Vitreous and peripheral retina in aphakia

A study of 200 non-myopic aphakic eyes

Z. FRIEDMAN, E. NEUMANN, AND S. HYAMS

Eye Department, Rothschild Hospital, Haifa, Israel

The prevalence of retinal detachment is between 1 and 3 per cent. in aphakic eyes (Sheppard, 1934; Lister, 1957) compared to less than 0.2 per cent. in phakic eyes of a similar age group (Böhlinger, 1956). Duke-Elder and Dobree (1969) stated that "detachment certainly occurs more frequently in aphakic than in phakic eyes".

The following paper reports an investigation of the vitreous and peripheral retina in non-myopic aphakic eyes, with emphasis on those changes which might lead to the development of retinal detachment.

Material and methods

All aphakic eyes seen in our outpatient clinic during a 9-month period were included in the study provided that they fulfilled the following criteria:

- (1) Uncomplicated extraction of senile cataract;
- (2) Aphakic correction of $+11$ diopters or more;
- (3) Transparent media and fully dilatable pupils;
- (4) Normal intraocular pressure;
- (5) Absence of diabetic retinopathy.

Altogether there were 200 eyes of 160 patients aged 44 to 80 years. There were 69 males and 91 females (Table I).

The patients were examined 2 months to 3 years after cataract extraction. Maximum dilatation of the pupils was attained by one or more instillations of 0.5 per cent. tropicamide and 10 per cent phenylephrine. The cornea was anaesthetized with 0.4 per cent. benzoxinate hydrochloride (Novesine) and the vitreous and entire retina were examined with the Goldmann three-mirror contact lens and the Haag-Streit 900 slit lamp.

Results

VITREOUS DETACHMENT

Posterior vitreous detachment was seen in 132 of the 200 eyes (66 per cent.). It was most frequent in the younger patients and much more frequent in the older ones (Table I). In 43 eyes the vitreous was seen to be detached only above, in 58 eyes it was detached above and at the posterior pole, and in 31 eyes the posterior vitreous detachment was seen to be

Table I Age and sex distribution of 160 patients (200 non-myopic aphakic eyes)

Age (yrs)	Sex			
	Male		Female	
	No. of patients	No. of eyes	No. of patients	No. of eyes
45-50	6	8	4	6
51-55	2	2	10	16
56-60	3	5	13	15
61-65	14	16	18	25
66-70	20	25	18	22
71-75	10	12	13	14
Over 75	14	16	15	18
Total	69	84	91	116

Table II Prevalence of vitreous detachment in 200 non-myopic aphakic eyes, by age of patient

Age (yrs)	No. of eyes	Eyes with vitreous detachment	
		No.	Per cent.
45-50	14	5	36
51-55	18	12	66
56-60	20	14	70
61-65	41	25	60
66-70	47	30	64
71-75	26	18	70
Over 75	34	28	82
Total	200	132	66

complete. No correlation could be found between the time lapse since cataract extraction and the prevalence of vitreous detachment (Table III).

Table III Interval between cataract extraction and fundus examination of 200 non-myopic eyes

No. of eyes	Interval	
	Up to 1 year	More than 1 year
Examined	97	103
With partial or complete vitreous detachment	62	70
With retinal breaks	10	8
With peripheral retinal haemorrhages	10	10

In thirty of the forty patients with bilateral aphakia, the state of the vitreous was identical in both eyes, in three patients one eye showed complete and the other only partial vitreous detachment, and in seven patients one eye showed partial vitreous detachment while the vitreous in the fellow eye seemed to be in place.

VITREO-RETINAL ADHESIONS

These were present in 21 eyes, in eleven of which the adhesion was associated with a horseshoe retinal break.

RETINAL BREAKS

27 full-thickness retinal breaks were found in eighteen eyes in eighteen subjects. Five of these eyes had multiple breaks. The shape and distribution of the 27 breaks are shown in the Figure (overleaf).

