eyes. One was finally lost, but the other recovered. It is only three years, however, since the first application of radium, but to date there are no opacities in the lens of the remaining eye, but there are characteristic atrophic changes in the choroid.*

I have here two photographs which show that the changes are in all particulars similar to the lens changes seen in marked choroidal disturbance which Dr. Weeks told me some time ago they had found in such cases.

TERMINAL STAGE IN A CASE OF RETINITIS WITH MASSIVE EXUDATION †

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Since Coats first directed attention to the curious condition which bears his name, quite a number of cases have been reported. These have for the most part been observed for but short periods, and the interest of the writers has been directed to the ophthalmoscopic picture in the active stages, and to the pathologic changes discovered after enucleation. Little has been added to Coats' statement:‡ "In the later stages detachment of the retina, secondary cataract, iritis, decrease of intra-ocular tension or glaucoma may lead to loss of the eye, but some cases may come to a standstill before such consequences appear." In a paper by one of us read before the American Ophthalmological Society in 1914§ a series of five cases was reported, with pathologic studies of two eyes enucleated, and with colored pictures of two fundi. Of the latter, case 5 illustrated the condition of a young man, then aged seventeen years, which was described as follows:

* Since this report was given this child died of general metastasis without notable increase in the size of the tumor in the remaining eye.

† From the Departments of Ophthalmology of the University of Maryland and the Johns Hopkins University.

‡ Arch. f. Ophth., 1912, lxxxi, p. 275.

§ Tr. Am. Ophth. Soc., 1914, xiii, p. 819.

"The central vision of the left eye is 20/15, and the field quite normal. Under homatropin the disc, the retina, and the vessels show absolutely normal conditions. The central vision of the right eye is entirely lost, but the peripheral field is retained on the temporal side in half-moon-shaped form (fig. 12). Ophthalmoscopic examination reveals a picture similar to that generally described in Germany as von Hippel's disease. The blood-vessels on the disc, both arteries and veins, are considerably enlarged. The disc is markedly hyperemic and blurred in outline. Toward the nasal side conditions that prevail are perfectly normal, aside from a little increase in the width of the veins. In one place the superior nasal vein shows a slight narrowing. In the upper inner part of the retina there is a fluffy mass of white opacities made up of very small spots. Above the disc similar spots are seen. In the macular region the changes are most extensive. The whole area about the disc, and considerably beyond the macula, in a roughly circular zone, is one large mass of degeneration in which the retina is in part detached and can be seen with +8. In this area there are numerous red spots which at first sight appear hemorrhagic, but which, on closer examination, are seen to be enormously dilated and convoluted veins. In some areas there are convoluted masses in which the caliber of the veins varies greatly, often becoming sausage-like in appearance. Beyond this area the veins also show enormous variations in caliber, with frequent varix-like enlargements. In the far periphery the changes seem to be very slight. . . ."

This patient passed out of observation and returned fifteen years later, in November, 1928. This is the first case observed again after a long interval in which an accurate drawing enables us to determine the detailed changes in the retinal picture which have come about during this long period.

The present condition is as follows: The left eye is entirely healthy. The right eye diverges slightly but appears normal ex-

ternally. The crescentic field of peripheral vision persists but central vision is entirely lost. On ophthalmoscopic examination the media are found clear. The disc is of good color; its margin slightly blurred. The inferior nasal artery is dilated and shows a slight visible pulsation. The direct nasal branch is also full and of normal appearance. The inferior temporal is somewhat narrow and has visible walls. The superior temporal is markedly constricted. The nasal part of the field appears perfectly healthy, but beginning at the disc and extending temporalward there is a definite tessellated appearance of the fundus.

The whole macular region is flecked with masses of blackish pigment of irregular outline. Occasional small white dots are seen in the retina. The retina here has a whitish sheen resembling that seen in retinitis pigmentosa, probably due to gliosis of the retina. The superior temporal vein shows several localized areas of thickening of its walls with visible white streaks, and the small accompanying artery is markedly tortuous and irregular in caliber. The edges of the tessellated zone are sharply limited, and at the points where the vessels leave this zone these show marked sclerosis. Beyond is normal-looking fundus. To the temporal side of the macula there are some streaks of pigment of the bone-marrow type. There is obvious thickening of the retina in the macular region of irregular character, and along one small tortuous superior macular vein there is a bed of dilated capillaries, faintly reminiscent of the varices which were formerly seen. The present appearance is well shown in the colored plate (fig. 1).

