Arch. Soc. Amer. Oftal. Optom. (1975)-10-373

UNILATERAL MYOPIA
PERSONAL OBSERVATIONS

Por:
DEREK AINSLIE
LONDON, ENGLAD

Evolution

The youngest patient presenting at my clinic for the treatment of unilateral myopia of over five dioptres. was four years of age and the oldest forty-six. It seems almost certain that in both instances, the myopia had been present since birth. In the four-year-old child, the myopic correction required was -11.00 dioptres, and in the adult -9.00 dioptres, and in neither was there any sign of degenerative change.

It is now three years since the child was seen and keratomileusis has been performeed. Initially the post-operative refractive error was -1.50, and this increased over a period of one year to -2.50 dioptres, and has since remained stationary. The whole of the loss of correction can be accounted for by a decrease in the radius of curvature of the anterior surface of the cornea. There has been no change in the axial length of the already abnormally long eye.

The problem of some loss of correction during the post-operative period following keratomileusis will be considered in detail in the section relating to the surgical correction of myopia.

Progression of the axial myopia in these unilateral cases has been exceptional, both in the untreated cases and in those who have undergone surgery.

In only two out of thirty-eight cases of unilateral myopia treated by keratomileusis has there been a subsequent increase in the myopia due to an elongation of the eye. Both of these cases have been older children, aged twelve and thirteen years, with initially fourteen and seventeen dioptres of myopia respectively. Both have shown degenerative fundus changes.

Based on my relatively small series, therefore, it would appear that cases of unilateral myopia are usually fully developed by the time they are first examined.

It is, therefore, quite reasonable to proceed to surgical correction in suitable cases at an early age, since gross increase in the myopia is unlikely to occur.

This factor is important since, if the amblyopia is to be overcome, early correction is essential.

Complications

Cases with a low degree of bilateral myopia seldom suffer any serious complication but those progressing to seven dioptres or more, are frequently beset by the consequences of choroido-retinal degeneration, vitreous degeneration and retinal detachment.

However, with the exception of those cases of unilateral myopia complicated by other congenital anomalies such as cataract, lenticonus, megalocornea or aniridia, the eyes when first examined are healthy and remain so.

Unilateral myopia is usually congenital but is often not discovered until school age. It is usually non-progressive or only slightly so, and myopic degenerative changes seldom occur.

In only 6 per cent of the cases of high unilateral myopia which I have seen, have there been degenerative fundus changes. The one common serious complication of congenital unilateral myopia, is amblyopia, and occurs in 80 per cent of cases.

Not only this high incidence, but the intractable nature of the amblyopia has been long recognized Jonkers (1960) noted this reluctance of myopic anisometropia to respond to treatment in his work on the "indications for Pleoptic and Orthoptic Treatment". Surgical correction of the anisometropic eye has still not provided the full answer, but some encouraging results will be discussed later on.

JONKERS, S. H., Klin. Monatsbl. Augenh. (1960), **137**, 145.

Treatment

Cases of unilateral myopia where the anisometropia is small, require little treatment. In some, the wearing of normal spectable lenses is all that

is necessary, and in others, no correction at all is needed. In children, however, a careful watch must be kept for the onset of amblyopia, though this is rare when the myopia is less than four dioptres. As the patient grows older, a small degree of unilateral myopia may, indeed, become a positive advantage. The ability to use the emmetropic eye for distance, and the myopic for near, lessens the problems of presbyopia.

Where unilateral myopia is more marked, however, the patient is, for all practical purposes, one-eyed, and since the condition is usually congenital, amblyopia is a common sequel.

Surprisingly little attention has been paid to the problem of unilateral high myopia, possibly because treatment has seemed so unrewarding. Duke Elder (1970) in his System of Ophthalmology, writes "Only a small percentage can be expected to attain useful binocular vision even with the aid of contact lens and prolonged pleoptic treatment."