There were twelve horseshoe and fifteen round breaks. Nine of the 27 breaks were located in the oral region of the peripheral retina and eighteen in the equatorial region.*

*The oral and equatorial regions of the peripheral retina are separated by a line 2 disc diameters posterior and parallel to the ora serrata (Rutnin, 1967).

FIGURE Site and shape of retinal breaks in 27 eyes

There were ten breaks in the upper temporal quadrant, eight in the lower temporal, six in the upper nasal, and two in the lower nasal quadrant. One giant horseshoe tear was located in both lower quadrants (Table IV).

Table IV Site of lesions in the peripheral fundus of 200 non-myopic aphakic eyes

Lesions	Quadrant			
	Temporal		Nasal	
	Upper	Lower	Upper	Lower
Retinal breaks	10	9*	6	2
Peripheral retinal haemorrhages	11	9	8	4
Lattice degeneration	3	5	1	4
Snail-track degeneration	2	3	2	2
Pigmentary degeneration	25	33	28	30
Paving-stone degeneration	9	16	8	14
Cystoid degeneration	52	36	48	36
Retinoschisis	17	9	6	4

*Including a giant tear in both lower quadrants

Fifteen of the breaks were less than $\frac{1}{4}$ disc diameter in size, seven were $\frac{1}{4}$ — $\frac{1}{2}$ disc diameter, two were $\frac{1}{2}$ —1 disc diameter, and three were larger than 1 disc diameter in size. Partial or complete vitreous detachment could be seen in fourteen of the eighteen eyes with retinal breaks. A free operculum overlying a pigment patch, suggesting a “healed” retinal hole, was found in three eyes. In three additional eyes, a tongue-shaped elevation of the retina was found, but a retinal break could not be identified.

RETINAL HAEMORRHAGES

Small round retinal haemorrhages, either single or in a row parallel to the ora serrata, were found in the peripheral retina of twenty eyes. They were more frequent in the upper than in the lower quadrants and in the temporal than in the nasal quadrants (Table IV). None of the patients with retinal haemorrhages was diabetic. In fifteen of the twenty eyes with retinal haemorrhages, partial or complete vitreous detachment could be seen.

The time interval between cataract extraction and the examination at which the above findings were noted is shown in Table III.

LATTICE DEGENERATION

This was found in six eyes. The distribution of this finding in the four quadrants is shown in Table IV. In three of these six eyes there were retinal breaks associated with the area of lattice degeneration and in a fourth eye there was a retinal break in a different quadrant. Vitreous detachment was found in the four eyes with lattice and retinal breaks, but not in the two eyes with lattice alone.

SNAIL-TRACK DEGENERATION

This was found in five eyes (Table IV), in two of which there were several retinal breaks within the affected area. In four of these five eyes the vitreous was detached.

PIGMENTARY DEGENERATION

This was found in the periphery of 45 eyes, in 23 of which it was present in all four quadrants. It was more frequent in the lower than in the upper half of the retina (Table IV). In thirty of the 45 eyes with pigmentary degeneration the vitreous was detached.

PAVING-STONE DEGENERATION

This was found in the periphery of seventeen eyes, in seven of which it was present in all four quadrants. There was a marked predilection for the lower periphery (Table IV). In thirteen of the seventeen eyes with paving-stone degeneration the vitreous was detached.

CYSTOID DEGENERATION

Some cystoid degeneration was found in almost every eye examined and involved one quarter of the periphery or more in 57 of the 200 eyes. It was more frequent in the upper than in the lower half of the retina and was present in all four quadrants in 31 eyes (Table IV). In 43 of the 57 eyes with extensive cystoid degeneration, the vitreous was seen to be detached.

SENILE RETINOSCHISIS

Schisis of the peripheral retina was found in 28 eyes. It was more frequent in the upper than in the lower quadrants and in the temporal than in the nasal quadrants (Table IV). The schisis involved one quadrant in 21 eyes, two quadrants in six, and three quadrants in one.

