BILATERAL ECCENTRIC FIXATION*†

BY

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UNILOCULAR eccentric fixation is a not infrequent condition, but bilateral eccentric fixation has only recently been reported in the literature (von Noorden, 1963; Akimoto, 1964; Scassellati Sforzolini and Anselmi, 1965).

Particulars of 71 such cases detected in the orthoptic and pleoptic clinics of the Irwin Hospital from August, 1964, to September 1966, are presented below.

Material

We investigated 685 cases of squint and amblyopia by the cover test, the Maddox wing, and Maddox rod tests, and the synoptophore. Retinal fixation was determined independently by visuscopy under mydriasis by at least two senior ophthalmologists, and 202 cases of eccentric fixation were discovered, 71 of them bilateral. There were 38 females and 33 males, age range 5 to 40 years, and thirteen had bilateral nebular corneal opacities (Table I). The type of squint is shown in Table II.

TABLE I
AGE AND SEX OF PATIENTS WITH BILATERAL ECCENTRIC FIXATION

Sex	Organic Lesion	Age (yrs)					
		5-10	11-15	16-20	20-25	More than 25	Total Cases
Male	Present	—	—	5	3	1	9
	Absent	4	7	9	1	3	24
Female	Present	—	2	2	—	—	4
	Absent	16	10	2	2	4	34

TABLE II
TYPE OF SQUINT IN 71 CASES OF BILATERAL ECCENTRIC FIXATION WITH AND WITHOUT ORGANIC LESIONS

Type of Squint		None	Convergent				Divergent			
			Concomitant		Paralytic		Concomitant		Paralytic	
			Uni-ocular	Alter-nating	Acquired	Duane's Syndrome	Uni-ocular	Alter-nating	Acquired	Duane's Syndrome
Organic Lesion	Absent	5	19	16	1	1	8	8	—	—
	Present	7	7	—	—	—	4	1	—	—
Total		6	26	16	1	1	12	9	—	—

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The type of refractive error in the 58 cases without organic lesions is shown in Table III.

TABLE III
TYPE OF REFRACTIVE ERROR IN 58 CASES OF BILATERAL ECCENTRIC FIXATION OF
NON-ORGANIC ORIGIN

Type of Refractive Error		Total	Isometropia	Anisometropia (D)				
				Less than 1	1-2	2-3	3-4	More than 4
Hypermetropia	Simple Compound	15	8	3	2	1	—	1
		33	5	18	5	5	—	—
Myopia	Simple Compound	2	1	1	—	—	—	—
		5	3	1	—	1	—	—
Mixed	Simple Compound	—	—	—	—	—	—	—
		3	—	—	—	—	1	2

Method

The 71 cases were classified (Table IV) according to the categories of eccentric fixation devised by Agarwal, Malik, Mohan, and Parkash (1962) and the 58 cases without corneal opacities were treated as follows:

The refractive error of the better eye was corrected and the other eye was covered with a Doyné occluder for 2 weeks before starting the pleoptic exercises. When the deviation was greater than 15°, surgical correction was undertaken before starting treatment. If the fixation was close to the fovea (erratic or parafoveal), Haidinger's brushes were used (with Cüppers's co-ordinator or a Haidinger's brushes attachment to the Clement Clarke synoptophore). If the fixation was away from the fovea (paramacular, centro-caecal, pericaecal), the patient was given after-image exercises with Keeler's projectoscope until the fixation shifted to within 3° of the fovea, when Haidinger's brushes were used. A Wratten Gelatin Kodak filter 92 was worn before the worse eye for 2 to 4 hours a day, keeping the better eye occluded. The patient was encouraged to read printed matter using the red filter. Pleoptic exercises were given daily. The retinal fixation and visual acuity were checked once a week.

TABLE IV
TYPE OF ECCENTRIC FIXATION IN EACH EYE IN 71 CASES

Type of Fixation in Each Eye	E E	E PF	E PM	E PC	E CC	PF PF	PF PM	PF PC	PF CC	PM PM	PM CC
No. of Cases	22	9	8	6	2	9	7	2	4	1	1

E = Erratic. Unsteady within 3° of fovea
PF = Parafoveal. Steady within 3° of fovea
PM = Paramacular. 3°-6° of macula
CC = Centrocaecal. Beyond 6° between disc and fovea
PC = Pericaecal. On nasal side of disc

Results

Only sixteen patients persevered with the pleoptic treatment long enough for the results to be evaluated. In eight of them no improvement was seen after from eight to 73 sessions. The results in the remaining eight cases are given in Table V (opposite). Five cases (3, 4, 5, 6, 8) showed good improvement in both eyes with a shift of fixation towards the fovea, but only Cases 6 and 8 achieved fusion.

