Diabetic Retinopathy

A Further Study of Prognosis for Vision

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SUMMARY

Prognosis for vision has been studied in 135 patients with diabetic retinopathy and good vision and compared with that in 228 diabetics without retinopathy similarly studied. The risk of "blindness" in diabetics with retinopathy whose diabetes was diagnosed under the age of sixty was 3 per cent in five years, and 20 per cent in those diagnosed over that age. The risk of "visual impairment" also increases with age at diagnosis.

Fifty per cent of a small group of diabetics with "malignant retinopathy" were "blind" in five years, and only 14 per cent preserved good vision.

One third of forty-six diabetics had good vision in one eye one year and four years after their first vitreous hemorrhage. One third had "impaired vision," and one third were "blind." DIABETES *17*:121-23, March, 1968.

The present study is intended to add to the scanty data on the prognosis for vision in diabetic retinopathy,[1-4] to amplify a previous investigation,[4] and to provide data on severe or proliferative retinopathy, and on prognosis for vision following vitreous hemorrhage in diabetic retinopathy.

MATERIAL AND METHODS

Since 1949 ophthalmologists have regularly examined patients attending the Radcliffe Infirmary Diabetic Clinic. These observations are largely random,[4] and the interval between them is usually between two and five years. Retinopathy was judged present if there was a clear statement of the presence of microaneurysms, hemorrhages or exudates of diabetic type in either eye, and "malignant retinopathy" if there was new vessel formation, glial proliferation or vitreous hemorrhage.

An ophthalmologist's observation was accepted for the determination of prognosis for vision if the state of both fundi was recorded, and there was no other ocular disorder except lens opacity not obscuring fundus detail, which might affect vision—in particular, glaucoma, senile macular degeneration, myopic chorioretinal atrophy, or aphakia.

Vision was classified as follows:—Good vision: visual acuity 6/12 or better in both eyes; Visual impairment: visual acuity 6/18 to 6/60 in the better eye; Blindness: visual acuity less than 6/60 in the better eye. "Visual impairment" as defined thus corresponds approximately to the requirements of the Partially Sighted Register, and to "economic blindness" as defined by Beetham,[3] and "blindness" to the requirements of the Blind Register, and to "legal blindness."

Three hundred and sixty-three patients with initial good vision had more than one acceptable observation, 135 having retinopathy and 228 no retinopathy at any observation.

The chances of change in vision were calculated by a maximum likelihood method;[5] chances were calculated in terms of events per month, and these transformed into chances for five-year periods, each with its standard error. An extension of the method has been used to cover the situation where two types of event are possible.[6] The computations were carried out by computer in the Department of Biomathematics.

Observer error cannot be directly assessed in any retrospective investigation, but here the estimated chances of visual deterioration for patients without retinopathy have been taken to measure the elements of subject and observer error inherent in the determination of visual acuity, and also the consequences of increasing presbyopia, of progression of lens opacities, and of refractive changes due to variations in blood sugar.[4] Since the estimates of the chances of visual deterioration in these patients are on the whole small, observer error is not believed likely to contribute greatly by itself. The estimated monthly rates for patients without retinopathy have been subtracted from the estimated monthly rates for patients with retinopathy to give "corrected" rates for the latter, and these are taken to be estimates of the chances of visual deterioration due to retinopathy alone.

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For the study of the prognosis after vitreous hemorrhage, the records of forty-six patients were available, in whom the hemorrhage was known to have been the first, and had been observed by an ophthalmologist, and for whom there were subsequent records of visual acuity. For this purpose (and this alone), records of observations made in the Oxford Eye Hospital were used in addition to those made in the Diabetic Clinic. Thirty-nine of the forty-six patients had a short-term follow-up observation less than two years from the vitreous hemorrhage (mean 12.1 months), and twenty-two a long-term observation over two years after (mean 4.3 years). Seventeen patients had both a short and a long-term observation.

RESULTS

Table 1 shows the estimated chances of development of "visual impairment" or "blindness" in the patients with retinopathy and those without retinopathy divided by age at diagnosis of diabetes. The "corrected" estimates for chances of "visual impairment" or "blindness" rise from 3 per cent in five years in those under thirty years of age at diagnosis of diabetes to 32 per cent in those over sixty. In patients under sixty at diagnosis the chances of "blindness" are 3 per cent or less in five years, and 20 per cent in those over sixty.

