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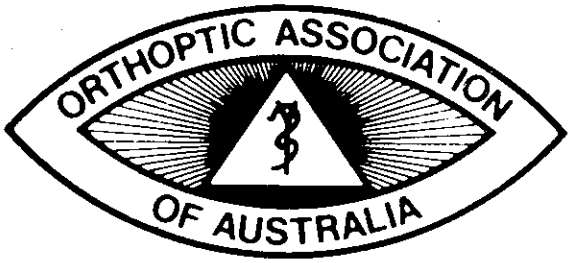

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CONTENTS

EDITORIAL

WRITING AN ABSTRACT

Every paper written for the *Australian Orthoptic Journal* is to have an abstract following the title page.

Although limited to 150 words, the abstract should be a complete miniature paper, giving a precise, informative statement of studies performed, the findings, and principal conclusions. It should be understandable without the necessity to consult the paper, and should contain no jargon or unexplained abbreviations.

Statements such as "examination techniques are described", "results are analysed", or "treatment is discussed" are inappropriate as they contain no facts.

The abstract is the flag-bearer for the author. For many readers a good abstract persuades them to proceed and read the paper (and vice versa). It should be appropriate for use by abstracting services whereby the author's findings and views are given wide international cover.

Abstracts tend to be poorly written in comparison with the main bodies of papers, but as they will be read by far greater numbers they should be even more carefully prepared.

The above is printed with acknowledgements to Dr Ronald Lowe and the Royal Australian College of Ophthalmologists.

Australian Orthoptic Journal 1987; 24: 3-7

THE ORTHOPTIC CARE OF THE ELDERLY

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Abstract

A survey of 201 patients aged 65 years and over, representing 3.8% of total referrals to three orthoptic clinics, is presented. The causes of symptoms were mainly found to be related to such orthoptic problems as heterophoria, convergence insufficiency and defective ocular movement, however, 11% of the group had problems such as monocular diplopia from lens opacities or retinopathy. Despite the low expectations of many of the patients, most were able to be given positive help, particularly by the use of prisms.

Key words: *Orthoptics, geriatrics, binocular vision.*

Several recent studies have advocated that more emphasis should be given to the ocular problems of the ageing population. Clayton and Clayton[1] carried out a survey of 100 geriatric in-patients and found that 39% required intervention management such as referral to the ophthalmologist or optician, or needed orthoptic exercises or prisms. The importance of orthoptic assessment in patients with cerebro-vascular disease prior to rehabilitation has been stressed by Macfarlane and Longhurst.[2]

This study presents a review of patients aged 65 years and over, seen in the orthoptic clinics of three hospitals in the North Birmingham district, over a period of 10 years, from January 1976 to December 1985. The total number of new cases seen during this period was 5,297: patients aged 65 years and over numbered 201, 3.8% of the total (Figure 1). All these elderly patients were referred by the ophthalmologists for investigation of symptoms which suggested a disturbance of binocular vision.

The aim of the surgery is to analyse the causes of the symptoms, and to discuss the management and outcome of treatment.

There may be several problems encountered when dealing with elderly patients. The patient often has a low expectation of improvement, and is surprised to be referred for orthoptic investigations, and feels that nothing can be done to help. There is an attitude of resignation and acceptance that eye defects are a result of getting older. "I suppose I must expect this and put up with it at my age," is a remark frequently heard. Infirmities associated with ageing such as deafness and restricted mobility may make detailed and prolonged orthoptic examination inappropriate. There may be difficulty in obtaining a reliable case history and description of symptoms. Most elderly patients are anxious, and forgetfulness and mental confusion may mean that an accompanying person will have to be asked to supply what information they can. However, many elderly patients are articulate, co-operative and anxious to benefit by any means to improve their ocular comfort.

The problems encountered were divided into two main groups (Table 1):—
Group A — those associated with a disturbance of binocular vision.

TABLE 1
Showing Incidence and Percentages of Causes of Symptoms Within Each Group

Group A 179 Patients (89%)	
1. Heterophoria and convergence insufficiency	39 (19.5%)
2. Defective ocular movement	79 (39%)
3. Long-standing heterotropia	14 (7%)
4. Distance esotropia (divergence insufficiency)	10 (5%)
5. Aphakia	22 (11%)
6. Symptoms 'cleared'	15 (7.5%)
Group B 22 patients (11%)	
1. Lens opacities	13 (6.5%)
2. Retinopathy	8 (4%)
3. Optical	1 (0.5%)

Group B — 'non-orthoptic' conditions affecting visual acuity, but who were usually referred because of reported diplopia.

GROUP A

1. *Heterophoria and Convergence Insufficiency*

Twenty four patients were found to have decompensating heterophoria, four with esophoria, 10 with exophoria and 10 with hyperphoria. Orthoptic exercises were successful in relieving symptoms in only two patients with exophoria but, after a trial period, prisms were prescribed for permanent wear for 16 patients, and occlusion for one patient with hyperphoria. Three patients with esophoria had symptoms only without glasses and were reassured. Fifteen patients had convergence insufficiency causing difficulty on close work. Seven of these responded to orthoptic treatment, but five patients needed prisms in their reading glasses and one lady of 85 years of age persisted in closing one eye when reading.