Spectacle lenses, except as a temporary measure, during initial occlusion, are of no value owing to the aniseiconia produced. Contact lenses may be valuable, but in my experience, perseverance with them in cases of anisometropia of this type is often lacking. This is especially so in children, where truly continuous correction of the refractive error is essential if the amblyopia is to be overcome. It is in such cases that keratomileusis has its most important place.

Priestley and Others, (1963), reporting on the treatment of twenty-one cases of unilateral high myopia with contact lenses, commented on the difficulty of the problem but had three very successful results and some improvement in sixty-one per cent of the cases. It is against this generally difficult background that visual results following keratomileusis in the treatment of unilateral myopia must be judged.

Detailed tables of the pre-operative visual acuities and refractive errors and the post-operative results in individual cases have been previously published. (Ainslie, 1969, 1971 and 1972. Ainslie & Mathalone, 1972). Later in this paper, however, I will present a summary of the visual acuities obtained in differente classes of cases and show how these relate to the initial visions.

Every case upon which operation has been performed has had other more conventional methods tried first. In some cases, the methods may well have been continued for rather too long, making the problem, of overcoming

the amblyopia more difficult. Of over a hundred cases of unilateral myopia which I have seen with a view to possible surgery, operation has only been performed on thirty-eight. In most of the others, the eyes were suitable for the technical procedure, but either because the symptoms were insufficient, or because some other simpler treatment proved successful, keratomileusis was not advised.

All cases of severe unilateral myopia in children should be considered for keratomileusis, but visual results are usually poor if the amblyopia is dense. Based upon our results, it appears that if the corrected visual acuity when first seen is 6/36 (0.17) or better, the visual prognosis is good. If it is less than this, a trial period of complete occlusion of the good eye, with the myopic eye corrected. In cases showing eccentric fixation, pleoptics may also be required. If there is no increase in vision, it is unlikely that surgery will lead to a genuine visual improvement. Any improvement during the period of occlusion, even to as little as 6/60, is a hopeful sign and keratomileusis is worth serious consideration. In such cases, post-operative occlusion must be continued if maximum benefit is to be achieved. The younger the patient, the more likely is visual improvement, but cases of ten or even twelve years of age, showing initial improvement, are well worth treating. (Tables I and II).

The visual symptoms calling for treatment of adult anisometropia are more vague and consist of diplopia, often transient, or aching of the affected eye after prolonged use. A general anxiety occasioned by the knowledge that the eye appears useless is common. Results in adult cases with reasonably good corrected vision have been gratifying.

The visual improvements in these adult cases is indicated in Table III, but the subjective relief to the patient has usually been disproportionately greater than would be expected from these figures. Most adults and older children, where the post-operative visual acuity has remained low on Snellens Letter Chart, have found the eye to be substantially more useful.

Bilateral myopia is seldom an indication at the present time, but as experience grows, more such cases, along with a wider field of unilateral myopes, may well be deemed suitable for surgery.

Although this paper does not embody detailed consideration of techniques, it is important to mention very briefly the complications which have been encountered.

COMPLICATIONS OF KERATOMILEUSIS

1. *Reduction in Correction Post-operatively*

A slight reduction in correction occurs in almost all cases during the first few weeks after operation, but in five cases there has been a substantial reduction over a period of about a year. Two of these were due to an increase in the actual myopia, but the other three were due to loss of corneal correction. In no case has the myopia returned to the former preoperative level.

2. *Dislocation of Disc.*

Dislocation of the disc has occurred in one case, but the final outcome was satisfactory.

3. *Foreign Bodies at the Interface.*

Foreign bodies are very difficult to exclude completely, but careful technique and the use of only particle-free fluids, and careful slit-lamp observation of the interface at the end of the operation, can largely overcome the problem.

4. *Amorphous Deposits at the Interface.*

Sometimes curious amorphous deposits can be seen at the periphery of the interface. These are fluid aggregations and can be treated by a small incision and expression of the collection of fluid. They appear to occur where apposition is not perfect and very firm post-operative padding is the best prophylaxis. Exactly similar deposits can be seen in ordinary lamellar keratoplasty, but as the cornea surrounding the graft is usually semi-opaque, they are less readily seen. Fortunately, the peripheral situation means that visual acuity is seldom adversely influenced.

