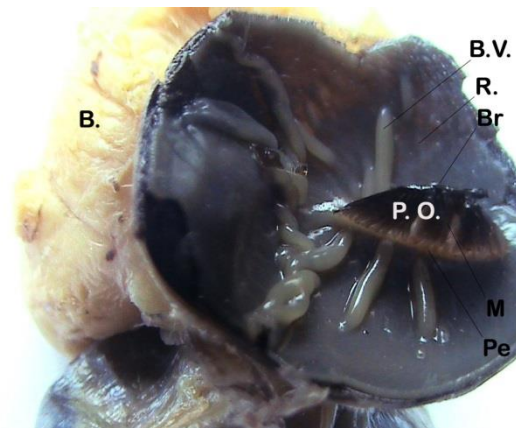


Fig. 1. The appearance of pectin oculi of *Milvus Migrans* shows the pectinate pleat and the Bridge. The pectinate pleat links of the membrane. Bridge (Br); Retina (R); Membrane (M); Pectinate pleat (Pe); Pecten Oculi (P. O.); Brain (B); Blood vessels (B. V.).

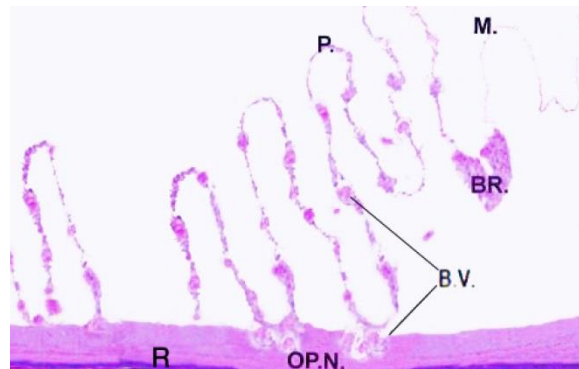


Fig. 2. Link of the eye pecten to the nerve optical. Retina (R); Optic Nerve (Op. N.); Blood Vessel (B. V.); Bridge (Br); Membrane (M). (H&E) stain (10x).

## Discussion

Birds retina is characterized as non-vascular, thus providing oxygen and nutrition by a multicellular pigment known as pecten oculi, which is always located above the optic

nerve and extends to the vitreous humor in the direction of the lens [10]. The size of pecten oculi and its number appears to be related to visual activity for birds, where the species with high pecten oculi have large folds, and vice versa [11].

The results of the current study showed that the pecten oculi in *Milvus migrans* is of the folded type and has a total of 17 fold and appear thick. While in *Alectoris Barbara*, the type is fan and the number of is 12 small folds. It was found to be folded in *Coturnix coturnix japonica* [4,5] *Melopsittacus undulate* [12]. *Bubo virginianus*, and propellers [7]. in *Accipiter nisus* and *Circus cyaneus*. From 11-12 fold [4].

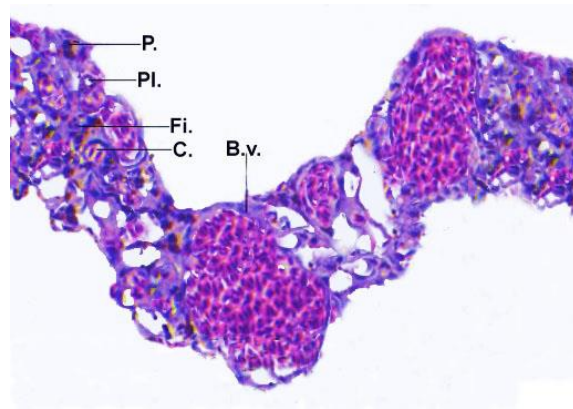


Fig. 3. Longitudinal section showing the texture composition of each fold through the pecten oculi bridge (thickened and highly pigmented). Blood Vessel (B. V.), Capillaries (C), Plasma cell (Pl.). (H&E) stain (25x).

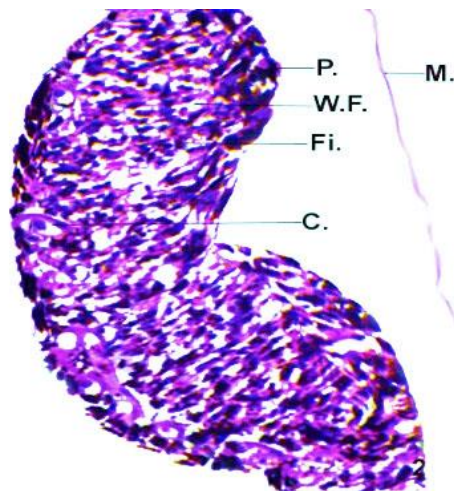


Fig. 4. Longitudinal Section showing texture OF the pectinate. Membrane (M); pigment cell (P); White fiber (W. F.); Capillary (C); Fibroblast (Fi.). (H&E) stain (25x).