2. *Defective Ocular Movement*

This was the largest group and comprised 79 patients, 69 with recent onset and 10 with a long-standing condition.

(a) *Recent Onset*

The types of palsy found in this group can be seen in Table 2.

Vascular causes were judged to be responsible for 38 cases of neurological palsies. Seven of these patients had diabetes, of whom six had sixth nerve palsies and one had a fourth nerve palsy. Trauma was the cause in two cases, and herpes zoster opthalmicus in two cases. Two

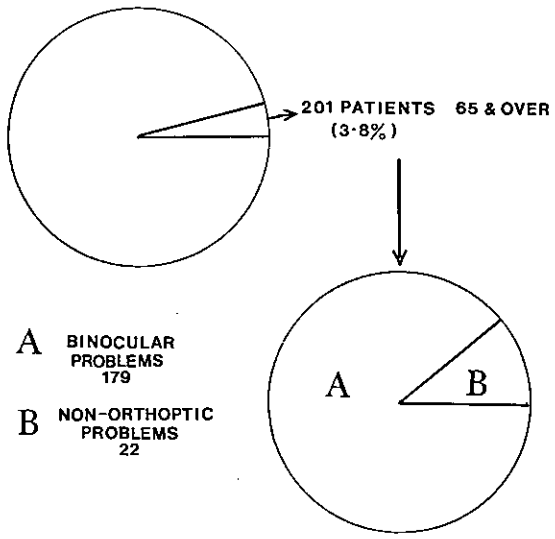

Figure 1: Showing the proportion of elderly patients presenting for orthoptic assessment, and those whose problems were found to be due to defective binocular vision.

patients with gross restriction of ocular movement were referred to the neurosurgeon and underwent surgery to remove invasive intraocular tumours. In the remaining 25 cases the cause was unknown.

Spontaneous resolution of diplopia with complete recovery of ocular movement occurred in 36 patients (55%). The average time taken for recovery to take place was three months, but ranged from 12 days to 12 months. Temporary prisms were used for 38 patients, and eventually prescribed for permanent wear in 16 cases where recovery did not occur or was incomplete. Six patients needed permanent occlusion, either because the deviation was too large to be

TABLE 2
Showing Incidence of each Type of Recently Acquired Palsy

Type of palsy	No. of cases
Third nerve palsy	5
Fourth nerve palsy	10
Sixth nerve palsy	36
Ophthalmoplegia	2
Internuclear ophthalmoplegia	2
Gaze palsy	1
Isolated superior rectus palsy	4
Dysthyroid disease	6
Myasthenia gravis	1

corrected by prisms, or the distortion to vision caused by high-power prisms could not be accepted.

(b) *Long Duration Ocular Palsies*
Seven of the patients with superior rectus palsies, and three with superior oblique palsies were judged to have had the condition for several years. One patient had vertical muscle surgery, five needed prisms, one patient had a compensatory head posture, and three patients complained of diplopia only on extreme positions of gaze.

3. *Long-standing Heterotropia*
Fourteen patients gave a history of squint of long duration of up to 60 years. Unlike younger patients, none of them was concerned about the cosmetic appearance, but several complained of diplopia following a recent illness. Eleven patients had exotropia, some were consecutive squints, and in two cases the deviation was secondary to pathological amblyopia. Orthoptic treatment was successful in relieving symptoms in two cases of intermittent exotropia, but prisms were needed in two cases and occlusion in one case. Two patients had partially accommodative esotropia and had been wearing prisms for some years, but these had been discontinued by the optician in recent glasses. Both patients became symptom free when the prisms were replaced in the spectacles. One patient had a long-standing vertical deviation but no symptoms.

4. *Distance Esotropia*
Ten patients presented with uncrossed diplopia for distance. No problems were present for near vision, although most cases showed exophoria at reading distance. The deviation was concomitant and measured the same on lateroversions, so could not be ascribed to sixth nerve palsy. This condition has been reported as divergence paralysis or divergence insufficiency. Kirkham et al.[3] reported three cases associated with raised intracranial pressure, all with sudden onset, but resolving in a few weeks. They suggest the cause may be vascular insufficiency involving the sixth nerve nucleus or infra-nuclear pathway. Cunningham[4] reported seven cases, six of whom were thought to have vascular disease involving the brain stem. Six of the patients in his series were over 60 years of age. Krohel and co-workers[5] describe 11 cases of divergence paralysis followed up for between one and 11 years, and conclude that, despite reports in the literature associating the condition with well-defined organic disease, it is unlikely for such patients to develop further neurological sequelae. Two of our cases recovered spontaneously, but prisms were prescribed for eight patients for permanent wear. Only one patient needed increasingly strong prisms over a period of 10 years, and eventually showed signs of bilateral lateral rectus weakness.

5. *Aphakia*
(i) *Bilateral Aphakia*
It is not unusual for disturbance of binocular vision to occur following cataract surgery on the second eye, particularly if there has been a considerable time lapse since the operation on the first eye. Nineteen patients presented with such problems, nine had exotropia (seven with associated vertical deviations), six had esotropia (four with a vertical deviation), and four patients had heterophoria. Thirteen cases were helped with prisms, and six patients regained comfortable binocular single vision within a few weeks and were able to discard them. Permanent prisms were ordered for four patients. One patient with a vertical deviation had successful muscle surgery, and two patients with exophoria and convergence insufficiency responded to orthoptic exercises.

