OCCLUSION WITH HIGH PLUS CORNEAL LENSES*†

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Case Reports

Case 1. In April, 1964, a boy aged 2 years and 2 months, was brought to hospital by his parents; he had a perforating corneal wound of the left eye, which he had sustained while playing in the garden the previous day.

At operation, iris, lens capsule, and soft lens matter were found protruding from a vertical corneal wound at 8 o'clock near the limbus. The iris was replaced and the soft lens matter abscised. The wound was closed with four silk sutures. The eye remained irritable and one week later anterior synechiae were separated through a cyclodialysis incision and the anterior chamber filled with air. Following this, the eye settled and whitened, but the lens opacities gradually increased.

In December, 1964, a left linear extraction and peripheral iridectomy were performed. This was followed in February, 1965, by a needling.

In April, 1965, a +10 D sph. spectacle lens was prescribed and right patch occlusion carried out for 9 to 10 hours daily. The visual acuity at this time was 3/60; by July it had improved only to 6/60, and by August to 6/36.

On September 30, 1965, an orthoptic report recorded acuities of 6/9 in the right eye and 6/36 in the left. By corneal reflections without glasses a left divergent strabismus of -12° , R/L 4^Δ was diagnosed.

Contact Lenses.—In October, 1965, a start was made to fit a corneal contact lens to the left eye. By the end of the month, after three attendances, the child was able to begin wearing the lens. (This was a biconvex lens with an overall diameter of 9.5 mm. and a peripheral curve 1 mm. in diameter, 8/10 mm. flatter than the central curve.) It had a reduced optical zone of 15 D sph. power. The power was arrived at by retinoscopy with a trial lens of approximate power *in situ*. The lens was fitted according to the principle of minimal apical clearance. This was done by observation of the fluorescein pattern when the lens *in situ* was examined under ultra-violet black light. The corneal wound did not present difficulties. The child was co-operative. His parents were taught how to insert, remove, and look after the lens, and they showed great enthusiasm.

When next seen some 3 weeks later on November 16, the tolerance was reported to be 9 hours a day with a break of 2 hours in the middle. No problems had been encountered, and the visual acuity was now 6/24.

Right patch occlusion had been continued, but it was now decided to fit an occluding corneal lens to the right eye to try to improve the visual acuity of the left eye with its lens *in situ*. Accordingly, on November 22, a lens identical to that in the left eye was supplied for occlusion of the right eye (Fig. 1, opposite).

Little adaptation was needed to wear the two lenses together and they were worn for 9 hours a day. The boy was conscious of a change in his vision but, not understanding why it was coming about, made no effort to remove the right lens.

On January 5, 1966, the visual acuity in the left eye was found to have improved dramatically to a clear 6/9 during the 6 weeks in which the right occluding lens had been worn. The divergent strabismus had increased to -14° , R/L 4^Δ (objective angle only). Instructions were now given to leave out the occluding right lens for half the day.

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FIG. 1.—Case 1. Left aphakia with occluding corneal lens on the right eye and correcting corneal lens on the left.

On April 1, 1966, a left lateral rectus recession of 6 mm. and a medial rectus resection of 4 mm. were performed.

An orthoptic examination on June 28, 1966, showed a synoptophore angle of -2° with fusion at 0° and possibly some stereopsis.

Case 2. On April 26, 1966, a doctor's son aged $5\frac{1}{2}$ years was brought to one of us (I.A.M.) for a second opinion.

The boy had been seen by an ophthalmologist at 3 months, 4 years, and $4\frac{1}{2}$ years of age. On the last occasion glasses had been prescribed and he was wearing +3 D sph., -2 D cyl., axis 25° in the right eye and +5 D sph., -1 D cyl., axis 180° in the left.

It was said that there was a coloboma of the left iris and that part of the retina in the left eye was missing.

Examination.—He was a bright, intelligent boy with, in fact, a corectopia of the left iris, the pupil being displaced downwards and inwards. The iris ruff was complete and the iris was thickened and the angle narrower in the 8 o'clock position. There was no retinal abnormality. The eye was about 30° convergent. The visual acuity with correction was 6/9 in the right eye and 6/60 in the left—the latter with some difficulty.

The boy's mother was hypermetropic, had a squint, and wore contact lenses. His brother, aged 14, had had a squint.

Orthoptic Report.—Marked manifest left convergence with left hypertropia for distance and near. It was considered that there might be a two-fold advantage in using contact lenses. As the pupil was not central, the amblyopia might in part be due to his looking through a part of the cornea which was not "optically worked". Also, in view of his age, a highly effective method of occlusion was desirable.

Contact Lenses.—Fitting of contact lenses was started on May 6, and completed by May 26. (The lenses were again of 9.5 mm. overall diameter with a 1 mm. peripheral curve, 8/10 mm. flatter in radius.) They were fitted according to the principle of minimal apical clearance. The right lens had a power of +15 D sph. (for occlusion) and the power of the left lens was determined by retinoscopy with a lens of approximate power *in situ* (Fig. 2, overleaf).

