Lens displacement associated with pseudocapsular exfoliation

A report on 19 cases in the Southern Bantu

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Consecutive or secondary displacement of the lens is a well-recognized condition caused by stretching, inflammation, or degeneration of the zonule. Degeneration occurs with long-standing glaucoma, high myopia, retinal detachment, and particularly with a mature or hypermature cataract (Duke-Elder, 1969).

Lens displacement associated with pseudocapsular exfoliation has not been well described. Irvine (1940) reported two cases with tremulous lenses and two in which the lens dislocated when grasped with forceps; these were all complicated by vitreous loss and were taken from a series of 42 cases of glaucoma capsularis. He drew attention to the possibility of a weak zonule, a fluid vitreous, and a friable capsule.

Gradle and Sugar (1940) described 43 eyes with pseudocapsular exfoliation and concluded that, because of zonular degeneration, spontaneous dislocation might occur in advanced cases. There were four attempted intracapsular extractions and in three of them there was vitreous loss.

Sugar (1957) quoted two cases of spontaneous dislocation and several in which dislocation occurred during surgery in a series of 154 cases of pseudocapsular exfoliation and concluded that there was a tendency to spontaneous and operative dislocation.

Gifford (1958) quoted three cases with spontaneous dislocation in a series of 62 cases. In 22 cataract extractions he noted that the lenses dislocated easily without rupture of the capsule, vitreous loss, or fluid vitreous, indicating that the zonule was more friable than normal.

Tarkkanen (1962), in a review of 418 patients, noted nine eyes with displaced lenses out of a total of 635 eyes with pseudocapsular exfoliation.

Present investigations

During a 2 year clinical study of lens displacement nineteen patients with 22 displaced lenses in association with pseudocapsular exfoliation have been seen. The clinical manifestations of these cases and the results of cataract surgery in eight of them are described below.

Material

During 1968 and 1969 all cases with displacement of the lens seen at the Eye Department of Baragwanath Hospital and the St. John's Eye Hospital, Johannesburg, were referred to the author for clinical assessment, treatment, and follow-up. Of these patients 90 per cent. are Southern Bantu, the remaining 10 per cent. being Asian or Coloured. 238 eyes with lens displacement have been seen to date, and 22 associated with pseudocapsular exfoliation were seen in nineteen Bantu patients.

Eight cataract extractions have been done and these cases have been followed for between 3 and 18 months.

Results

In the nineteen Southern Bantu patients there were sixteen with unilateral and three with bilateral displacement. The age and sex distribution of the patients is shown in Fig. 1.

FIG. 1 Distribution of patients by age and sex

The details of pseudocapsular exfoliation, whether uniocular or binocular, and the site within the eye are given in Tables I and II. This was recorded as + when the exfoliative process was early and as ++ when it was advanced.

Table I Distribution of pseudocapsular material

Bilateral	15
Unilateral	4
Anterior chamber not seen	3
Previous aphakia	1

Table II Distribution of pseudocapsular material in the eye

Site	Pseudocapsular material		Total eyes
	+	++	
Lens	12	10	22
Iris	13	9	22
Zonule	—	11	11
Ciliary body	—	1	1
Angle	5	4	9

The direction and degree of the lens displacement and its association with cataract is given in Tables III to V (overleaf).

The relationship of iridodonesis to the degree of pseudocapsular exfoliation and of the pupillary responses to mydriatics and miotics is shown in Table VI. Pupillary dilatation after application of topical Mydriacyl and 10 per cent. Phenylephrine was recorded as incomplete after a minimum of 2 hours' treatment.

Table VII shows details of glaucoma findings and Table VIII the results of vitreous examination.

Table IX (overleaf) shows the results of surgery in eight cases. All the operations were done under local anaesthesia. A two-plane ab externo incision was used which was closed with six to eight interrupted 8/0 virgin silk sutures.

Postoperative visual acuity was recorded, using a standard +10 diopetre correction.

Table III *Degree of lens displacement*

Minor subluxation		4
Major subluxation	Lens equator visible in dilated pupil	8
	Lens equator visible in undilated pupil	10
Luxation into vitreous		—
Total		22

Table IV *Direction of lens displacement*

Inferior	19
Temporal	1
Superior	1
Backward tilt at equator	4
Total	25

Table V *Association of lens displacement and cataract*

Lens clear		2
Cataract Immature	early cortical	3
	advanced cortical	6
	early nuclear	1
	advanced nuclear	4
Mature		5
Hypermaturation		1
Total		22

Table VI *Relationship of iridodonesis, pupillary response to mydriasis, and miosis to degree of pseudocapsular exfoliation*

Pseudocapsular exfoliation		+	++
Iridodonesis	present	11	—
	absent	2	9
Mydriasis	full	8	—
	incomplete	3	9
Miosis	rapid	6	—
	slow	0	—