(ii) *Unilateral Aphakia*
Three patients complained of variable intermittent diplopia following unilateral cataract surgery. One patient became symptom free when his contact lens was changed to a soft lens, but the other two patients could not cope and abandoned their lenses.

With the modern procedures of intraocular lens implants or extended wear contact lenses, post-operative diplopia is rare, and if it does

occur, usually disappears within 7-10 days following surgery.

6. *Symptoms 'Cleared'*
Fifteen patients proved to have normal ocular muscle balance, yet eleven of them gave definite descriptions of diplopia which had recovered within periods varying between three days and four weeks. Four patients complained of intermittent blurring of vision for which no cause could be found.

GROUP B
Twenty two patients (11% of the group) had symptoms which were initially ascribed to possible defective binocular vision. However, the causes were found to be due to the following:—

1. *Lens Opacities*
Thirteen patients (6.5%) complained of diplopia which proved to be uniocular, affecting both eyes in seven cases and one eye in six cases. The symptoms were usually intermittent and mildly irritating.

Other causes of uniocular diplopia include corneal opacity, astigmatism, sometimes caused by pressure on the cornea from a lid cyst, and subluxation of the lens. None of these conditions were present in our patients. An explanation of the cause of the symptoms reassured the patients.

2. *Retinopathy*
Eight patients (4%) presented with a variety of symptoms, such as 'ghosting', distortion, blurring and diplopia. Pigmentary disturbance or pin-point haemorrhages at the macula were thought to be the cause.

3. *Optical*
One patient complained of blurring and diplopia since new spectacles, but a correction in the axis of the cylinder rectified the problem. Special care should be taken to make sure that elderly patients are wearing the correct glasses with an up-to-date prescription. It is not unusual to find that the glasses are many years old, with scratched lenses and ill-fitting frames. Sometimes patients abandon bifocal spectacles in favour of their old distance glasses, so have no reading correction, and consequently have great difficulty with shopping and close work. Appropriate glasses will greatly improve their quality of life.

MANAGEMENT
Modifications to normal orthoptic methods of investigation may be necessary when dealing with elderly patients. If possible the examination room should be quiet and private. The orthoptist must listen carefully to the patient's symptoms and worries and show sympathy and understanding, and hopefully, give encouragement about the prognosis.

Orthoptic tests may be limited by the patient's infirmities, and it may not be possible to carry out a synoptophore examination or a Hess chart. Remedial measures should be effected at the first visit, so that the patient leaves the clinic reassured and more comfortable.

Prisms play an important part in the relief of symptoms, particularly in the control of diplopia in recent ocular muslce palsies. The strength of the prism should be chosen in relation to the degree of deviation measured, and with particular consideration of the patient's responses as to which prism gives the most comfortable binocular single vision. In some cases the total amount of deviation needs to be corrected. If horizontal and vertical displacement of images is noticed, a prism rotated to effect control of both elements of the diplopia may be used. It may be appropriate to apply a segmental prism to either the distance or near correction when diplopia is present at only one distance. Patients usually prefer the prism over the affected eye except when the sound eye is amblyopic. Regular review is essential as the prism may be reduced in strength if improvement occurs, or discarded altogether if spontaneous recovery takes place. There seems to be no way of forecasting whether resolution of diplopia will take place, or how long it will take. In the present series 55% of recent ocular muscle palsies recovered completely within an average time of 3 months.

Prisms for permanent wear are prescribed when recovery is incomplete or absent after 6

months. In this series, temporary prisms were used for 95 patients and prescribed for permanent wear for 58 patients.

Occlusion is advised for those situations in which binocular single vision cannot be restored and if surgery is inappropriate.

Ocular muscle surgery is seldom undertaken for elderly patients. It may be inadvisable due to health problems but is usually refused by the patient.

Orthoptic treatment is successful in relieving symptoms in selected cases of heterophoria and convergence insufficiency, but prism glasses seem to be needed more than for younger patients.

It is important that the patient understands the reasons for his symptoms and the procedures to be carried out for their relief. Regular review by the ophthalmologist is continued, and urgent referral is essential if there is a deterioration or significant change in the patient's condition.

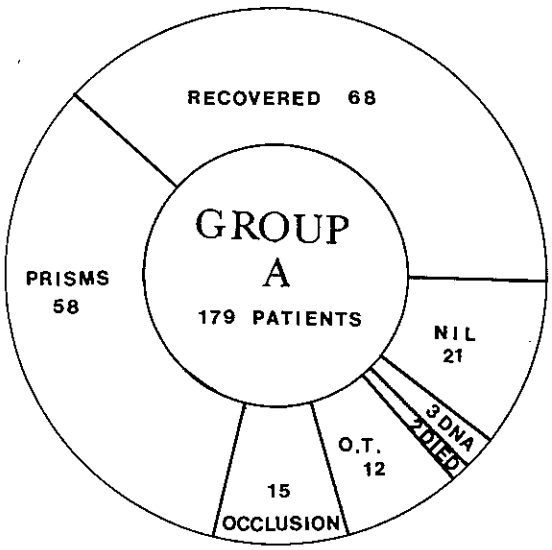

Figure 2: Showing the treatment needed for patients in group A.

