

VITREOUS ANATOMY

Essay

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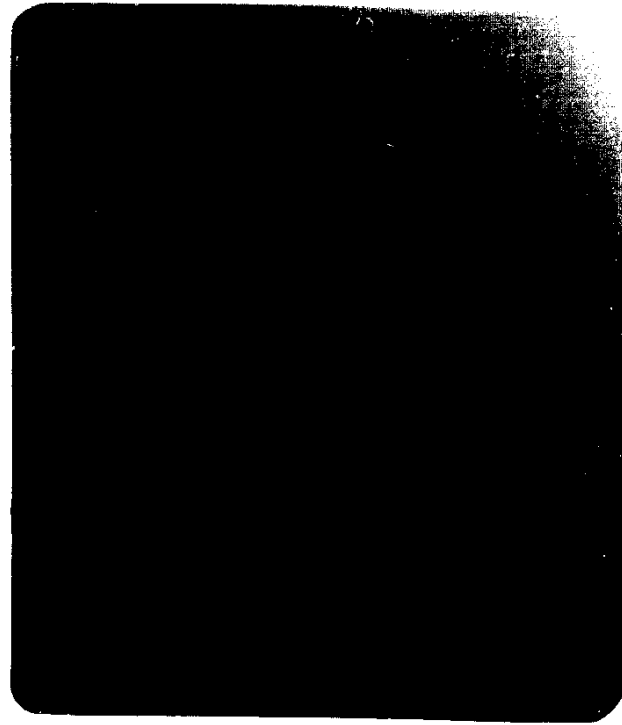
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H I S T O R I C A L

HISTORICAL

Within the coats of the eye ball are three transparent media which used to be termed 'humors' (humor= fluid) of the eye; the aqueous, the vitreous, and the crystalline humors. The name is still applied to the first of these; the second is best termed the vitreous body; and the third is called the crystalline lens. The vitreous body was recognized as a 'humour' from ancient times, Hippocrates assumed that it was the essential organ of sight. To the Alexandrian school the crystalline lens became the unique visually important structure and the vitreous was relegated to a subordinate role, a view maintained by Galen. There the position remained until relatively recent times when our conception of its organization and structure has been revolutionized by successive improvements in the techniques of examination- first by gross methods assisted by chemical treatment, a study dating from the middle of the 18th century, then by histology from the middle of the 19th century, then by biomicroscopy from the second decade of the present century, and ultimately by the use of phase-contrast and electron microscopy (Duke-Elder, 1966).



Drawing to show vitreous relations in the anterior eye. The ora serrata(1) is the termination of the retina. The vitreous base(2) extends forward about 2.0 mm. over the ciliary body and posteriorly about 4.0 mm. over the peripheral retina. The collagen fibrils in this region are oriented at a right angle to the surface of the retina and ciliary body, but anteriorly are more parallel to the inner surface of the ciliary body. The posterior hyaloid (4), the Wieger's ligament(5), and the space of Berger at (6).

GROSS ANATOMY

GROSS ANATOMY

The vitreous body (vitreous = glassy) is a clear transparent gel of semisolid consistency filling the chamber of the eye ball behind the lens , it thus occupies about two-thirds of the volume of the globe . Its shape is determined by the cavity in which it lies , confirming to the spherical curve of the walls of the eye , and hollowed out in front by a sugar-shaped depression representing the impression of the posterior convexity of the lens , the patellar fossa.(Duke-Elder , 1966). At the edge of this fossa is a circular thickening of the vitreous , 8 to 9 mm. in diameter , which is known as the ligamentum hyaloideocapsulare of Wieger'. This attachment is firm in young eyes but becomes less distinct with increasing age , so that in older eyes the lens and the vitreous can be separated from each other easily during cataract surgery (Rosen , 1962) . Within the attachment zone of the ligamentum hyaloideocapsulare is the "space of Berger" , which is a potential space where the lens and the vitreous are in very loose contact (Hogan et. al, 1971). At other times containing aqueous as well as embryonic remnants and fine vitreous fibrillae , and in pathological conditions often containing blood and inflammatory cells (Duke-Elder , 1966 ,

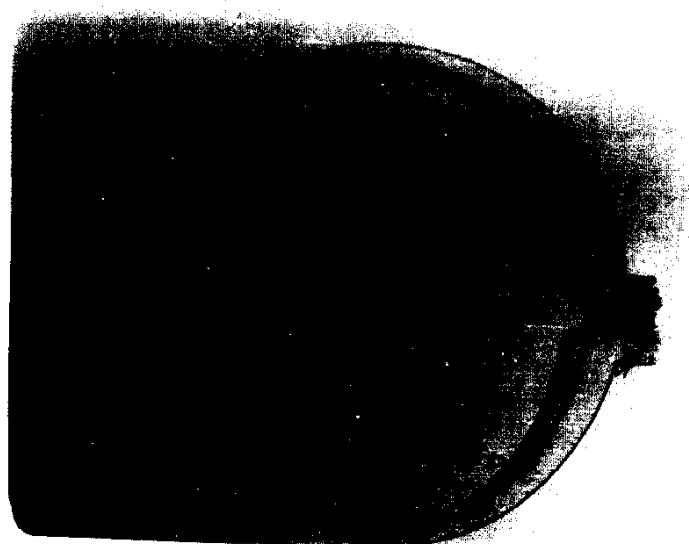


Diagram shows division of vitreous cortex by vitreous base (b) into anterior (a) and posterior (p) parts. Inset shows schematic drawing of vitreoretinal border as seen with electron microscope. Outer most layer of vitreous cortex(VC); Muller cells(mc); inner limiting membrane(ilm) .