Table VII *Associated glaucoma findings*

Applanation tension (mm. Hg)	Less than 21	11
	21-30	4
	31-40	2
	Over 40	5
	Total above 21	11
Optic discs	Cupped	2
	Normal	17
	Not seen	3
Angles	Open	22
	Increased pigment	22
	Pseudocapsular material	9

Table VIII *Vitreous findings*

Vitreous face intact and behind lens and anterior to lens	17
broken	3
Asteroid hyalopathy	2

Discussion

CLINICAL PICTURE

Pseudocapsular exfoliation has been seen in many countries and is particularly common in Scandinavia. Gradle and Sugar (1947) reported two cases occurring in American Negroes but considered the condition to be rare, and it has not been reported in Negroes

Table IX *Results in eight cases undergoing surgery*

Case no.	Lens	Method	Vitreous	Miotic	Visual acuity		Follow-up (mths)
					Preoperative	Postoperative	
1	Intracapsular	Vectis	Loss	P+	Hand movements	6/36	17
2	Intracapsular	Cryophake	—	P+	Perception of light	6/24	17
3	Intracapsular	Cryophake	—	M+	Hand movements	6/36	14
4	Intracapsular	Vectis	Loss	M+	Hand movements	C.F.	4
5	Intracapsular	Forceps	—	M+	Perception of light	6/24	3½
6	Intracapsular	Cryophake	—	M+	Hand movements	6/12	3½
7	Intracapsular	Forceps	—	M+	Hand movements	6/24	3
8	Intracapsular	Forceps	—	M+	Hand movements	6/36	1½

(P+ = Miosis to pilocarpine, M+ = miosis to miochol)

elsewhere. Although no accurate figures are yet available for its incidence in our clinic it is by no means uncommon in the Southern Bantu.

The average age of 65 years is less than the 70 years found by Tarkkanen (1962) in a large series. The differences in sex distribution and unilateral or bilateral occurrence is not significant in such a small series.

The appearance and distribution of the pseudocapsular material is similar to that reported by Vogt (1923), Tarkkanen (1962), and others. It was seen on the lens and iris margin in all cases and was particularly prominent on the zonular fibres when these were visible. It was seen in the angle in nine eyes, and floating free in the aqueous in two eyes.

The response to mydriasis is poor with atropine and adrenaline-like drugs. The response parallels the degree of pseudocapsular exfoliation present. In the more advanced cases only minimal dilatation occurs. In contrast there was a rapid response to miochol or pilocarpine in those eyes that underwent cataract surgery.

Iridodonesis was seen in only eleven of the 22 eyes and was present where pseudocapsular exfoliation was in its earlier stages. In more advanced cases with obvious lens displacement iridodonesis tended to be absent. These iris features may be explained by an increased rigidity of the iris, caused by infiltration of the stroma with pseudocapsular material.

The direction of displacement of the lens was inferior in sixteen eyes, the lens still being visible in the pupil. In four eyes, the lens was slightly displaced and separated from the iris. In one eye, the lens was displaced temporally, and in the remaining eye displacement was superior; this latter eye also had an inferior coloboma of the iris and lens. These findings suggest that gravity plays an important part in producing displacement in an inferior direction.

Cataract in association with pseudocapsular exfoliation is a common finding, but no more common than would be expected in a population of this age (Horven, 1937). In these 22 eyes there were five mature cataracts and one hypermature. In the other sixteen eyes, two lenses were clear, four had early opacities, and ten had moderately advanced but immature opacities. Of the fourteen immature cataracts, ten were cortical and four nuclear.

The zonule showed some interesting features (Figs 2 to 5). Although no one case could be followed through its natural history, a composite picture was built up from observing different cases. The superior zonular fibres were those more commonly visible. The fibres coated with varying amounts of pseudocapsular material become stretched and eventually break. The break does not occur at the site of their attachment to the zonular lamella but at their ciliary body attachment. This is said to be rare (Duke-Elder, 1969). The broken fibres are then seen waving gently in the aqueous beside those which are still intact. Subsequently the fibres become shorter and thicker, finally appearing as irregular lumps on the lens surface. This process has not been seen in any of the traumatic,

FIG. 2 *Typical appearance of pseudocapsular exfoliation in the Bantu*

FIG. 3 *Lens displacement with a minor degree of pseudocapsular exfoliation*

- (a) Early stage. Some zonular fibres are intact and coated with pseudocapsular material.
- (b) Intermediate stage. All the zonular fibres are ruptured, remnants with pseudocapsular material are visible on lens equator.

FIG. 4 *Lens displacement with a major degree of pseudocapsular exfoliation.*

Early stage. Some zonular fibres have separated from their ciliary body insertion. The fibres coated with pseudocapsular material appear thicker than normal.