TABLE V
RESULTS OF PLEOPTIC TREATMENT IN 16 CASES

Case No.	Age (yrs)	Visual Acuity				Fixation				Binocular Function		No. of Treatment Sessions Required
		Initial		Final		Initial		Final		Initial	Final	
		Right	Left	Right	Left	Right	Left	Right	Left			
1	5½	6/60	6/9	6/36	6/6	PM	PF	PM	F	Nil	SMP	34
2	15	6/60	6/9 pt	6/60	6/5	PM	E	PF	F	Nil	Nil	40
3	10	6/18	6/18	6/9	6/6	E	E	F	F	Nil	Nil	13
4	15	6/24	6/12	6/5	6/5	E	E	F	F	Nil	Nil	17
5	12	6/24	6/9 pt	6/9	6/6	E	E	E	F	Nil	Nil	11
6	6	6/18	6/9	6/6	6/5	E	E	F	F	SMP ST	SFP Fusion	10
7	14	6/9	6/30	6/6	6/60	E	PC	F	PC	Nil	Nil	20
8	15	6/9	6/24	6/5	6/6 pt	E	E	F	E	SMP	SFP Fusion	20

E = Erratic
PM = Paramacular
PF = Parafoveal
PC = Pericaecal

SMP = Simultaneous macular perception
SFP = Simultaneous foveal perception
ST = Stereopsis

Discussion

Bilateral eccentric fixation was first recognized by von Noorden (1963) who published two cases, one with bilateral pericaecal fixation and the other with bilateral paramacular fixation. Having observed two cases of bilateral eccentric fixation in the early part of this study, we had our patients checked independently by senior ophthalmologists and continued to examine each case with greater awareness, paying as much attention to the seeing eye as to the amblyopic eye. It is possible that other workers have failed to note the condition more frequently because the seeing eye is assumed to be fixing centrally. The Visuscope now enables an exact diagnosis to be made in each eye.

Unilateral eccentric fixation is believed to develop because of an altered sensory relationship (Cüppers, 1956), which is due to a clinical undetectable organic lesion in the macula (Priestly Smith, 1898; Poulard, 1921; Smukler, 1933; Sachsenweger, 1965) or in the higher visual centres (Sachsenweger, 1965).

Bilateral eccentric fixation may be due to more than one cause. Some cases may result from an organic lesion, such as haemorrhage in the macular area, which finally resolves leaving no evidence that a part of the retina has been put out of action. While the central vision is depressed some point outside the fovea may develop greater resolution. Retinal haemorrhages are reported in 10 to 35 per cent. of all new-born infants (Duke-Elder, 1949). When the fovea is stimulated and the eccentric point is depressed by pleoptic treatment, foveal suppression is eliminated and a central fixation is recovered.

Other cases may be due to damage at a higher level in the visual pathways, as suggested by Akimoto (1964). Von Noorden (1963) and von Noorden and Mackensen (1962)

attributed bilateral eccentric fixation to a bilateral defect of visual acuity with damage to the central aspect of the visual apparatus and substitution of the projectional value of the true anatomical foveae of both eyes by eccentric points. Akimoto (1964), who discovered the condition in twin sisters, attributed the anomaly to defects in the visual organization.

We subjected sixteen of our cases to fairly prolonged pleoptic treatment, and most of those who showed improvement were of the bilateral erratic type. This seems to show that pleoptic treatment is worth undertaking. It supports our hypothesis that the original organic lesion recovers structurally but leaves behind a functional defect which is amenable to pleoptic treatment. The cases which did not improve had perhaps suffered permanent structural foveal damage.

Summary

- (1) 71 cases of bilateral eccentric fixation are reported.
- (2) Sixteen cases were given pleoptic treatment and half of them showed improvement in visual acuity or fixation or both.
- (3) The aetiopathogenesis of bilateral eccentric fixation is discussed.

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