UNCOMMON RETINAL VASCULAR ANOMALIES*

BY

I. A. CHISHOLM

Tennent Institute of Ophthalmology, Western Infirmary, Glasgow

STANDARD works on the anatomy of retinal blood vessels (Leber, 1915; Wolff, 1954; Michaelson, 1954; Ballantyne and Michaelson, 1962) state that the four principal divisions of the central retinal artery and vein proceed to and from their respective quadrants, pursuing a sinuous course and branching dichotomously. This paper describes three types of uncommon retinal vascular anomaly with a unilateral incidence occurring in normally functioning eyes.

Arterial Anomalies

Figs 1 and 2 show examples of trichomatous arterial division, the first of the left superior nasal artery and the second of the right inferior temporal artery. Of the 8 published examples (Benson, 1882, 1 case; Leibitzky, 1928, 5 cases; Danis, 1940, 1 case; Primrose, 1960, 1 case) only 2 are of arteries to the lower half of the fundus.

Venous Anomalies

Over the years there has been a plethora of annotations on anomalies of the venous system of the retina (Werner, 1890; Stephenson, 1891, 1892; Frost, 1889, 1901; Lawford, 1895; Coats, 1914; Leber, 1915; Danis, 1940), but only one example of venous triconfluence is annotated (Danis, 1940). Fig. 3 shows an example of triconfluence of the left inferior temporal vein.

Although arteriovenous crossings are a normal feature of the fundus, crossings involving vessels of the same type are most unusual. Snodgrass (1956) showed that such anomalies do occur. Fig. 4 shows an example of a veno-venous crossing in the left eye. The inferior temporal vein is crossed by the inferior nasal vein. Together these two vessels then embrace the inferior temporal artery before uniting at the disc margin.

Discussion

It is known that the retinal arteries are functional end-arteries. They show both side-arm and dichotomous branching. The former, coming from the main trunk at right angles, are to be found especially in the retina of the posterior pole. It

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FIG. 1.—Fundus photograph of the left eye of a male aged 40 years, showing trichomatous division of the superior nasal artery.

FIG. 2.—Fundus photograph of the right eye of a female aged 22 years, showing trichomatous division of the inferior temporal artery with several small cilio-retinal vessels.

FIG. 3.—Fundus photograph of the left eye of a male aged 66 years, showing triconfluence of the inferior temporal vein.

FIG. 4.—Fundus photograph of the left eye of a female aged 47 years, showing a veno-venous crossing.

would be reasonable to accept the proposition that two such side-arm branches could arise exactly opposite each other by chance. Their subsequent development must depend on an equal growth stimulus to all these branches in order that the typical cross may develop with its arms of equal calibre.

The explanation of veno-venous crossings may lie in Michaelson's (1954) discovery that the temporal retinal vessels develop earliest. By a freak occurrence the nasal vein arises from the temporal side of the disc before sweeping nasally superficial to the temporal vein in order to gain its proper quadrant, as outlined by Snodgrass (1956).

Collier (1964) claims that vascular trifurcation is present in 10 per cent. of subjects, involving an artery twice as frequently as a vein, and in a small number of cases, is accompanied by other congenital anomalies of the retina, such as myelination of nerve fibres. Fig. 2 shows several cilio-retinal vessels in addition to the arterial trifurcation. Collier (1964) postulated an hereditary trait in the occurrence of vascular trifurcation. Although unable to confirm or refute this I feel it is of interest to compare the retinal vasculature with the foetal vascular architecture in the placenta. Shordania (1929) and Bacsich and Smout (1938) showed that the foetal umbilical end-arteries break up in the placental substance either by wholly dichotomous branching (disperse type) or side-arm branching (magistral type). This mode of branching, which is a characteristic of the mother (Shordania, 1929), is repeated in successive pregnancies, and is probably genetically determined (Bacsich and Crawford, 1960). In the placenta, as in some other organs—for example, the circle of Willis—the development of the blood vessels is known to be regulated by functional influences and hereditary factors. The occurrence of trifurcation of the retinal vessels may indeed be an hereditary trait, but we shall need to await the study of a larger series for its demonstration.

Summary

Three types of retinal vascular anomaly are presented. Two examples of trichomatous arterial division, one of triconfluence of a vein, and one of a veno-venous crossing are illustrated. The possibility of an hereditary trait to account for their occurrence is discussed.

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