CONCLUSIONS

Despite low expectations on the part of the majority of the patients, a high proportion achieved comfortable binocular vision. Of the 179 patients in Group A there were only 21 cases for whom orthoptic management was unable to give positive help. See Figure 2. Some of these patients were too ill to cope with remedial measures, and several others became symptom-free as a pathological deterioration of acuity of one eye reduced the struggle for binocular vision.

In a study of patients attending rehabilitation departments, Pierce[6] found a high incidence of visual field defects in patients of 65 years and over, and emphasises the need for explanation and advice to nursing staff and other professionals concerning the visual problems of patients in their care. Mitchell[7] advocates early and regular ophthalmological assessments in order to detect the onset of visually debilitating diseases, followed by early counselling, and suggests that the orthoptist can play a valuable role in the visual screening of adults.

In Great Britain there are at present about 8 million people over the age of 65 years, and by the year 2001 it is likely that one in 65 of the population will be 85 years and over. Projected population studies estimate that in the North Birmingham district, by the year 1994, there will be an increase of 26% in the population between the ages of 65 and 74, and of 10.5% in people over the age of 75 years.

The care of the elderly is therefore likely to become an increasing part of the orthoptic practice, and the present survey demonstrates that a high proportion of such patients referred to the orthoptic clinic can regain comfortable binocular single vision, and enjoy a significantly improved quality of life.

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Australian Orthoptic Journal 1987; 24: 9-12

UNDERACTION OF THE MEDIAL RECTUS MUSCLE FOLLOWING SURGERY FOR SQUINT

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Abstract

A series of twenty-three cases of underaction of the medial rectus muscle following surgery for esotropia was investigated.

Of these, four showed marked underaction (24° or less adduction), eight moderate underaction (25° to 29° adduction) and eleven mild underaction (30-34° adduction). Factors associated with medial rectus underaction were:

1. *Large or multiple recession of the medial rectus beyond the oculomotor equator.*
2. *A significant vertical component e.g. V or A sign, superior oblique tendon sheath syndrome.*
3. *Diminished adduction of the fellow eye.*

Prevention of gross medial rectus underaction needs careful design of surgery using A scan and measurement of amplitude of adduction pre operatively especially in the presence of a significant vertical component.

Key words: *Medial rectus underaction, oculomotor equator, vertical deviation, amplitude of adduction.*

When large angle esotropias are operated upon the surgeon often performs "maximal" medial rectus recessions and lateral rectus resections upon the deviated eye in order to correct the large deviation with an operation upon one eye alone. The amount of "maximal" recession performed varies with the surgeon, the muscle often being recessed to "beyond the equator". If very large, the recession may result in underaction of the medial rectus muscle which, if marked, may be cosmetically unacceptable, cause diplopia in the field of action of the muscle, or in some cases be followed by consecutive exo-deviation.

Webb Chamberlain[1] used single muscle medial rectus recessions for esotropia but noted some incomitance post operatively. Hess and Calhoun[2] recommended medial rectus recessions larger than the standard 5 mm. Stockbridge and Moore[3] found incomitance in only a small number of patients having monocular recession/resection surgery.

It may be reasonable surgical practice to "trade off" a small amount of medial rectus underaction for straight visual axes but a gross underaction is best avoided. We have studied a series of cases with medial rectus underactions of variable degree to see if this can be predicted and prevented paying particular attention to:

(a) The size of the eyeball

(b) The amount of surgery performed

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(c) The nature of the pre-existing deviation, particularly the presence of a vertical component, and amplitude of pre-existing adduction.

PATIENTS AND METHODS

A series of twenty-three patients with underaction of the medial rectus was studied. Following the operation, the angle of deviation was measured, then the ocular movements were examined and any underaction was noted. Various methods of measuring ductions are described. We used a method used by Roper Hall[4] in which the synoptophore was used with a simultaneous macular perception slide in front of the eye to be measured. The patient followed the slide as it was moved away from the straight ahead position until the patient could no longer maintain fixation or a shift in the corneal light reflex was noted. At this point the amount of adduction was measured on the degree scale.

Ductions were considered normal if they measured 35° or more, 30-34° was considered a mild underaction, 25-29° a moderate underaction and 24° or less a marked underaction.

The amount of recession beyond the oculomotor equator was then assessed. Using the method previously described[5] the anteroposterior length of the eyeball from corneal surface to the anterior surface of the retina was measured by A scan ultrasonography and 1 mm added to this to give the anterior-posterior length of the eye. From this the circumference was calculated and then the length of a quadrant from the central cornea to the geometric equator of the eye (¼ of circumference). The oculomotor equator is 2 mm anterior to this on the medial side as the oculo motor axis around which the recti muscles act is approximately 10° divergent to the antero posterior axis. Many of the eyes in this series had been operated upon elsewhere so the precise placement of the recessed muscle on the globe was not known and in these cases a standard corneal diameter of 12 mm with a medial rectus insertion 5 mm from the limbus was applied. This meant that the medial rectus insertion was approximated at 11 mm from central cornea which is rather small for large eyes.

RESULTS

Four patients had marked, eight moderate and eleven mild underation of the medial rectus.

The four patients with marked underaction of the medial rectus had all had large recessions more than 1 mm behond the oculomotor equator, three with two or more operations upon the medial rectus. Three of these patients had a significant vertical component, two having had surgery for this (see Table 1).