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It is believed that this difference between the type of pecten oculi and the number and thickness of folds is related to the behavior of birds and their relationship to daily activity and visual requirements of species [6,12]. and the present findings were totally in agreement with the findings of Kiama et al. [13] (*Gallus domesticus*), Venkatesan and Ramesh [14]. In domestic fowl and Pourlis [15]. for quail (*Coturnix coturnix Japonica*), Haller et al. [16]. who for the pecten oculi budgerigras (*Melopsittacus undulatus*) with collaborative observations. The study shows that there are many capillaries in each fold of the pecten oculi and *Milvus migrans* folds. These vessels appear to provide the retina with oxygen and food and maintain eye temperature [6]. The presence of melanocytes in the folds is to support the blood vessels and protect them from ultraviolet radiation and free radicals of oxygen [17].

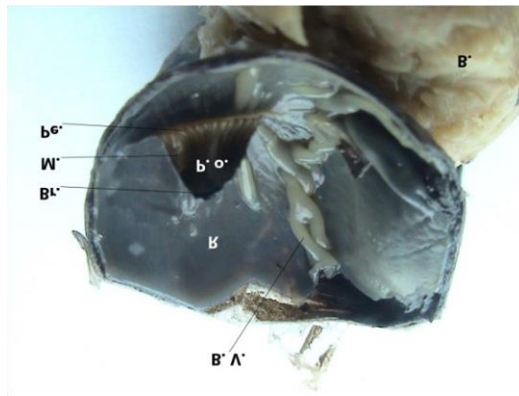


Fig. 5. The appearance of pecten oculi of *Alectoris Barbara* the pectinate pleat and the Bridge. the pectinate pleat link of the membrane. Bridge (Br), Retina (R), Membrane (M), Pectinate pleat (Pe), Pecten Oculi (P. o.), Brain (B), Blood vessels (B. V.).

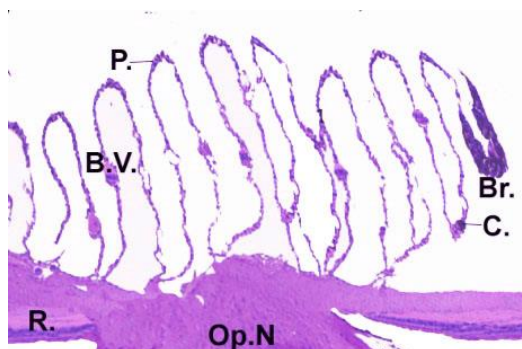


Fig. 2. A longitudinal section showing the link of the eye pecten to the nerve optical. Bridge (Br), Retina (R), Optic Nerve(Op. N.), Pigment cell (P.), Capillary (C), Blood Vessel (B. V.). (H&E) stain (10x).

The study showed that the bridge in pecten oculi *Milvus migrans* and consists of connective tissue containing many melanocytes, and it in *Milvus migrans* a few capillaries compared to *Alectoris barbara*, in which it is believed that the presence of many of them in the bridge leads to the absorption of light and thus increase the temperature and increase the physiological events within the eye contributes to the transfer of food to the retina [18]. Pecten oculi in vitreous humor contributes to its stability and helps its vascularity to provide vitreous humor with fluids necessary to regulate intraocular pressure [9].

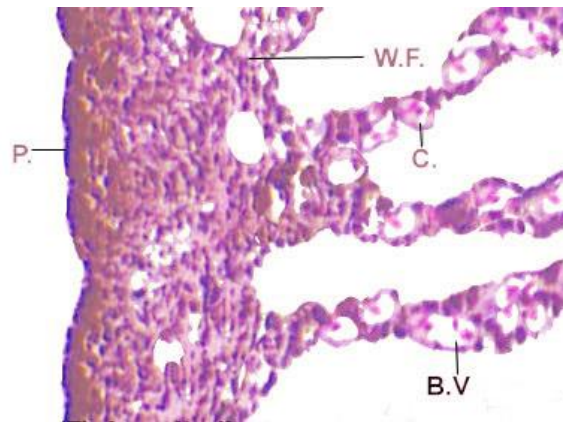


Fig.7. Longitudinal Section showing the texture the pectinate. pigment cell (P), White fiber (W. F.), Capillary (C). (H&E) stain (25x).

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