CONTACT LENS IN UNILATERAL APHAKIA*

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THE problem of uniocular cataract with good visual acuity in the other eye is an old, but by no means a solved, problem. The established view still upheld by many ophthalmologists, that such a cataract is best left alone, is based on the observation that the optical correction of unilateral aphakia is not satisfactory, as diplopia and general discomfort are experienced. Furthermore, the risks of the actual operation and of post-operative complications, the frequent occurrence of divergence, and the possible disappointment of the patient at the final result, foster this conservative attitude. Cowan (1949) states:

The correction of monocular aphakia is impracticable, not only because of the diplopia due to aniseikonia and to the prismatic effect of the difference between the glasses, but also because the patient has two different optical instruments, one dynamic with more or less active accommodation and the other static.

It is generally agreed that (there being good visual acuity in the fellow eye) the correction of unilateral aphakia with spectacle lenses is disappointing, because of the aniseikonia and diplopia. In contradiction of this view, Kuhn and Kuhn (1949) advise normal spectacle lenses and report a series of 82 uniocular aphakias corrected in this way. Their results are startling: 83 per cent. of cases had no trouble whatsoever in wearing full correction; only 4 per cent. were totally unable to wear full correction; and the remaining 13 per cent. had moderate trouble for a few months. The patients were fitted with a temporary lens 4 to 6 weeks after the operation and an occluder was worn while the diplopia lasted. Although no details about binocular vision are given, they state that "some persons suppress one image but most of them actually have binocular vision. Hard as it is to understand".

Most authors agree that a contact lens, at least theoretically, is the best remedy we have at present for abolishing the diplopia and aniseikonia which accompany the use of spectacle lenses. According to Town (1939), the diplopia is chiefly due to the prismatic effect of spectacle lenses of high positive power and not to aniseikonia, as is generally believed. The contact lens will abolish this prismatic effect, and the diplopia that may occur with a contact lens is probably due to muscle imbalance.

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The amount of aniseikonia in unilateral aphakias was calculated by Boeder (1938) to be about 25 per cent. This magnification is reduced by a contact lens to 11.4 per cent., and according to Blum and Babel (1948) is not more than 5 per cent. In order to equalize the two retinal images, Boeder suggested that the emmetropic (phakic) eye should be rendered 3D hypermetropic by a contact lens and that this should then be corrected with an ordinary spectacle lens. According to Blum this difference can also be abolished by an aniseikonic lens in an ordinary spectacle frame. The amount of aniseikonia that can be tolerated without impairment of binocular vision is not known exactly; Duke-Elder (1949) gives it as 5 per cent., above which binocular vision becomes difficult or impossible. On the other hand, according to Town (1939), the eye can achieve fusion with a difference in size of at least 10 to 20 per cent.

Contact lenses have been used extensively in uniocular aphakias for the past few years but the opinions of various authors differ in their evaluation; in a few cases good tolerance and restoration of binocular vision was attained (Town (1939) three cases; Girardet (1948) three cases; Maione (1949) three cases; Gettes and Ravdin (1949) one case), but others found contact lenses disappointing. Mann (1947), in an analysis of ten patients, found only one patient able to wear his contact lens with comfort; the rest complained of diplopia and discarded their lenses. Cross (1949), in a thorough survey of 875 contact lens wearers, found that 4 per cent. of these were fitted for uniocular aphakia, out of which only just over half were wearing them. His comment is interesting:

It was a surprise to realise that the percentage of aphakic persons wearing contact lenses were even less than the myopes. It appears that though a contact lens reduces the size of the image in the aphakic eye and overcomes the prismatic effect of a strong convex lens, this is not sufficient to allow fusion of images and comfortable vision in a very large proportion of cases. This is probably the result of absence of accommodation in the aphakic eye

Present Investigation

In view of this divergence of opinion regarding the value of contact lenses in unilateral aphakia, it was decided to review all cases that have been fitted with a contact lens for this condition in one of the clinics at Moorfields Eye Hospital during the past 2 years. Since the aim was to restore binocular vision with the aid of a contact lens, all patients with poor visual acuity in the other eye were excluded from this series.

A short case history of eighteen consecutive patients in this series is given in the Table (pp. 670 and 671).