2 weeks later the visual acuity in the left eye had improved to 6/18 partly and 2 months later it had reached 6/9 partly. Thereafter his mother experienced some difficulty with inserting the lenses, but this was overcome by teaching the child to insert them himself, the mother merely assisting by holding up the upper lid.

On October 12, 1966, a left medial rectus recession of 5 mm. and a lateral rectus resection of 6 mm. were performed.

FIG. 2.—Case 2. Left corectopia with correcting corneal lens.

Post-operatively a corneal lens was supplied to correct the right eye accurately, that is, not as an occluder. The improved visual acuity in the left eye has been maintained.

An orthoptic report of January 13, 1967, stated that there was a slight manifest left convergent strabismus. The objective angle was $+5^\circ$, L/R 2^Δ . There was simultaneous macular perception. Fusion was obtained at $+5^\circ$ with an amplitude of 10° adduction and 5° abduction. There was no stereopsis.

Discussion

Case 1. The management of a young child with unilateral aphakia after a penetrating injury is a constant source of worry. Having saved the eye, one is faced with the problem of amblyopia. Re-establishment of binocular vision is the best way of preventing this. Without binocular vision the child may be faced with alternate occlusion for some years. Even if the sight of the eye is saved by this procedure, its visual acuity is useless as long as the other eye is being used.

There are reports of contact lenses being used in children to prevent this state of affairs. Blaxter (1963) reported one patient aged $3\frac{1}{2}$ years, but the type of contact lens was not stated. At $7\frac{3}{4}$ years there was simultaneous macular perception and a visual acuity of 6/12 with spectacle correction in the aphakic eye. Ashbridge (1962) reported two children less than 5 years old who, despite wearing a contact lens all their waking hours, had just 6/60 vision with the unilateral aphakic eye. They had conventional occlusion.

We have found no report of a high plus contact lens being used in the normal eye to correct amblyopia in the aphakic eye, although Girard (1964) mentioned the possible use of high plus lenses as occluders. Dreyfus (1962–65) indicated a similar use for hydrophilic contact lenses, with “effects hitherto obtained only by applying drugs such as atropine”, but later mentioned the use of opaque hydrophilic lenses. Such lenses have disadvantages in comparison with conventional corneal lenses (Ruben, 1966; Sarwar and Fydelor, 1966).

We were impressed by the rapidity with which this type of occlusion brought the vision to normal after many months of only partial improvement with conventional occlusion.

The alternative to a contact lens as a means of establishing binocular vision is in the intra-ocular acrylic lens, or possibly the intracorneal lens. With these there is a surgical risk, a risk of complications, and the disadvantage that spectacles are almost always

required in addition. The lenses are also more expensive apart from the further hospitalization required. Girard, Friedman, Moore, Blau, Binkhorst, and Gobin (1962), comparing thirty cases of contact lenses with thirty cases of the Binkhorst pupillary clip lens, found that the binocular vision achieved with contact lenses was almost as good as that with the pupillary clip.

The risks with a corneal contact lens are considerably less than with an intra-ocular acrylic lens, but they are not negligible (Dixon, Young, Baldone, Halberg, Sampson, and Stone, 1966). Furthermore, cases have been reported of deep corneal vascularization in aphakic eyes in response to corneal lens wear in adults (Mandelbaum, 1964); this, however, was reversed when wearing was discontinued.

Case 2. Here again the rapidity with which normal vision was established in the squinting eye of a child aged $5\frac{1}{2}$ years with a neglected squint was impressive. Conventional occlusion might have achieved the same results, but this we doubt, and it would certainly not have been so quick.

Our experience with these two cases has shown that high plus corneal lens occlusion has the following advantages:

(1) It is cosmetically much more acceptable to a child, especially at school. The child with a patch is an oddity, whereas with contact lenses he is the centre of attraction.

(2) Possible allergy to the occluding patch is avoided.

(3) The child appears to notice only a change in the quality of the vision.

(4) There may be some advantage, orthoptically and psychologically, in the occluded eye not being "blackened out". Its central vision is "occluded" but its peripheral vision is maintained.

(5) In cases of unilateral aphakia a balance is achieved if a contact lens is being used in the normal eye.

Against these advantages must be weighed the cost of contact lenses, but this may be offset if treatment is speeded up by their use. This method may be effective when all other methods of occlusion have failed.

Summary

Two cases are presented in which high plus contact lenses were used for occlusion of one eye, while the other eye wore a correcting contact lens. The first case was one of post-traumatic aphakia in a boy of $3\frac{1}{2}$ years, and the second one of neglected squint in a boy of $5\frac{1}{2}$ years with unilateral corectopia. Contact lens occlusion was dramatically effective in overcoming the amblyopia in both cases.

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