Vascular changes in the iris in chronic anterior uveitis

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SUMMARY Vascular changes of the iris were studied in 6 patients with chronic anterior uveitis of varying aetiology by means of fluorescein angiography. In 1 case the angiographic findings of the second eye were compared with the histopathological changes in the fellow eye enucleated earlier because of absolute glaucoma. In the milder cases abnormal superficial vessels were seen mainly in relation to the minor arterial circle of the iris, while in advanced cases a coarse vascular network covered the whole surface of the iris. Both mild and severe changes were found to differ from the arborising type of neovascularisation usually seen in vascular eye diseases. Instead, a resemblance in the vascular pattern was found between some of these cases and eyes with chronic capsular glaucoma. In 1 patient clinical rubeosis seemed to be partly due to dilatation of the pre-existing capillaries rather than true neovascularisation.

Rubeosis iridis is one of the late complications of many vascular, neoplastic, and inflammatory eye diseases (Schulze, 1967; Hoskins, 1974). It has therefore been considered to be a nonspecific reaction of the iris vasculature to a variety of noxious stimuli. Histologically no differences have been found between the appearance of the rubeosis associated with chronic anterior uveitis and that of other eye diseases (Schulze, 1967). Most of the histological studies, however, have been done on eyes enucleated because of secondary neovascular glaucoma so that they are representative of the very late stages of rubeosis. Some peculiarities in the angiographic pattern of the iris have been described in chronic heterochromic iridocyclitis (Cobb and Smith, 1970). In this paper fluorescein angiographic findings of the iris vasculature in chronic anterior uveitis of varying aetiology are reported, and differences in the vascular response of the iris in uveitis and in some other eye diseases are discussed.

Patients and methods

Six patients with clinical rubeosis due to chronic anterior uveitis were studied. There were 2 cases with heterochromic iridocyclitis, 2 cases with rheumatoid arthritis, 1 case with ankylosing spondylitis

with bilateral chronic uveitis, and 1 case with phakogenic iridocyclitis due to traumatic cataract and subluxation of the lens. Further details of the patients are presented in Table 1.

The technique used in fluorescein angiography of the iris was described in detail by Vannas (1969) and is to be reviewed briefly by the author (Laatikainen, to be published).

Results

Two cases, Case 1 with heterochromic iridocyclitis (Figs. 1*a, b*) and Case 2 with chronic anterior uveitis due to ankylosing spondylitis (Figs. 2*a, b*) showed coarse irregular vessels superficially and related to the minor arterial circle of the iris. The superficial network, the arterial circle, and the peripupillary capillaries all leaked fluorescein. In Case 3, with phakogenic uveitis (Figs. 3*a, b*), dilated and leaking radial vessels and capillary networks were found mainly around the pupil and in the midstromal portion of the iris. Mild neovascularisation, although not visible in the angiogram, was present in the chamber angle in all these cases. The intraocular pressure was only moderately raised, and it was controlled by medical treatment. The radial vessels were clearly visible, particularly in Case 1, where there was iris atrophy, and they filled regularly in all cases.

In Case 4, with chronic anterior uveitis due to rheumatoid arthritis (Figs. 4*a, b*), and in Case 5,

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Table 1 *Clinical features of the patients*

Case no.	Age/ Sex	Duration (yr) and type of causative eye disease	Visual acuity right/left	IOP (mmHg) right/left	Gonioscopy	Treatment of glaucoma
1	59/M	19, Heterochromic iridocyclitis LE	1·0/1·0	15/37	Mild neovascularisation and localised anterior synechiae	Pilocarpine, adrenaline, acetazolamide
2	50/M	8, Chronic uveitis BE	HM/0·5	30/42	Ditto	Adrenaline, acetazolamide
3	52/M	7, Phakogenic iridocyclitis LE	1·0/PL	15/34	Moderate neovascularisation with anterior synechiae	Pilocarpine, acetazolamide, cyclocryoagulation
4	28/M	4, Chronic anterior uveitis BE	1·0/1·0	30–60/ 30–50	Fibrovascular anterior synechiae > 180°	Filtrating surgery, cyclocryoagulation
5	36/M	16, Heterochromic iridocyclitis RE	PL/1·0	34–58/16	Broad fibrovascular anterior synechiae	—
6	71/M	29, Recurrent anterior uveitis BE	0·5/—*	40–60/—	Angle closed by fibrous tissue > 180°	Filtrating surgery

RE = right eye, LE = left eye, BE = both eyes, HM = hand movement, PL = perception of light.

with heterochromic iridocyclitis (Figs. 5a, b), the superficial vascular network covered most of the surface of the iris from the angle to the pupillary margin, showing extensive leakage of the dye in the late phase of the angiogram. In Case 5 ectropion uveae was found on the temporal side. Some of the newly formed vessels had spread over the pigment epithelial seam on to the cataractous lens. In these eyes the radial vessels were less clearly visible because of a sheet of fibrous tissue covering the surface of the iris. Broad fibrovascular synechiae

were present in the chamber angle, and the intraocular pressure was high. In Case 4, 5 antiglaucomatous operations have been performed since this angiogram, but within a few weeks of operation the filtration cleft was closed by new fibrous tissue. In spite of increased intraocular pressure no treatment has been required for glaucoma in Case 5, because the eye was comfortable but blind.