Table 2 shows the estimated chances of "visual impairment" or "blindness" in twenty-two patients with "malignant retinopathy" as defined, five years after the first observation of malignant retinopathy, whatever vision was recorded at that time. The chance of "blindness" is 50 per cent and only 14 per cent have good vision.

Table 3 shows the prognosis for vision following the first vitreous hemorrhage. Both one year and four years after, one third (30 per cent) have a visual acuity of 6/12 or better in the better eye, about one-third "visual impairment" and one third are "blind." The causes of "blindness" were in approximately equal proportions

TABLE 2

Chance of visual deterioration following observation of "Malignant Retinopathy" (five-year chances per cent for twenty-two patients)

Vision after five years	Per cent of patients
Good	14
Impaired	36±10
Blind	50±11

TABLE 3

Prognosis for vision following first vitreous hemorrhage

Follow up: Average duration (Years)	Short-term 1		Long-term 4	
Visual acuity in better eye	Number	Per cent	Number	Per cent
6/12 or better	13	33	7	32
6/18-6/60	14	36	6	27
Less than 6/60	12	31	9	41
Total	39	100	22	100

failure of resorption of the original hemorrhage, recurrent hemorrhage, secondary glaucoma, and glial proliferation.

DISCUSSION

The inclusion of very few patients with "malignant retinopathy" in this study means that the estimates given in table 1 apply for the most part to simple retinopathy. Comparison with the few published studies is difficult, since either different methods of assessing vision were used[1,2,7] or each eye was considered separately.[4] In the last paper[4] estimates were given for patients at all ages at diagnosis of diabetes for the occurrence of "blindness" due to retinopathy of 11 per cent in five years, and of "visual impairment" of 23 per cent. It was suggested[8] that these estimates would prove too large for younger patients, and too small for older. Table I shows that this is the case. Indeed, except in patients over sixty at the diagnosis of diabetes, the

TABLE 1

Chances of visual deterioration in patients with initial good vision

Age at diagnosis of diabetes	Retinopathy	No. of patients	Per cent chance (± S.E.) after five years of: Visual impairment or blindness Found	"Corrected"	Blindness Found	"Corrected"
0-29	Yes	40	8.2± 3.9	3.2	4.1±2.8	2.8
	No	59	5.0± 2.4	—	1.3±1.3	—
30-59	Yes	81	21.1± 4.3	13.6	3.3±1.9	3.3
	No	135	7.5± 3.0	—	0	—
60+	Yes	14	48.3±12.7	31.5	19.5±7.8	19.5
	No	34	16.8± 5.8	—	0	—

chances of simple diabetic retinopathy giving rise to "blindness" are small, at 3 per cent in five years. It is probable that similar chances run for ten years. The same worsening in prognosis with age is also shown by others.[1]

The contrast between simple and malignant retinopathy is striking. Estimates from Beetham[3] form the best basis for comparison, because they are derived from a large group of patients with initial good vision.[8] The data indicate that one third to one half of patients with malignant retinopathy and good vision will become "blind" in five years and up to two thirds develop "visual impairment" (table 4). Again an effect of age is demonstrable, the younger patients having the better prognosis. The rates of visual deterioration are ten to fifteen times greater than those of patients with simple retinopathy. The figures given in table 2 are for all patients with malignant retinopathy, and are thus worse. They may be compared with the finding[9] that one half of a group of patients with proliferative retinopathy of sufficient severity to warrant hypophysectomy were dead or blind within five years. The findings in respect of vitreous hemorrhage are not dissimilar (table 3). One third retain useful vision in one eye four years after this severe manifestation of diabetic retinopathy. Preservation of useful vision after vitreous hemorrhage is remarked on by others.[10,11]

These facts must clearly be taken into account in considering treatment for diabetic retinopathy. In simple retinopathy controlled trials are clearly a necessity, while even in "malignant" retinopathy sufficient patients retain useful vision for at least five years for this to be the minimum time over which the effectiveness of measures such as pituitary ablation can be assessed. When this has been done, it is not clear that the results differ greatly from those of the untreated condition.[12,13]

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TABLE 4

Chances of visual deterioration in patients with retinopathy and initial good vision

Age at diagnosis of diabetes (years)	Final vision	Five-year chance per cent: "Simple retinopathy"	"Malignant retinopathy"*
0-29	Impaired or Blind	3	40-45
	Blind	3	30-45
30-59	Impaired or Blind	14	60-67
	Blind	3	40-55
60+	Impaired or Blind	32	—
	Blind	20	—

*Figures from calculations by Caird[8] from data of Beetham.[3]