5. *Irregularity at the Interface.*

Interface irregularity is present in all cases during the early post-operative period and may persist for many months. As with other forms of lamellar keratoplasty, improvement will continue for at least a year. Two patients with good visual acuity, still notice some irregularity of images, particularly in dim illumination. In both cases the correction was very high and the optical zone very small.

In order to prevent post-operative loss of correction, it is important not to remove too thick a lenticule of corneal stroma. Therefore, for high corrections the optical zone must be small. The minimum possible is 5.00 mm. but with so small a zone, centration of the disc must be very accurate.

The cause of the symptoms in the two cases mentioned appears to be due to aberrations from the periphery of the optical zone when the pupil is dilated.

CONCLUSIONS

Many patients with high degrees of unilateral myopia may be treated by contact lenses. If for any reason such treatment is impossible, or if satisfactory results, particularly in terms of visual improvement in amblyopic children, is not obtained, keratomileusis should be considered as the method most likely to be helpful.

Results of keratomileusis in adults with unilateral myopia have also been promising, and in suitably selected cases, may bring real benefit to the patient. At the present, bilateral myopia is very rarely an indication for keratomileusis, but as experience grows, more such cases along with a wider field of unilateral myopia may well be deemed suitable for refractive surgery.

Keratomileusis is still a new method and enthusiasm must be tempered with caution; but who knows what developments there may be in the future?

Methods considered today as commonplace, in the past often seemed fantastic. It is interesting to recall that the nineteenth centry ophthalmologist Dieffenbach (1831) dismissed the whole concept of corneal transplantation as an "audacious fantasy!"

REFERENCES

AINSLIE, D. (1969) **Trans. Ophthal. Soc. U. K. 89, 647.**

———, (1972) **Ibid.** (In Press).

———, (1971), **Bull et Mem. Soc. Fr. Ophthal. 84,** 175.

———, MATHALONE, M. B. R. (1972), **Trans. European Congress,** (In Press).

DIEFFENBACH, J. F. (1831), **Ztschr. Ophthal. 1,** 172.

DUKE ELDER, S. **System of Opthalmology,** Vol. V. (Kimpton), page **304.**

PRIESTLEY, B. S.: HERMAN, J. S., and BLOOM, M. (1963), **Amer. J. Ophthal. 56, 926.**

TABLE I

A D U L T S

REFRACTIVE ERRORS -6.5 to -18.00

	Pre-op. V.A. High correction	Post-op. V.A. (Nil or low correction)	Binocularity
1.	6/12	6/9	BSV
2.	6/24	6/18	BSV
3.	6/18	6/12	BSV
4.	6/12	6/18	BSV
5.	3/60	3/60	No BV
6.	6/24	6/18	BSV
7.	CF	CF	No BV
8.	6/12	6/9	No BV
9.	6/12	6/12	No BV
10.	6/60	6/36	No BV
11.	6/6 — 6/6	6/9 — 6/6	BSV
12.	6/18	6/18	Mac. Changes.

TABLE II

C H I L D R E N

Ages: 6-12 years

REFRACTIVE ERRORS -7.0 to -15.50

	Pre-op. V.A. High correction	Post-op. V.A. (Nil or low correction)	Binocularity
1.	CF	CF	No BV
2.	3/60	6/18	No BV
3.	CF	CF	No BV
4.	3/60	6/60	No BV
5.	3/60	6/24	BSV
6.	CF	CF	No BV
7.	1/60	6/60	No BV
8.	2/60	6/24	BSV
9.	6/60	CF	No BV
10.	2/60	6/24	BSV
11.	CF	CF	No BV
12.	CF	CF	No BV
13.	CF	CF	No BV
14.	1/60	6/60	No BV
15.	1/60	6/36	Gr. BSV
16.	6/60	6/24	BSV
17.	1/60	4/60	No BSV