G.

EXAMINATION OF THE VITREOUS

1. THE NORMAL VITREOUS

In aphakia with ordinary focal illumination, especially if sunlight or an arc-light be used, it is possible to see the framework of the vitreous. It has a wavy tunic-like form and often extends forward into the anterior chamber.

I have at times seen this scaffold-like structure before the introduction of the slitlamp. Gullstrand\(^1\) was the first to observe the framework of the vitreous in the non-aphakic eye, with the slitlamp. These observations were confirmed by Ergellet\(^2\) and the author\(^3\), who have reported and described changes in this structure. Other observations regarding the forms and types and of the pathology of the framework of the vitreous have been reported by L. Koeppe\(^4\) and J. Koby\(^5\).

In spite of these reports we are still at the threshold of this knowledge, and some of the reported findings have not been fully confirmed. Pathologic anatomical findings and clinical observations must go hand in hand to register progress.

The normal vitreous supporting structure presents many variations and the distinctness with which it may be seen varies in different individuals. In some persons it may be easily studied with the Nernst or nitrogen lamp, while in others this type of illumination presents the vitreous as being quite “optically empty”.

In general we may say, in agreement with the anatomic findings of E. Fuchs, that the framework has a pronounced membranous lamellar form. A fibrillar structure of the membranes may often be observed. The latter change is quite distinct in pathologic cases. Certain fibrils may undergo absorption. We must not confound these fibrillae with the luminous threads which are normally found quite frequently in the anterior portion of the vitreous, especially in old age.

In certain normal cases we receive the impression of a distinct fibre structure of the scaffolding. However, on increasing the intensity of illumination (micro-arc-lamp), we usually find it presents a lamellar form.

The specific weight of the framework is but little in excess of that of the vitreous fluid, so that it sways pendulum-like and is thrown into folds like a suspended cloth, on oscillation of the eyeball. If for instance, it is thrown upward on motion of the eyeball, it immediately returns to its original position.

As the framework is attached to the pars caeca, and the latter is connected anteriorly, as has been anatomically shown by Salzmann\(^6\), it is evident, why in the upright position of the body, the folds in the membranes of the framework assume a vertical direction.

The framework as a rule does not extend anteriorly to the lens surface. At this place there is a relatively “optically empty” space, filled with tissue fluids and aqueous, described by Ergellet\(^2\), and by the author\(^3\).

Koeppe has confirmed this observation with the slitlamp and E. Fuchs\(^5\) has recently described it anatomically.

Quite often, for instance in the case of Fig. 330, the vitreous is separated from the retro-lental space by a characteristically folded membrane, the much discussed membrana hyaloidea.

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Especially E. Fuchs\textsuperscript{106} has anatomically shown that a \textit{pseudo-membrane} of this kind, brought about by the apposition of lamellae, really exists. I have often observed it with the slitlamp. Fig. 330 shows it as a thin layer thrown into folds.

In Figs. 342 and 344, according to my judgment, it probably gives rise to a formation of strands. Similar curtain-like membranes may at times be seen at various deeper intervals, within the vitreous. Gullstrand\textsuperscript{120} had previously noted their approximate position.

At the time I changed my method of observation, substituting for the Nernst-lamp a \textit{micro-arc-lamp}, creating a \textit{micro-arc-slitlamp}, which latter was constructed by E. Zeiss\textsuperscript{*}, I was astonished at the increased amount of \textit{new detail} visible in the vitreous, in areas which formerly seemed void of structure.

Some of the latter spaces now presented a finely fibrous and delicately meshed network of structure. The coarse lamellae which formerly were hardly visible now presented a high degree of opacification. On the posterior lens surface embryonic vessel remnants in great numbers, which were never before observed made their appearance.

The remnants of the hyaloid artery present their most minute detail in distinct outline. Even under the highest magnification the light is of a sufficient intensity to show all of these structures. With the aid of this new source of light in some cases the just mentioned "optically empty" retrolental space was practically absent, or existed as a dark space only in a very limited area. In the light of the micro-arc-slitlamp as far as I have been able to observe there is \textit{no vitreous which is free of framework}, not even in the axial area.

In cases of average corneal curvature we may bring the vitreous into direct view with the bundle of light of the micro-arc-lamp to a depth of about 5 mm. Regarding the \textit{form of the framework} there have been classified a series of more or less typic forms, especially by Koeppe\textsuperscript{104}). We will not enter into detail regarding these, as their observation is somewhat dependent on the variety of light used, and further research is necessary.

Common types of framework as we have found them with the micro-arc-lamp are shown in Figs. 348 to 351. Some of these were absolutely invisible with the Nernstlamp illumination.

Note the \textit{stepform layers} which illustrate the concentric structure of the framework of the vitreous (Figs. 339 and 351), the retrolental space (Figs. 344, 346), and the \textit{vertically folded membrane with its dark cross striping} (Figs. 330, 346). These cross stripes give a characteristic design to the structure of the framework, and as I have frequently convinced myself, are also due to \textit{folds}, that is, they represent a \textit{cross folding of the membrane}. Especially luminous in comparison to the membranous framework are the fibre-like structures within the anterior area, as shown in Figs. 331 and 335.

\textbf{Fig. 329. The determination of depth in the vitreous.}

It is important, to localize areas in the vicinity of the \textit{posterior lens capsule}. It is not always easy to definitely determine whether an object is on the posterior lens capsule or just behind it. One must use the same principles that govern the determination of depth in the cornea and lens, that is by focussing the sharp image of the bundle of light in such a manner onto the object that we may obtain the image of a "sagittal optical section". The slit through which the nitrogen lamp image passes must be narrowed so that the focal beam will not exceed a width of 0,1 mm.

\textsuperscript{*} I am especially indebted to Prof. Henker for his assistance.

\textsuperscript{9} Voor, Atlas. (Engl.)