This case shows that the exudates may disappear, together with the vascular enlargements, and that the complications generally seen, such as glaucoma, cataract, etc., do not necessarily occur in this disease. Perhaps of equal interest with the actual present findings in this case are the changes in the course and arrangement of the retinal vessels, which can be noted by comparing the two drawings that have been made at an interval of fifteen years. In figure 2 we reproduce a sketch of the major vessels as shown in the two drawings, with only minor corrections in the older picture, where the relation of an artery crossing over or under a vein has obviously been reversed. The identity of most of

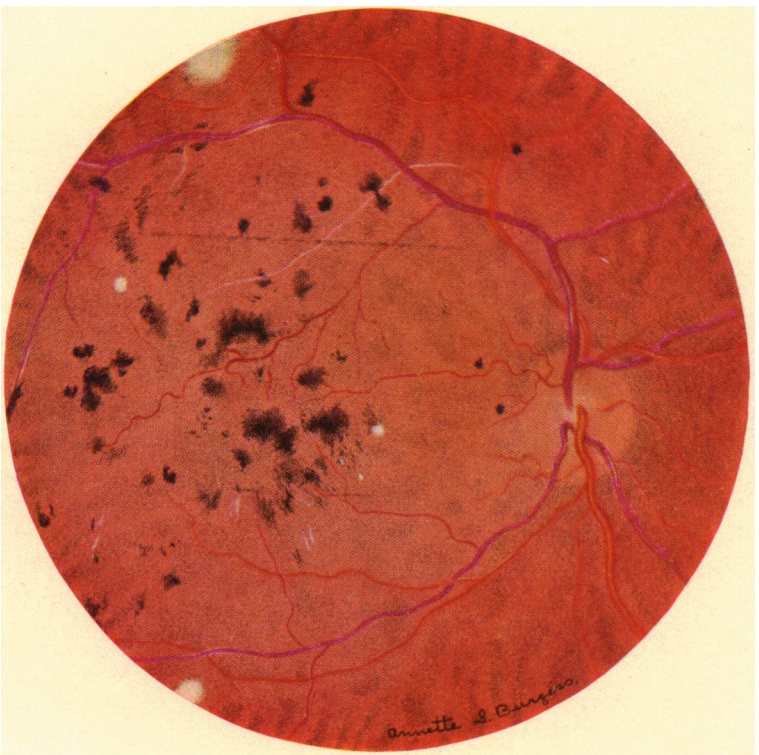

Fig. 1.

the branches can be clearly recognized, but the relations of these vessels have by no means remained unchanged. The superior temporal vessels appear to have been drawn upward and outward. Branch B of the superior vein, which in 1914 met the main stem at its root on the disc, now meets it above the level of G. The temporal displacement of the upper temporal vessels can be seen in the changed angle with which C meets the larger vein. The junction of the inferior nasal

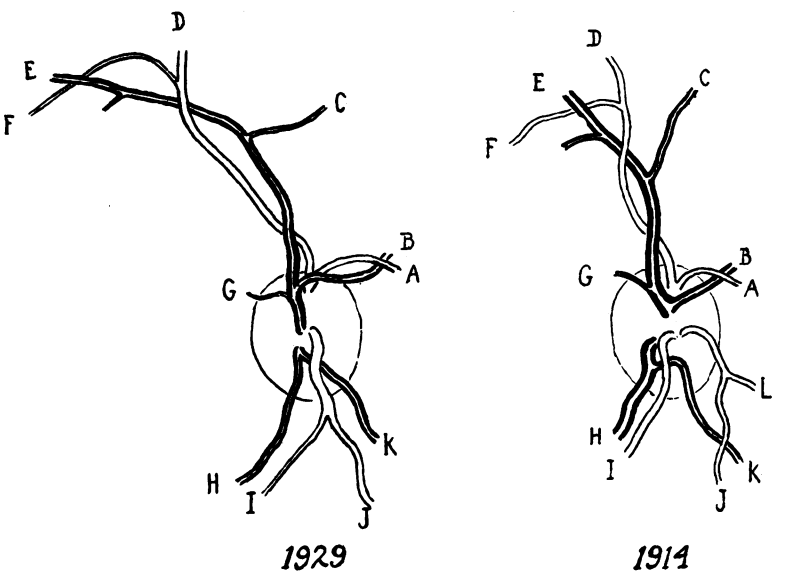

Fig. 2.

vein K has been displaced toward the root of the main inferior stem. The most extraordinary changes, however, are in relation to the inferior arteries. Branches J and L, which were quite sizable arteries in 1914, have disappeared from their old position. We cannot be sure that J in 1929 represents these vessels, but a nasal branch from this J is given off, and crosses K beyond the limits of the present drawing, and may perhaps be the same vessel as L in the

older drawing. If this interpretation is correct, it is evident that the sclerotic changes in I, which was markedly involved in the original disease, have led, not merely to a constriction in the caliber of this vessel, but also to a decrease in its length, drawing the junction with the inferior nasal branch J a full disc-diameter from its former position.

DISCUSSION

DR. ALBERT C. SNELL, Rochester, N. Y.: In 1927 I reported to this Society some early observations in a case of angiomatosis retinæ. Some later changes, perhaps not terminal, may properly be discussed in connection with Dr. Friedenwald's paper, since these cases are usually included with those having massive exudates.