CYSTS OF THE PARS PLANA

These were found in nine eyes, in two of which they involved three quadrants.

Discussion

A comparison of the results of the present study with the relevant reports in the literature reveals that retinal breaks in non-myopic eyes are significantly more common in aphakia than in phakia. On the other hand, the prevalence of other degenerative lesions in the peripheral retina and the prevalence of vitreous detachment do not seem to be affected by extraction of the lens.

Retinal breaks were found in 9 per cent. of the 200 non-myopic aphakic eyes in the present series. Byer (1967) found breaks in 3.3 per cent. of 3,400 eyes of patients over the age of 10; the prevalence of eyes with breaks among patients over the age of 40 in his study was 7 per cent. compared to 6 per cent. in the series reported by Halpern (1966). Rutnin and Schepens (1967a) found retinal breaks in 7.8 per cent. of phakic eyes in the general population, the prevalence of breaks being unrelated to age. The prevalence of retinal breaks in *post mortem* eyes has been reported to be between 3.5 to 10.5 per cent. (Okun, 1961; Everett, 1966; Foos and Allen, 1967). All these studies included myopic eyes in which the prevalence of retinal breaks is unusually high (Hyams and Neumann, 1969) and it can be assumed that the prevalence of breaks in phakic non-myopic eyes is somewhat lower than the above figures; in the series of Byer (1967), for example, only 2.4 per cent. of the non-myopic eyes had retinal breaks. The size, shape, and distribution of retinal breaks in the present series do not differ significantly from the size, shape, and distribution of retinal breaks in phakic eyes reported by the above authors.

The incidence of lattice, snail-track, pigmentary, paving-stone, and cystoid degeneration, retinoschisis, and cysts of the pars plana in the present series is similar to that reported in phakic eyes of a similar age group (Teng and Katzin, 1953; Straatsma and Allen, 1962; O'Malley, Allen, Straatsma, and O'Malley, 1965; Everett, 1966; Halpern, 1966; Rutnin and Schepens, 1967b).

Vitreous detachment was present in 66 per cent. of the eyes in the present series. This compares to 58 per cent. of vitreous detachment in phakic eyes of patients over the age of 50 reported by Pischel (1953) and 65 per cent. of vitreous detachment above the age of 65 reported by Goldmann (1961). We could not confirm the findings of Hauer and Barkay (1964) who reported vitreous detachment in all of 100 aphakic eyes examined 3 months to 3 years after operation. In the present investigation, the diagnosis of vitreous detachment was made only when the posterior vitreous face was clearly visible some distance away from the retina. The authors have examined a number of eyes with acute vitreous detachment accompanied by photopsies and entopsies, and sometimes by haemorrhages in the peripheral retina, many months after cataract extraction. In the present series, small haemorrhages were seen in the peripheral retina of twenty eyes, eight of which were examined 2 years or more after cataract extraction. Such haemorrhages are probably the sign of a recent or impending vitreous detachment (Ballantyne and Michaelson, 1970). Vitreous detachment is probably a more dangerous process in aphakia due to the greater mobility of the vitreous body in the absence of the lens. This may account for the higher prevalence of retinal breaks and retinal detachment in aphakic eyes.

Summary

The vitreous and peripheral retina of 200 non-myopic aphakic eyes were studied with the Goldmann three-mirror contact lens. Vitreous detachment was found in 66 per cent. and retinal breaks 9 per cent. of the eyes examined.

A comparison of the results of the present study with the studies of phakic eyes reported in the literature, reveals that retinal breaks are significantly more frequent in aphakia. The prevalence of other degenerative lesions in the peripheral retina and the prevalence of vitreous detachment do not seem to be affected by the extraction of the lens.

Vitreous detachment is probably a more rapid and dangerous process in aphakic eyes and this may account for the higher prevalence of retinal breaks and retinal detachment in aphakia.

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