

THE CHANNEL BY WHICH, IN CASES OF NEURORETINITIS, THE
EXUDATION PROCEEDS FROM THE BRAIN INTO THE EYE.
By Dr. H. KNAPP.

Recent anatomical researches by Schwalbe and Schmidt on the lymphatic spaces of the eye, show that a communication exists between the arachnoidal space of the brain and the intervaginal space of the optic nerve, terminating at the lamina cribrosa. Before these researches this communication must have been clear to every one who bore in mind that the outer sheath of the optic nerve is a continuation of the dura mater, which the nerve receives at its exit from the optic foramen, while its inner sheath is an extension of the pia mater enveloping the optic trunks already in the brain. Thus it is clear that any liquid in the arachnoidal space has no difficulty in penetrating into the intervaginal space of the optic nerve, which, although containing some very loose connective tissue and elastic fibres, is but an extension of the arachnoidal cavity.

I have been convinced, for several years, from pathological and clinical observations, that blood and exudation are not always stopped at the lamina cribrosa, but may find their way through it into the eye. I was led to this opinion, about nine years ago, by one of those extremely rare cases of pigmentation of the optic disk (published in Græfe's Arch., xiv., 1, pp. 252-261). The pigment, in these cases, lies only on the periphery of the papilla, and encroaches a little upon the retina. I thought from the first, that this pigment resulted from blood, and since it was confined to the region opposite the termination of the intervaginal space, I concluded that the blood had oozed from there into the eye. By some specimens in Henry Müller's and Iwanoff's collections, I convinced myself of the occurrence of isolated hemorrhage in the intervaginal space of the optic nerve. In 1867 I directly observed, in a case of injury of the orbit, the transmission of blood through the intervaginal space into the eye, and its gradual metamorphosis into pigment. The case is described in the place quoted above, and illustrated by a chromo-lithographic picture of the ophthalmoscopic appearance of this eye.

That exudation takes its way from the brain through the

intervaginal space of the optic nerve into the eye, I am now able to prove by clinical facts. Every one of you must have been struck by the fact, that sometimes very good vision exists in eyes which show, ophthalmoscopically, high degrees of neuroretinitis. This would be inconceivable if the exudation travelled from the brain through the nerve itself; for it could not leave its function of being the conductor of the retinal impressions so perfect. In two cases which came under my observation last winter, I found very highly developed neuroretinitis with $S = \frac{1}{3}$ in the one, and $\frac{1}{5}$ in the other. I measured the extent of Mariotte's blind spot, which, in the first case, was, in diameter, two and a half times as large as in a healthy eye; and, in the second case, about four times as large, extending very near the point of fixation in either eye. This latter was one of the most advanced cases of neuroretinitis I have ever seen. The original disease was a bony tumor, causing afterward exophthalmus of the right eye, and total blindness of both. There was no restriction of the visual field in either case. The first case ended in recovery; the second cannot be far from a lethal termination.

This enlargement of Mariotte's blind spot can, to my mind, only be explained thus: The exudation—fluid and white blood corpuscles—travels from the arachnoidal cavity into the intervaginal space, oozes through the periphery of the lamina cribrosa, and expands into the soft tissues around the margin of the optic disk, the suprachoroid, choroid proper, and retina. The optic nerve fibres of the latter, situated farthest from the origin of the exudation, will be attacked least and last. The rods and cones, however, the peripient layer of the retina, will be affected sooner, and have their function either destroyed or, in case of recovery, kept in abeyance. The enlargement of Mariotte's blind spot, which I found to correspond to the extent of the exudation visible with the ophthalmoscope, proves this conclusively. In addition, I may strengthen this theory by the following facts: The rods and cones are delicate organs, and more easily destroyed than the nervous fibres. The exudation, seen through the ophthalmoscope, has its summit at the margin of the optic disk. Extending in both directions, between the fibres of the optic nerve entrance, and into the cho-

roid and retina, the most destructible parts it meets on its way are the rods and cones, the nutrition of which, moreover, is dependent rather on the choroid than on the retina. If the exudation passed through the optic nerve itself, there would be, in consequence of a like pressure on *all* the nervous fibres, an equal diminution of visual acuteness over the whole field of vision. The anatomical study of specimens alone can fully explain this process. But since this has not yet been done, and specimens are exceedingly difficult to obtain, I thought it well to present my views on this subject before the members of this society, thereby calling their attention to it, in order that no opportunity may be lost, both with regard to the clinical observation and the anatomical investigation of neuroretinitis.

DEMONSTRATION OF OPHTHALMOSCOPIC DRAWINGS. By Dr. H. KNAPP.

Dr. H. Knapp exhibited drawings, made by himself with colored crayons, of some rare ophthalmoscopic appearances, and accompanied them with explanatory remarks, of which the following is an abstract:

1. *Non-inflammatory, excessive hypercæmia of both retinae.* The patient had enlargement of the heart, without valvular anomalies, general cyanosis, aneurismal bruit at different points of his body. His retinae were so vascular, that a countless number of thick and tortuous arteries and veins arose from the optic disks and branched radiating toward the periphery like a caput Medusæ. The area and borders of the optic disks were totally concealed. The yellow spot was distinctly discernible. A great number of arterial and venous twigs reached to the fovea centralis. The retinal tissue, refracting media, sight, and visual field of both eyes were perfectly normal. The patient died in the hospital of Heidelberg eight years ago. His body exhibited a general enlargement—hypertrophy—of the whole vascular system. I have not heard of a similar case.

2. *Perivasculitis choroidea.* This condition of the choroidal vessels has not yet been described, as far as I know. The pic-