

Rubeosis of the iris and haemorrhagic glaucoma in patients with proliferative diabetic retinopathy

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Although abnormal iris vessels and secondary glaucoma in a patient with proliferative diabetic retinopathy was described over 80 years ago by Nettleship (1888), Salus (1928) was the first to call attention to rubeosis of the iris as a specific manifestation of long-term diabetes and to point out that the neovascularization of the iris resulted in haemorrhagic glaucoma.

Neovascularization of the iris and the chamber angle is far less frequent than retinal changes in diabetics. In nonselected groups of diabetics, rubeosis of the iris occurs in only a small percentage (Ohrt, 1958; Armaly and Baloglou, 1967). Most frequently, the iridic neovascularization appears in eyes with proliferative retinopathy (Janert, Mohnike, and Georgi, 1957; Krüger, 1961; Ohrt, 1967; Madsen, 1971a).

The purpose of this paper is to describe the occurrence of rubeosis of the iris and the development of this affection in diabetics with proliferative retinopathy.

Material

The series consists of 68 diabetics suffering from proliferative retinopathy. These patients were examined repeatedly during the years 1963–1968 in the Departments of Ophthalmology and Internal Medicine, the University Hospital, Aarhus. The examination was carried out by means of a slit lamp, often with great magnification, and red-free light. The site of the neovascularization was described in detail, in many cases accompanied by drawings for subsequent comparison.

Proliferative retinopathy had been present for years in most of the patients before the appearance of the rubeosis.

Hypophysectomy had been carried out in 31 of the patients. Further information on the 68 patients is given in the following paper (Madsen, 1971b).

Results

Rubeosis of the iris was seen in 58 eyes during the observation period. One of the eyes was removed on account of haemorrhagic glaucoma. At the last examination, rubeosis of the iris was observed in 42 eyes, but had disappeared in fifteen eyes (Table I, opposite).

In many patients, rubeosis of the iris may be unchanged for several years, or there may be fluctuation in the severity of the neovascularization. In nineteen patients, rubeosis of the iris had repeatedly been observed in 24 eyes without being followed by haemorrhagic glaucoma during the observation period. As shown in Table II, the observation time was up to 5 years.

Table I Occurrence of rubeosis of the iris and haemorrhagic glaucoma in 135 eyes (last examination)

Rubeosis of the iris	Hypophysectomy		Total	Stages :	
	Performed	Not performed			
o	44	49	93	o	No rubeosis
(+)	5	2	7	(+)	Small vascular coils at pupillary border
+	8	12	20		
++	5	10	15	+	Greater vascular networks in annulus minor
Rubeosis previously observed	4	11	15		
Haemorrhagic glaucoma	5	8	13	++	Severe rubeosis with vessels on entire iris surface

Table II Rubeosis of the iris in 28 eyes without haemorrhagic glaucoma

Age (yrs)	Sex	Eye	Time of observation (mths)	Rubeosis of the iris	Chamber angle	Hypophysectomy
45	F	R	39	(+)	—	+
		L	39	(+)	—	+
30	F	R	11	(+) → +	?	+
30	M	R	7	(+) → +	—	+
64	M	R	64	+	—	+
56	M	R	44	+	— → o.v.	+
44	F	R	50	(+)	—	+
		L	50	+	—	+
32	M	L	35	+ → (+)	—	+
37	F	R	60	(+) → +	—	
38	M	L	48	+	—	
37	F	L	7	+	—	
40	F	R	37	+ → ++ → +	—	
		L	37	+ → ++ → +	—	
34	M	R	4	(+)	—	
23	F	R	23	+ → ++ → +	— → o.v.	
		L	11	—	o.v.	
49	M	L	25	(+) → +	—	
59	F	R	38	+	—	
44	M	R	17	+ → (+)	—	
60	M	R	31	+ → ++	o.v.	
65	M	R	9	+ → ++	o.v.	
		L	9	+	o.v.	
36	M	L	38	++ → +	o.v.	

Key to abbreviations : o. = open angle v. = new-formed vessels in angle

Rubeosis of the iris occurred with almost the same frequency in hypophysectomized and nonhypophysectomized patients, as did the other signs of diabetic iridopathy, *viz.* porosity and atrophy of the pupillary border, atrophy of the iris, and deposits of pigment granules on the surface of the iris.