The vitreous surface is divided by the ora serrata region into anterior hyaloid and posterior hyaloid.

Anterior hyaloid:

The surface of the vitreous anterior to the ora serrata region is known as the anterior hyaloid which is more condensed than the **surface** of the vitreous posterior to the ora serrata. Laterally, the anterior hyaloid is in close relation to the pars plana and the retina. It separates from the pars plana approximately 1.5mm. anterior to the ora serrata. The anterior hyaloid gel invests the zonular fibres and is attached to the ciliary epithelium and ciliary processes. Then the zonular fibres and the vitreous extend forwards between the ciliary processes into the ciliary valleys. The vitreous then continues anteriorly to the region of the lens equator, where its surface is in contact with the lens capsule, in this region it is thickened forming the hyaloideocapsular ligament of Wieger. If the vitreous and the zonular fibres are mechanically detached from the ciliary body, the shallow indentations of the ciliary processes can be seen on the vitreous surface (Hogan et. al, 1971).

The posterior hyaloid:

The posterior limiting layer or posterior hyaloid is the condensa-

3-a



Histologic section of anterior cortex(ac)
showing anterior hyaloid membrane (abm)

-tion of vitreous fibrils on the posterior retinal surface (Foos , 1973) . The posterior hyaloid extends back from the region of the vitreous base (Last , 1968) , which will be discussed later , and is only evident clinically when there is preretinal blood or a contraction of the vitreous . The framework of the vitreous body changes its arrangement during aging , with the collagen fibrils tending to form larger and larger sheets and layers of filaments . This aggregation of fibrils with aging is associated with shrinkage or contraction (Fine, Yanoff , 1972) . The resulting space between the posterior hyaloid and the retina is then filled by the fluid vitreous . This is known clinically as posterior vitreous separation or detachment . Shrinkage of the formed vitreous and posterior vitreous detachment are one and the same (Teng , 1957) . This separation of the formed vitreous from the retina is usually spontaneous aging phenomenon , but it may be precipitated by trauma . In addition it may be caused by a number of pathologic processes including intraocular inflammation . If there happen to be an abnormally firm vitreoretinal adhesion in a limited area , as in lattice degeneration , the shrinkage of the vitreous may create a retinal tear (Foos , 1973) . The attachment of the vitreous to the retina posterior to the vitreous base is

generally tenuous except in the papillary region (Hogan et. al, 1971).

The vitreous attachments:

The vitreous is firmly adherent to the adjacent structures, especially at the vitreous base and the peripheral margin of the optic nerve head . Firm vitreoretinal adhesions are also present surrounding areas of lattice degeneration and some chorioretinal scars . Weaker attachments are present surrounding the macula in young patients and along some retinal vessels in the periphery (Michels , 1981) .

Vitreous base:

The vitreous base is the most solid attachment of the vitreous to the wall of the eye (Hogan et. al, 1971). It is in reality a three-dimensional zone which extends approximately 1.5 - 2 mm. (Fine and Yanoff , 1972) anterior to the ora serrata and 1.8 mm. posterior to the ora serrata temporally and 3 mm. posterior to the ora on the nasal side of the globe (Foos , 1973) ..If this line of attachment is irregular , it may lead to localized points of high vitreoretinal traction , which in turn may result in retinal tears (Teng , 1957). Blunt trauma resulting in rapid equatorial stretching of the globe , may cause avulsion of the vitreous base , including the underlying ciliary epithelium and retinal tissue

(Michels , 1981) . Traction on the vitreous in this region causes tenting of the retina and ciliary body , if traction is forceful , the ciliary epithelium and retina come loose . The traction produces tension lines in the vitreous at right angles to the surface of this tissue , indicating that the principal orientation of its framework is in this direction. Traction on the anterior vitreous after the lens is removed produces the same phenomenon , indicating that the vitreous base framework also continues forward . If the traction is made at some distance from the ciliary body and the retina , very little tenting occurs , showing that the most highly organized portion of the framework is a zone only 2 to 3mm. wide adjacent to these tissues (Hogan et. al,1971). In most disorders characterized by vitreous traction , one end of the contracted vitreous sheet is attached to the vitreous base because this is the strongest zone of vitreoretinal adhesions in both physiologic and pathologic conditions(Michels , 1981).

Peripapillary attachment:

The peripapillary attachment passes along the peripheral margin of the optic disc . Over the surface of the nerve head itself any adherence is lacking "the area of Martegiani" (Tolentino