Of the eight patients with moderate medial rectus underaction (see Table 2) none had a recession to more than 1 mm beyond the oculomotor equator, although one (A.E.) had multiple operations (3) on the medial rectus and two others (J.B. and Ca.R) had both recession and resection operations for a consecutive eso and consecutive exo respectively. Six patients had a significant vertical component (one with operation). Of the seven patients in whom the

TABLE 1
Marked Underaction of the Medial Rectus

	Circumference & quadrant	Insertion to equator	Recession (mm)	Excess (mm)	Vertical error	Adduction
KL	75/18.75	5.75	8.0*	2.25	No	23 (33)
CS	71/17.75	4.5	6.5*	2.0	Yes (Opn)	24 (35)
TL	68/17	3.75	5	1.25	Yes	22 (35)
NJ	68/17	6.0	10 *	4	Yes (Opn)	22 (45)

* = multiple recessions.
Adduction is given in degrees of rotation. The figure in parentheses gives the adduction in degrees for the fellow eye, and is underlined if this eye had previous surgery.
Opn = previous operation for vertical error.
Excess = excess in mm of recession over distance from the insertion to the oculo motor equator.

TABLE 2
Moderate Underaction of the Medial Rectus

	Circumference /quadrant	Insertion in equator	Recession (mm)	Excess (mm)	Vertical error	Adduction
A.H.	69/17.25	4.25	5	0.75	R10+ + R50=	26 (32)
M.S.	75/18.75	6.25	4.5	−2.00	V	28 (38)
C.E.	74/18.5	6.5	6.5	0	No	25 (45)
J.B. (consec eso)	72/18	5	5*	0	Yes (Opn)	26 (31)
Ca.R.†	78/19.5	6.5	?*	?	R10+ LS0+	27 (38)
Cr.R.† (consec. exo)	77/19.25	6.25	4	−2.25	No	27 (38)
G.B.†	72/18	5	5	0	R10+	25 (40)
A.E.†	71/17.75	4.75	?*	?	R10+ RS0−	25 (36)

Conventions as in Table 1.
†=standard value for corneal diameter (11 mm) and medial rectus insertion (5.5) were used because of lack of operative data.

opposite medial rectus was unoperated five had less than 40° rotation on adduction of this normal eye, one patient (J.B.) having only 31°

Of the eleven patients with mild underaction of the medial rectus (see Table 3), one had a recession of 1 mm or more behind the oculomotor equator while another had multiple operations to the medial rectus with one recession "to the equator". All but one patient had a significant vertical component, five having had operation for this. Six patients had less than 40° rotation in adduction of the normal fellow eye.

In the whole series, there was only one patient (C.E. with a moderate underaction) who had a "safe", although large, recession, no vertical component and normal adduction of the fellow eye.

DISCUSSION

Three factors were associated with underaction of the medial rectus muscle in this series:

1. Large recessions of the medial rectus muscle beyond the oculomotor equator or multiple medial rectus recession.
2. Significant vertical component such as inferior oblique over-action, superior oblique tendon sheath syndrome V or A sign.

TABLE 3
Mild Underaction of the Medial Rectus

	Circumference /quadrant	Insertion in equator	Recession (mm)	Excess (mm)	Vertical error	Adduction
J.L.	74/18.5	6	7	1	Yes (Opn)	31 (40)
S.G.†	73/18.25	5.25	5	−0.25	No	31 (38)
K.W. (consec. exo)	71/17.75	5	5.5	0.5	L10+	32 (40)
G.A. (consec. exo)	78/19.5	6.0	5.0	−1.0	A	30 (45)
D.D.† (consec. eso)	77/19.25	5.75	4*	−1.75	Yes (Opn)	32 (36)
R.R.†	71/17.75	4.75	5	0.25	R+L10+	33 (43)
S.H.†	80/20	7	"Equator"*	?	(Yes (Opn)	31 (36)
M.L.†	71/17.75	4.75	5	0.25	L10+	30 (35)
D.C.†	75/18.75	5.75	6	0.25	Yes (Opn)	33 (40)
M.K.†	64/16	5	4	−1	R+L10+	32 (36)
F.G.†	72/18	5	4	−1	Yes (Opn)	33 (38)

Conventions as in previous tables.

3. A diminished amplitude of rotation in adduction of the fellow unoperated eye.

Large recessions of the medial rectus in each case were associated with marked underaction of the medial rectus. This stresses the importance of the oculomotor equator derived by A scan as the limit of "safe" recession. In the other groups with less underaction large recessions were much less frequent and some patients had recessions well in front of the equator.

A significant vertical component was present in most patients with medial rectus underaction whether marked, moderate or mild. Less than half the patients had undergone surgery for this so the degree of vertical component varied. Patients with this vertical component may also have some inherent limitation in adduction which we did not detect pre-operatively.

The presence of poor adduction of the fellow eye suggests that adduction of the operated eye may have also been defective before surgery to the medial rectus. In the group with marked underaction only one case, (K.L.) showed defective adduction of the fellow eye, however in the other two groups this underaction was present in just over half of the fellow eyes. In the past it has not been usual to measure adduction carefully before medial rectus surgery, but this study indicates that it should be measured, especially if large medial rectus recessions are intended.