Haemorrhagic glaucoma occurred in fourteen eyes during the observation period. In our eyes, glaucoma was already present at the first examination; in ten eyes rubeosis of

the iris was observed before the onset of haemorrhagic glaucoma. Table III shows the time interval between the appearance of rubeosis of the iris and the onset of the haemorrhagic glaucoma. This interval varied from 1 to 38 months.

Table III Time interval between detection of rubeosis iridis and occurrence of haemorrhagic glaucoma

Age (yrs)	Sex	Eye	Interval (mths)	Development of rubeosis of the iris	Chamber angle	Hypophysectomy
29	F	L	1	+ → ++	o.v. → cl.	+
32	M	R	12	+ → ++	— → cl.	+
37	F	L	36	+ → ++	— → o.v.	+
32	M	R	27	+ → ++	o.v. → cl.v.	
		L	32	+ → ++	— → cl.v.	
27	F	R	6	+ → ++	— → cl.v.	
30	M	R	1	+ → ++	— → o.v.	
49	M	R	13	+ → ++	o.v. → o.v.syn.	
59	F	L	38	+ → ++	? → cl.	
44	M	L	17	++	? → cl.	

Key to abbreviations: o. = open angle cl. = closed angle
v. = new-formed vessels in angle syn. = synechiae

Simple glaucoma was seen in only one patient (hypophysectomized). Otherwise, the intraocular pressure was low in the great majority of the patients in this series. At the last examination, the average intraocular pressure in 54 nonglaucomatous eyes in the hypophysectomized patients was 12.5 mm. Hg, and in 61 eyes in the nonoperated patients the average was 13.3 mm. Hg.

Very low intraocular pressures were found in eyes in which haemorrhagic glaucoma later developed. In eight of the ten eyes in Table III, intraocular pressures of 10 mm. Hg or less (applanation) were found in the period before the occurrence of the glaucoma. In this hypotonic phase, rubeosis of the iris developed, followed by a rise in the intraocular pressure, of sudden or more gradual onset. Such a case with hypotonia and subsequent development of haemorrhagic glaucoma is shown in the figure.

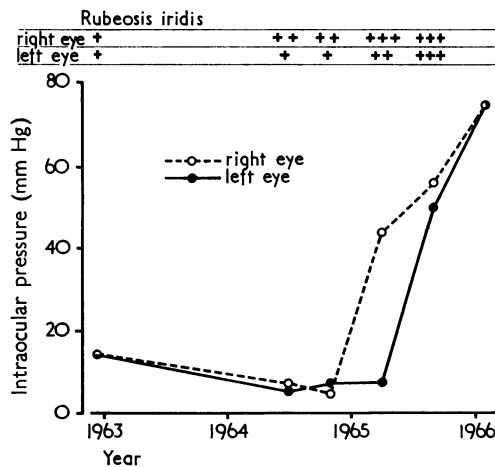


FIGURE Intraocular pressure and development of rubeosis iridis in a young man with proliferative diabetic retinopathy in both eyes

Discussion

Rubeosis of the iris is relatively frequent in eyes with proliferative diabetic retinopathy, and occurred in 43 per cent. in the present series. It is a serious complication on account of the frequent concomitant occurrence of haemorrhagic glaucoma. This form of glaucoma supervened in fourteen of the 58 eyes with iridic neovascularization during the observation period.

It is shown that, in some eyes, rubeosis of the iris may run a very slow course. There may be periods of exacerbation or regression, or the new-formed iridic vessels may eventually disappear, as has also been demonstrated in other series (Ohrt, 1967). In all cases under observation, haemorrhagic glaucoma occurred after the development of neovascularization in the iris and chamber angle. No case of secondary rubeosis was seen.

Hypotonia seems to be an important factor in the development of rubeosis of the iris and the subsequent haemorrhagic glaucoma.

Summary

In a series of 68 patients with proliferative diabetic retinopathy, rubeosis of the iris was observed in 58 eyes, including 22 in patients who had been subjected to hypophysectomy during an observation period of up to 5 years. Haemorrhagic glaucoma occurred in fourteen eyes.

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