TABLE SHOWING RESULTS IN EIGHTEEN

Case No.	Sex	Age	Cataract		Complications (pre- or post-operative)	Duration of aphakia	Contact lens supplied
			Cause	Eye			
1	♀	22	I.O.F.B.	LE.		1945	November 1948
2	♂	54	Perforating corneal wound	LE.	Iris prolapse Corneal scarring	1947	March 1948
3	♂	19	Perforating corneal wound	LE.	Iris prolapse Corneal scarring Peripheral anterior synechiae	1945	January 1948
4	♂	13	Air-gun injury	RE.	Dislocated lens	1947	April 1948
5	♂	41	Perforating corneal wound	LE.	Iris prolapse Secondary glaucoma	1947	January 1948
6	♂	61	I.O.F.B.	RE.		1947	March 1948
7	♂	41	I.O.F.B.	RE.	Siderosis Vitreous prolapse	1948	November 1948
8	♂	60	Senility	RE.		1943	October 1948
9	♂	31	I.O.F.B.	LE.		1948	March 1949
10	♂	65	Senility	LE.	Choroid detachment Cystoid scarring	1948	January 1949
11	♂	23	I.O.F.B.	RE.		1948	January 1949
12	♀	66	Senility	LE.		1948	November 1948
13	♂	32	I.O.F.B.	RE.	Iris prolapse	1949	May 1949
14	♂	26	I.O.F.B.	RE.	Chorioretinal scarring	December 1949	January 1950
15	♂	48	Heterochromic cyclitis	LE.		November 1949	December 1949
16	♀	46	Not known	RE.		October 1949	December 1949
17	♀	48	Not known	RE.		1948	October 1949
18	♂	49	?Trauma	LE.		November 1949	December 1949

CONSECUTIVE CASES OF UNILATERAL APHAKIA

Visual acuity with contact lens		Binocular vision with contact lens		Orthoptic treatment	Tolerance of contact lens (hours)	Remarks
RE.	LE.	Single vision	Stereopsis			
6/5	6/9	yes	good	yes	4-6	Constant wear, comfortable
6/9	6/12	yes	good	yes	4	Constant wear, comfortable
6/5	6/9	yes	none	yes	5-6	Constant wear, comfortable
6/6	6/5	yes	good	yes	up to 18	Constant wear, comfortable
6/9	6/9	yes	good	no	4-5	Constant wear, comfortable
6/6	6/6	Weak fusion	none	yes	nil	Psychoneurotic symptoms
6/9	6/6	yes	good	yes	Does not wear it	Paresis of R. ext. rectus due to fractured skull
6/6	6/6	yes	good	no	5	Constant wear, comfortable
6/5	6/12	yes	good	yes	5-6	Constant wear, comfortable
6/6	6/9	yes	good	no	5	Constant wear, comfortable
6/5	6/5	yes	good	no	4	Constant wear, comfortable
6/9	6/12	yes	good	no	4	Constant wear, comfortable
6/6	6/6	yes	good	yes	8-9	Constant wear, comfortable
6/9	6/6	yes	good	yes	4-5	Constant wear, comfortable
6/5	6/9	yes	good	no	5	Constant wear, comfortable
6/9	6/6	yes	good	no	14	Constant wear, comfortable
6/9	6/6	yes	good	yes	14	Constant wear, comfortable
6/9	6/9	yes	good	no	5	Constant wear, comfortable Moderate myopia

It should be stated here, that certain cases were considered unlikely to benefit from contact lens and were rejected at the beginning. Manifest squints, considerable hyperphorias, amblyopias, nystagmus, central chorioretinal lesions, and chronic glaucoma were among the contraindications. This caution was necessary in view of the high cost of the contact lens.

The routine procedure was as follows: the patient was first refracted and the aphakic correction with spectacle lenses recorded. A trial contact lens was then inserted and the visual acuity ascertained. With this correction the fusion was tested and the muscle balance for distance measured; if the patient obtained immediate fusion, he was given a contact lens on loan and, where necessary, convergence exercises were carried out in the orthoptic department. As in most cases some degree of exophoria was present; this was treated during and after the contact-lens fittings. After the dispensing of the final contact lens, a +3DS was ordered for reading for the aphakic eye and, where necessary, a reading correction prescribed for the other eye. The contact lens used was of the Dallos type.

Most of the patients were thus examined and treated if necessary in the orthoptic department before ordering the permanent contact lens, as it was felt that the restoration of binocular vision was necessary before embarking on such a costly and time-consuming procedure. (No case needed more than six or eight orthoptic treatments.)