FIG. 5 *Pseudocapsular material on the vitreous face in a postcataract patient.*

congenital, or consecutive cases in this series and would seem to be peculiar to lens displacement associated with pseudocapsular exfoliation. The fibres that break first are those behind the equator and those inserted most anteriorly. The fibres inserted just anterior to the equator remain intact longest. The amount of pseudocapsular material present on the zonule does not seem closely to parallel the degree of displacement. These findings suggest that the main degenerative process occurs at the ciliary insertion of the zonular fibres, perhaps in the ciliary epithelium, one of the suggested sites for the production of pseudocapsular material (Ashton, 1957; Etienne, 1960).

Vitreous changes commonly accompany zonular degeneration (Duke-Elder, 1969). In two eyes the vitreous face was ruptured, one having had previous trauma; in the remaining twenty eyes the vitreous face was intact and undue fluidity was not noted. At operation in eight eyes there were two with vitreous loss, both using the vectis; the remaining six were uncomplicated, using forceps or cryophake. If the vitreous face is intact, successful removal without vitreous complications should be possible if a suitable method of extraction is used.

Glaucoma has been said to be the only important complication of pseudocapsular exfoliation (Duke-Elder, 1969). In these 22 eyes, eleven had intraocular pressures above 21 mm.Hg, seven of them above 30 mm.Hg; in two eyes the optic disc was cupped and in three it was not seen; in the remaining seventeen the discs were normal. The angles were open in all cases and showed an increase in pigmentation, more in those eyes with a raised intraocular pressure, above that normally seen in the Bantu eye. There was visible pseudocapsular material in the angles of nine eyes.

AETIOLOGY

The aetiological factors which might play a part in producing displacement in these cases are trauma, secondary or consecutive to glaucoma or maturity of the lens, and occurring congenitally or spontaneously in the elderly.

In only one case was there a definite history of trauma; this was of mild degree and in addition to the lens displacement a ruptured vitreous face was the only other sign of ocular trauma. While minor trauma must play some part in precipitating displacement in some cases, it is not an important factor in the majority.

In long-standing glaucoma a shrinking cataract may undergo displacement. Only three eyes had advanced glaucoma, in sixteen eyes the intraocular pressures were below 30 mm. Hg and one may reasonably conclude that long-standing glaucoma plays no part in the majority of these cases.

A mature or hypermature cataract is said to be the commonest cause of consecutive displacement (Duke-Elder, 1969). 24 eyes have been studied with this type of displacement; the majority of them were hypermature and none showed the zonular characteristics described above. Although there was one hypermature cataract and five mature in the 22 eyes, this factor was not present in the other sixteen eyes.

Spontaneous or congenital displacement is not common in the over-50 age group. Only three eyes have been seen in this series unassociated with ocular or general abnormalities and again the zonular changes were different from those described here.

On the basis of these observations one may conclude that in pseudocapsular exfoliation there is a characteristic degeneration of the zonule which may occur in early as well as advanced cases and which is likely to lead to displacement of the lens.

Summary

- (1) Pseudocapsular exfoliation is described in the Southern Bantu for the first time. The clinical appearance is similar to the generally accepted descriptions.
- (2) The zonular fibres part from their attachment with the ciliary body and produce characteristic inferior displacement of the lens. This mechanism seems to be peculiar to eyes in which pseudocapsular exfoliation is present.
- (3) The absence of iridodonesis in advanced cases and the poor response of the pupil to mydriatics is explained by an increase in iris rigidity through infiltration of the iris stroma by pseudocapsular material.
- (4) Fluid vitreous and vitreous loss during cataract surgery must be anticipated, but with a suitable surgical technique these complications may be avoided. A good visual prognosis may be expected in the absence of advanced glaucoma.

I wish to thank Prof. M. H. Luntz for his interest and encouragement and the Superintendents of the Baragwanath Hospital and the St. John's Eye Hospital for permission to publish.

References

- ASHTON, N. (1957) *Trans. Amer. ophthal. Soc.*, **55**, 215. (Discussion of paper by H. Gifford).
- DUKE-ELDER, S. (1969) "System of Ophthalmology", Vol. XI "Diseases of the Lens and Vitreous; Glaucoma and Hypotony", pp. 297-299. Kimpton, London
- ÉTIENNE, R. (1960) *Ann. Oculist. (Paris)*, **193**, 97
- GIFFORD, H., jnr. (1958) *Amer. J. Ophthal.*, **46**, 508
- GRADLE, H. S., and SUGAR, H. S. (1940) *Ibid.*, **23**, 982
- , ——— (1947) *Ibid.*, **30**, 12
- HØRVEN, E. (1937) *Brit. J. Ophthal.*, **21**, 625
- IRVINE, R. (1940) *Arch. Ophthal. (Chicago)*, **23**, 138
- SUGAR, H. S. (1957) "The Glaucomas", 2nd ed., pp. 329. Cassell, London
- TARKKANEN, A. (1962) *Acta ophthal. (Kbh.)*, Suppl. 71
- VOGT, A. (1923) *v. Graefes Arch. Ophthal.*, **111**, 91