It is also of interest that six patients showed exotropia at some stage of their clinical course. Two had operations for consecutive esodeviation following operation for exotropia. The others showed exotropia following surgery for esotropia but this needed surgery in only one case. Four of these cases showed poor adduction of the fellow eye and in another it was borderline at 40°.

We have stressed before[5] the importance of measuring ocular dimensions by A scan to determine the oculo motor equator which is the limit of safe medial rectus recession. It may be reasonable to "trade off" some limitation of adduction postoperatively for straight visual axes. However, care is needed particularly in the presence of a significant vertical component or limitation of adduction. This limitation of adduction may not be obvious on observation of ocular movement, but careful testing of the range of adduction with the synoptophore may show that only limited adduction is present.

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SINGLE VS. MULTIPLE PINHOLE — DOES IT MAKE A DIFFERENCE?

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Abstract

The visual acuity of 29 subjects was tested using a single pinhole, a multiple pinhole and the best corrected visual acuity. Statistical analysis showed no significant difference in the visual acuity achieved using a single or multiple pinhole. It was also shown that a significant difference exists between the visual acuity obtained by pinhole and the best corrected visual acuity.

Key words: *Visual acuity, single pinhole, multiple pinhole.*

INTRODUCTION

The pinhole, an opaque disc perforated by a small hole in the centre, is used to determine the extent of visual acuity reduction caused by a refractive error. Recently there has been increased usage of the multiple pinhole. The aim of this study was to determine whether there is any significant difference in the visual acuity obtained with a single or multiple pinhole, and to compare these results to the best corrected visual acuity.

METHOD

Subjects

The subjects were 29 adults with a refractive error, from an outpatients ophthalmology clinic.

Procedure

The visual acuity of the subjects was tested using a single pinhole, a multiple pinhole and best corrected visual acuity. Visual acuity was tested using Clement Clarke perspex illuminated charts numbers 107 and 108 with reverse letters and a mirror at 3 metres. These charts contain the same eight letters in different combinations. Measurements of visual acuity were made using a Rayner trial lens single pinhole and a multiple pinhole supplied by Parke-Davis. The latter had 17 pinholes arranged in two concentric circles with one central hole, all were 1 mm diameter. The pinholes were placed in an Oculus Universal trial frame and were correctly centred. The other eye was occluded with a black disc.

The pinhole visual acuity was tested with the right eye first. Half the subjects were tested with a single pinhole first and the other half with a multiple pinhole first. The visual acuity charts were changed between the right and left eyes. These variations minimised the effects of learning on the test results. The best corrected visual acuity was then obtained for each eye by a subjective refraction.

For the purposes of this paper, the subjects selected were those who obtained pinhole visual acuity of the total 6/12 line or better for both eyes. This level was used to minimise the possibility of ocular pathology, and thus restrict the sample to patients with refractive error only.

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TABLE 1
Results of Visual Acuity Testing

	Right Eye		Left Eye	
	Mean (±SD)	Range	Mean (±SD)	Range
Single pinhole	12.5 (±7.4)	0-29	13.3 (±6.6)	3-25
Multiple pinhole	13.7 (±8.1)	3-28	14.2 (±7.0)	0-27
Best visual acuity	20.2 (±8.0)	5-29	18.2 (±8.7)	5-29

The refractive error of the subjects ranged from −4.00D to +4.25D spherical equivalent, with various powers of cylindrical correction to a maximum of 3.50D.

For statistical analysis the visual acuity was expressed as the number of letters seen on the 9, 6, 5 and 4 lines which contained 6, 7, 8 and 8 letters respectively. Hence a total of 29 letters could be obtained. This process had inherent problems in that not all the letters and increases are equal. However, since these levels of vision involving visual angles of 1.5′, 1′, 0.83′ and 0.67′ are not as disparate as at the poorer levels of visual acuity, these shortcomings were considered acceptable.

RESULTS

The results of visual acuity testing are shown in Table 1.

Statistical analysis using ANOVA with a 3×2 crossed repeated measures design showed no significant difference in variance between right and left eyes or the interaction effect. However a significant difference in variance was observed due to the visual acuity testing conditions ($F = 23.35$, $df = 28$, $p < 0.001$).

Since there was no significant difference between right and left eyes, further analysis was performed on the data for right eyes alone. A further ANOVA reconfirmed the significant effect of the testing condition ($F = 21.55$, $df = 28$, $p < 0.001$). This difference was then analysed using a post-hoc test. The *t*-test showed no statistically significant difference between visual acuity using a single or multiple pinhole, but a significant difference between pinhole visual acuity and best corrected visual acuity for both single pinhole ($t = 6.51$, $df = 28$, $p < 0.001$) and multiple pinhole ($t = 4.76$, $df = 28$, $p < 0.001$).

DISCUSSION AND CONCLUSIONS

The problems of statistical analysis of visual acuity results when tested and recorded as a Snellen fraction are due to the fact that this measurement is not ratio data, as the size change from one line to the next is not equal at each stage. This problem has been highlighted by Ferris et al,[1] who described a new visual acuity chart on the same principle as a Log MAR chart, where the progression from line to line is geometric both in letter size and spacing. The visual acuity score is then either calculated by adding up all the numbers read, or it can be recorded as a Snellen equivalent. Hence, these charts allow for easier data analysis. With this particular set of data there were further statistical considerations caused by the fact that many measures were taken from the same individuals and hence were correlated. Therefore repeated measures analyses were required.