Discussion

Although the number of cases quoted is small, it demonstrates amply the value of contact lens in cases of uniocular aphakia. Of eighteen patients fitted with contact lens for this condition, sixteen have had binocular vision fully restored and are able to wear their contact lens constantly and with comfort. As one would expect, the majority (eleven patients) had traumatic cataract, and all except the two failures were able to resume their usual occupation. Seven of the traumatic cases had intra-ocular foreign bodies. Of the seven non-traumatic cataracts, six were of senile type and one was a complicated cataract due to heterochronic cyclitis.

The tolerance was good in all these cases; this may be due to the improved type of the contact lens or to reduced corneal sensitivity following the limbal section.

The age of the patients varied from 13 to 66 years and did not seem to influence the final result. Girardet (1948), however, believes that the best indication is in young adults with traumatic

cataract. He thinks that in older people the wearing of a contact lens requires a greater effort of tolerance and of manual dexterity, and he therefore advocates aniseikonic lenses instead. There seems to be no definite opinion regarding the time that should elapse between the cataract extraction and the fitting of the contact lens. Girardet is against an early fitting, though the logical step, if divergence be avoided, is to apply a corrective contact lens as soon as the limbal section is firmly healed and the eye shows no sign of irritation. In this series, this period varied, the shortest being 6 weeks from the cataract extraction.

Success in restoring binocular vision with a contact lens depends mainly, I believe, on the state of binocular vision existing before the onset of the trauma or disease that led to unilateral cataract. Assuming that good fusion was present and that the neuromuscular apparatus was not impaired by the trauma or disease, the ultimate result with a contact lens should be favourable.

Though there is no doubt that the absence of accommodation in the aphakic eye is an important obstacle in attaining comfortable binocular vision, the loss of accommodation alone cannot account for fusion failure, as Cowan (1949) and Cross (1949) believe. In a normal person the fusion amplitude remains unaltered if one eye is rendered cycloplegic and its total refraction fully corrected by a spectacle lens; I was able to verify this in cases where atropine had been used (as after corneal foreign bodies), and in cases of traumatic mydriasis with complete loss of accommodation.

The enthusiasm of the patient undergoing the tedious procedure of fitting, and his perseverance despite the initial discomfort and occasional diplopia, are other important and necessary factors.

The two failures in this series are instructive; in Case 6 there was an unmistakable neurotic element coupled with fear of loss of adequate compensation, and the fitting was undertaken in the hope that the contact lens might alleviate his complaints (neuralgic pain, inability to concentrate, etc.). In Case 7 the residual weakness of the external rectus muscle due to a previous trauma to the 6th nerve (fracture of skull), was not recognized before the fitting and, in spite of the presence of fusion and stereopsis, this muscular weakness proved a sufficient obstacle to comfortable binocular vision.

It appears, therefore, that considering the high cost of contact lenses, careful selection of cases is essential; patients with heterotropia, hyperphoria or amblyopia, or with neurotic

symptoms, are not likely to benefit from contact lenses. On the other hand, corneal scars, anterior peripheral synechiae, cystoid cicatrix, and slight vitreous prolapse, do not seem to be contraindications, as all these conditions occurred in patients where full binocular vision was restored.

The necessity and value of orthoptic treatment cannot be too strongly stressed; it helps to improve the fusion amplitude and to reduce the exophoria that is usually present. Eight patients in this series did not require any orthoptic treatment at all, as their fusion was strong and no muscle imbalance was found. The majority, however, benefited greatly by the treatment, and my own belief is, that without orthoptic exercises, many cases would have been given up as failures.

In conclusion, contact lenses appear to offer us the best solution in the problem of the correction of unocular aphakias; they are certainly superior to any other optical correction we have at present. The old *laissez-faire* attitude will no doubt change as more encouraging results appear in the literature and the selection of cases is more clearly defined.

Summary

(1) A short case history is given in tabular form, of eighteen consecutive patients with unilateral aphakia fitted with contact lens in the past two years, and the routine procedure outlined.

(2) Sixteen out of eighteen patients have had their binocular vision fully restored and are able to wear their contact lens in comfort.

(3) Stress is laid on the need for discrimination in selecting cases and on the value of orthoptic treatment in the re-education of binocular single vision.

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