In Case 6, with recurrent iridocyclitis and secondary glaucoma due to rheumatoid arthritis, dilated capillaries were seen in relation to the radial

Fig. 1 Case 1, heterochromic iridocyclitis. Fluorescein angiogram of the left iris. Coarse superficial irregular vessels in relation to the minor arterial circle (a) with leakage (b). Mild leakage around the pupil (b). IOP 37 mmHg

Fig. 2 Case 2, chronic anterior uveitis due to ankylosing spondylitis. Fluorescein angiogram of the right iris. Coarse superficial vessels particularly in relation to the minor arterial circle (a) with mild leakage (b). Leakage around the pupil (b). IOP 42 mmHg

<i>Other changes</i>	<i>Duration and type of causative disease</i>
Aphakia for 15 yr	—
Posterior subcapsular cataract	Ankylosing spondylitis for 10 yr
Mature cataract and subluxation of the lens	Trauma 47 yr ago
Aphakia RE for 2 yr, LE for 1 yr	Juvenile rheumatoid arthritis for 16 yr
Mature cataract, ectropion uveae	—
Mild posterior subcapsular cataract	Rheumatoid arthritis for 50 yr

* Left eye enucleated because of secondary glaucoma 7 yr earlier.

arteries (Fig. 6a). Furthermore these vessels leaked fluorescein (Fig. 6b). On this eye trabeculectomy was performed and iris angiography was repeated 1 week later when the intraocular pressure was 10 mmHg. This postoperative angiogram (Figs. 6c, d) showed further dilatation and leakage of the deep capillaries between the radial vessels, but superficial vessels similar to those seen in the previous cases were not present. In this case the intraocular pressure has been controlled since the operation. Histopathological study of the other eye, enucleated

because of absolute glaucoma 7 years earlier, showed peripheral anterior synechiae and mononuclear inflammatory cells in the angle (Fig. 7a). In the central part of the iris deposits of dense inflammatory cells with a few small vessels were also present, but dilated capillaries were seen only round the pupil (Fig. 7b).

Discussion

The fluorescein angiographic picture of rubeosis iridis seen in the present cases of chronic anterior uveitis differed from that found in various vascular eye diseases (Laatikainen and Blach, 1977; Laatikainen, to be published). In the less advanced cases minute vessels were found crossing the chamber angle, and in addition irregular superficial leaking vessels were present in the area of the minor arterial circle of the iris. Similar angiographic changes were described by Cobb and Smith (1970) in heterochromic iridocyclitis. The present cases showed that this type of capillary network was not specific for heterochromic iridocyclitis but that similar vessels could also be found in other types of chronic anterior uveitis.

Vascular changes described in other anterior segment diseases such as pseudoexfoliation of the lens with or without capsular glaucoma have some similarities with these cases (Vannas, 1969). In

Fig. 3 Case 3, phakogenic uveitis. Fluorescein angiogram of the left iris. Areas of superficial neovascularisation, particularly in the pupillary part of the iris (a) with leakage (b). IOP 34 mmHg

Fig. 4 Case 4, chronic anterior uveitis due to rheumatoid arthritis. Fluorescein angiogram of the right iris. Delicate newly formed vascular network all over the iris (a) with moderate leakage in the late picture (b). IOP 30 mmHg

Fig. 5 Case 5, heterochromic iridocyclitis. Fluorescein angiogram of the right eye. Rich superficial vascular network all over the iris (a) with mild leakage in the late picture (b). Newly formed vessels cross the pupillary border on to the cataractous lens (a, b). IOP 37 mmHg

Fig. 6 Case 6, recurrent anterior uveitis with secondary glaucoma due to rheumatoid arthritis. a and b: Fluorescein angiogram of the right iris at the time of increased IOP (40 mmHg) showing arborisations of small deep vessels (a) which leak fluorescein (b). c and d: Postoperative angiogram (IOP 10 mmHg) showing further dilatation and leakage of the iris capillaries (c, d)

contrast, in vascular diseases, neovascularisation of the iris usually appears as arborisations of vessels coming from the angle with or without peripupillary vascular dilatation or neovascularisation, but the midstromal portion is rarely involved early. Early leakage of fluorescein from the circular vessels or vessel loops in the area of the minor arterial circle is common both in inflammatory and in vascular diseases.

As the inflammatory process advances, fibrovascular tissue may gradually cover most of the surface of the iris. In these advanced cases a uniform network of larger mesh of neovascularisation was formed rather than arborisations of vessel trunks such as are usually seen in advanced cases of diabetics (Laatikainen, to be published) or other vascular iridopathies. Similar changes in chronic

uveitis have recently been reported by Demeler (1978). Thus it seems that, although histologically indistinguishable, the vascular changes in the iris in localised chronic inflammatory diseases differ in their evolution from those in vascular diseases of the eye. In vascular diseases the pathological process is usually more acute and affects the metabolism of the iris tissue more than in chronic inflammations. Therefore the stimulus for the formation of new vessels is more intense, whereas the formation of fibrous tissue predominates in inflammatory diseases.

It is not always possible to differentiate neovascularisation from dilated vessels clinically or even by fluorescein angiography, because both leak fluorescein. Leakage is more profuse if active inflammation or hypotonia is present, as was seen

Fig. 7 Case 6, left eye. Sections from chamber angle (a) and central part of the iris (b). Anterior synechiae and mononuclear inflammatory cells in the angle (a). Dense inflammatory cell deposits and a few vessels in the iris stroma (b). Peripupillary capillaries dilated. Remnants of cyclitic membrane on posterior surface. (Haematoxylin and eosin)

in the post-operative angiogram in Case 6, where some of the leaking vessels were probably dilated capillaries rather than newly formed vessels. This opinion was supported by histological findings in the other eye, where the chamber angle was closed by anterior synechiae, but the number of vessels in the iris was small.

In the second eye of this patient filtering surgery was also more successful than in the other cases where neovascularisation was present on the surface of the iris. In all the other cases the intraocular pressure at the time of angiography was moderately raised. This pressure level may slightly increase the leakage of the superficial networks, because corresponding vessels found in capsular glaucoma have shown less leakage and some of them have even disappeared after return of the intraocular pressure to normal by surgery (unpublished data).

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