It appears from the results that when assessing visual acuity of patients with refractive error there is no significant difference between the results achieved using a single or multiple pinhole. The means of 12.5 and 13.7 in the right eye are visual acuities of 6/6 (−1) and 6/6 respectively. It was also noted that none of the subjects commented that the multiple pinhole was easier, nor were any subjects particularly quicker with one or the other.

It is to be noted however, that the best corrected visual acuity is greater than that obtained with a pinhole, i.e., a mean of 20.2 letters which is visual acuity of 6/5 (−1), one line better. This is due to the pinhole effect of diffraction, caused by the bending of light as it strikes an edge. The effect of increased visual acuity due to the central unrefracted rays only passing to the retina is partly off-set by the

decreased vision caused by diffraction. Safir,[2] states that a 1 mm pinhole allows a subject with a 5 dioptre refractive error to see 6/12, whereas an emmetrope has vision reduced to 6/7.5.

In conclusion, it appears that there is no significant difference to be expected in visual acuity results using a single or multiple pinhole in subjects with no significant ocular pathology. It should also be remembered that the best corrected visual acuity is likely to be better than the pinhole visual acuity.

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COLOUR VISION: ISHIHARA AND CITY UNIVERSITY TESTS

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Abstract

The aim of this study was to compare the results recorded from two colour vision tests. The City University Colour Vision Test (CUCVT 2nd ed. 1980) and Tests for Colour Blindness by Ishihara (Ishihara, 24 plates, 1974) were used to assess colour acuity in a population of kindergarten children (n = 81). Traditionally, Ishihara has been used to detect red/green colour deficiencies, and the CUCVT aims to detect blue-yellow anomalies as well as red/green. We found that there was no significant difference in error recording between the two tests with regard of time taken, instructions, given, level of illuminations, or presentation order. However, CUCVT did not agree with the Ishihara in detecting red/green defects in this population, and appears to be more sensitive or biased towards eliciting errors of a blue/yellow nature.

Key words: *Red/green, blue/yellow, colour deficiencies, colour acuity, kindergarten children.*

INTRODUCTION

The aim of this study was to compare the results recorded from two colour vision tests. The City University Colour Vision Test (CUCVT 2nd Ed. 1980) and Tests for Colour Blindness by Ishihara (Ishihara, 24 plates, 1974) were used to assess colour acuity in a population of kindergarten children ($n = 81$). The Ishihara test has traditionally been the test of choice for detecting congenital (red/green) colour defects. The CUCVT was chosen because of brevity, ease of understanding and claims to detect red/green as well as blue/yellow defects. According to Hill et al,[1] the CUCVT demonstrated poor internal validity and least overall complete agreement by comparison with the Ishihara and four other tests. The retesting reliability of the CUCVT was said to be deficient where originally defective results subsequently were normal, and changes occurred in classification and degree of colour defect with retesting. The test is said to rely on "colour difference estimations" which is unique in a colour test, being hue discrimination rather than colour confusion.

The ideal colour vision test should demonstrate reliability in measurement, quantification of a defect and ease of administration. These features should be maintained through a known range of test conditions; such as illumination required for test administration.

In clinical practice the Ishihara test is often used solely to assess colour acuity. The pseu-

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doisochromatic stimuli of this test demands that a subject identify one stimulus as different from a background stimulus.

The colours of the stimuli are those which a red/green deficient subject will confuse. The CUCVT is not yet widely used in clinical practice. Hue discrimination is the basis of this test. Five stimuli are presented, requiring the subject to match one stimulus to one indicated by the examiner. The hues chosen as stimuli are those which a red/green or blue/yellow deficient subject will confuse. Verriest[2] compared hue tests to isochromatic tests, and claimed the CUCVT to be comparatively more sensitive in detecting acquired colour defects than congenital ones. This study reported that the Ishihara is amongst the most sensitive tests of red/green deficiency while the CUCVT is amongst the most sensitive tests for blue/yellow but not red/green deficiencies. However, Fitzgerald[3] reported that the CUCVT is the most reliable screening test for both congenital and acquired colour defects, although the study was of only 15 colour defective adults. The present study investigated whether significant differences existed between the tests' sensitivity to colour vision defects when changes in time and instruction of administration and illumination occurred, in a specific population.

METHOD

Children attending kindergartens of the Melbourne City Council take part in a vision screening service conducted by the School of Orthoptics, Lincoln Institute of Health Sciences. This prospective study of 81 children incorporated colour vision assessment into the existing programme. Ages ranged from 3-5 years, with a mean 4.02 years. First year orthoptic undergraduate students conducted the testing under the supervision of an orthoptist. The children were assessed in the kindergarten environment.

A new set of the City University Colour Vision test (CUCVT) second edition, 1980 was purchased, along with a new set of the Test for Colour Blindness by Ishihara, 24 plates, 1974.

A standard light meter, commonly used by orthoptists for visual perimetry, was employed to measure illumination levels before each test presentation. This was recorded with each test result as lighting varied considerably with each kindergarten and possible effects on colour vision recordings needed to be examined. The gradations of illumination were in multiples of 179 lux; being 179, 328, 715 and 1430 lux.