At the time of my report of this case there had not occurred hemorrhage or increase of tension, but since, four interesting events have taken place: (1) subretinal hemorrhage; (2) acute glaucoma; (3) complete detachment of the retina; and (4) a quiet, soft eye following a posterior scleral trephine operation.

The hemorrhages were first noted in March, 1928; they were never large—the largest was about one disc-diameter, and seemed to be in proximity to the varix-like dilatations or the cysts. It seemed to me that these subretinal hemorrhages were due to the breaking of the walls of the overdistorted varicose veins, since these became greatly enlarged before the hemorrhages were noted. Some of the cystic detachments were best seen with a +16.

On March 2, 1928, a sudden acute attack of glaucoma had its onset, associated with all the usual symptoms. Tension was 45 mm. (Schiötz) and a complete detachment of the retina was clearly made out. It could easily be seen with oblique illumination. Tension remained for a month constantly between 50 and 55 mm. Eserin was used. Pain, however, completely subsided within ten days of the onset.

Since this patient was a young, sensitive girl and socially prominent, I desired to save the globe if possible. After consultation with Dr. Knapp I did a posterior scleral trephine operation, entering near the insertion of the superior oblique muscle and behind a large fold of detachment, the trephine probably passing through the choroidal layer. A quantity of faint amber fluid exuded through the opening.

The detachment flattened most remarkably following the operation, so that, as noted on March 30, 1929, the retina seemed to be in nearly normal position, except here and there throughout the fundus small areas of flat detachments could be seen, and in the vicinity of the periphery there were still present rounded overhanging folds of retina.

One month after the trephining the tension had returned to 48 mm. (Schiötz), but during the next four months its decrease was continuously downward until it reached 10 mm., where it has remained for the past six months.

At the present time the eye is perfectly quiet and normal in appearance. The lens has remained clear. There is no annular synechia, but the iris is in contact with the cornea, where it has been since the onset of the glaucoma. The vitreous is filled with cholesterin. All retinal vessels are entirely empty, even the varix dilatations. Future complications may arise, but the preservation of the natural-appearing globe has been a great satisfaction and has justified the operation.

DR. WILLIAM L. BENEDICT, Rochester, Minnesota: Dr. Friedenwald did not mention the vision that resulted after the subsidence of this disease. In 1926 I saw a girl, who was then eighteen years old, with massive exudative retinitis in both eyes, which had been going on for about three weeks when I first saw her. The picture that Dr. Friedenwald threw on the screen was a good picture of the two eyes of this girl. During the height of the disease the vision was reduced to mere light perception and remained that way for a considerable time. During the last year she has had sufficient vision to get about where she is familiar and do some work, wearing a minor correction of less than 2 diopters. The vision is 6/60 in one eye; and ability to count fingers in the other eye, which was not improved by glasses. Last week she returned and with telescopic spectacles we were able to improve the vision in one eye from 6/60 to 6/7. Although she could not read readily she could pick out all the letters on the 6/7 line. The telescopic glass did not aid her in reading. She could read as well with her minor correction as with the telescopic correction.

The atrophy of the vessels is very marked. The pigment migration is more pronounced than in Dr. Friedenwald's case, and while it is not a characteristic retinitis pigmentosa, there is throughout the whole fundus such excessive pigmentation that one wonders where it all comes from. The pigment is not only increasing in

amount but also in blackness. There seems to be more and blacker pigment this year than last. The improvement in vision is the remarkable part, that is, the amount of vision that remains.

DR. E. V. L. BROWN, Chicago: I would like to ask just where the pigment is in relation to the vessels. I presume it is in the retina.

DR. JONAS S. FRIEDENWALD, closing: The vision in this case was unimproved and the patient still had a large scotoma which extended from the blind spot to the periphery with a small crescentic field on the outside.

The pigment I believe is in the retina. There are a few patches around the blood-vessels similar to those seen in retinitis pigmentosa.

LIPEMIA RETINALIS IN A DIABETIC*

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AND
(By invitation)
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Lipemia retinalis is a rare affection. Up to the present time only four cases have been presented before the American Ophthalmological Society—the first by Heyl in 1880, the second by Hardy in 1921, the third by McGuire in 1922, and the fourth by Hardy in 1923. In view of the comparative rarity of this affection and its infrequent observance even by ophthalmologists of wide experience, it seems proper that this case should be placed on record.

Examination of the literature shows that thirty-five cases of lipemia retinalis have so far been reported, this making the thirty-sixth. Wagener, in 1922, reported three cases in the American Journal of Ophthalmology, and in addition has observed ten† in the Mayo Clinic, as yet not reported. With

* From the medical service of Prof. Thomas McCrae, Jefferson Hospital.

† Personal communication to the authors.