A Cassio's stopwatch was used by the supervising orthoptist to measure the time taken by each subject for each test.

Timing commenced after the first plate of each test had been presented and after the initial explanation. Timing ceased when a response had been given for the last plate. There was no time limit imposed on the subjects.

Permission for the entire visual assessment was given by the Melbourne City Council, however the subjects were unaware that they were involved in a study. Similarly, as a double-blind procedure, the undergraduate students administering the tests were also unaware of the study or its objectives. The students were given very specific instructions to put to each subject, (see Table 1), and the number of instruction recorded.

As detection of congenital colour vision problems is a main purpose of screening for

TABLE 1
Instructions

ISHIHARA
Instruction No. 1 "What numbers can you see?"
OR (if the subject had difficulty)
Instruction No. 2 "Draw the number with your finger."
(Indicate where to begin.)
CUCVT
Instruction No. 1. "See the spot in the middle/centre." (Point to it). "Show me another one that's nearly the same colour."
OR (if the subject had difficulty)
Instruction No. 2. "There are two spots nearly the same colour; this is number one." (Point to it.) "Where is number two?"

colour defects in this age-group, tests were conducted with both eyes open, and not monocularly, as would be expected when suspecting acquired defects. In all instances, testing was performed in rooms where lighting was a mixture of natural and artificial; and subjects and testers were seated at children's tables facing the 'plates' perpendicularly.

The colour vision assessments were made prior to any other visual testing to avoid elements of fatigue or other effects. To control for any presentation order effects, the students were instructed to present first to the subject, the test which had been presented second to the previous subject.

RESULTS

The subjects were a group of kindergarten children ($n=81$), with a mean age 4.02 years, 42% males and 58% females. The Ishihara test was presented first in 54% instances, and CUCVT presented first 46% of the time. When using the Ishihara test, 10% of the children were given Instruction No. 1, and 90% were given Instruction No. 2. This was not random choice, but aimed at levels of abilities of the child as appropriate. Using the CUCVT, 98% of the children were given Instruction No. 1, and 2% were given Instruction No. 2.

The times taken to complete the tests were:

Ishihara: Av. 2 mins 56 secs. Range 1 min 8 secs-6 mins 28 secs. Seventeen plates were used, with a mean time per plate as 10.34 seconds.

CUCVT: Av. 1 min 41 secs. Range 33 secs-4 mins 39 secs. Ten plates were used, with a mean time per plate as 10.09 seconds.

The illumination levels varied from 179 lux to 1430 lux, with mean 570 lux.

Using the Ishihara test, 18.75% (15) of the group recorded errors. Of these 15, five subjects recorded two or more errors. In this group of five, the mean number of errors was 3.6, with a range 2-4 errors. Overall, the number of errors recorded at two or more was 6.25% of the group of 81. Using the CUCVT, 49.37% (39) of the group recorded errors. Of these 39, 16 subjects recorded two or more errors. In this group of 16, the mean number of errors was 1.85, with the range 1-6 errors. Overall, the number of errors recorded at two or more, was 20.25% of the group of 81.

T-tests analyses ($p<0.05$) were performed. Of the errors detected using the Ishihara, 87% (13) had been given Instruction No. 2, and 13% (2) had been given Instruction No. 1. There was found to be no significant difference ($t=0.97$ DF = 13) in the number of errors detected and the choice of instruction. This was similarly found in the 39 errors recorded using the CUCVT ($t=0.62$, DF = 38) where 5% (2) had been given Instruction No. 2, and 95% (37) were given Instruction No. 1.

There was also found to be no significant difference between the order of test presentation and the number of errors recorded (Ishihara $t=1.48$, DF = 13 CUCVT $t=0.36$, DF = 37) or errors of "two or more" (Ishihara $t=0$, DF = 3, CUCVT $t=0.14$, DF = 14). Illumination levels less than, equal to, or greater than 600 lux, using both colour tests, showed no significant difference in the number of errors recorded (Ishihara $t=0.11$, DF = 13, CUCVT $t=1.18$, DF = 37) or errors of "two or more" (Ishihara $t=1.4$, DF = 3 CUCVT $t=0.51$, DF = 14). Although no Ishihara tests were performed in illuminations <300 lux, seven CUCVT tests were done at <300 lux. Three of these recorded errors, but the number of errors found in illumination <300 lux was not significantly different to the number of errors found in illumination >300 lux.

Of the five subjects recording errors of two or more on the Ishihara, and 16 with the CUCVT, only three were common to both groups. All three children had the CUCVT presented first and the Ishihara second.

DISCUSSION

Unlimited time per plate was allowed for each subject with each test, as Taylor[4] has warned of possibly inducing tritan defects with restricted viewing time. This was found to occur in groups of normal and selected colour defective subjects, when time was reduced to 3.75 seconds per plate. The instructions of each test recommend

TABLE 2
Levels of Referral

1. Nakajima A, et al, used the following guidelines for error referrals using the Ishihara test:
   3-9 errors — doubtful.
   10+ errors — defective, to be confirmed by other methods
2. Instructions in the Ishihara test give:
   3-5 errors — doubtful.
   6+ errors — defective, follow-up assessment with anomaloscope.
3. CUCVT instructions, state for the Ishihara test and the CUCVT, that three errors are border-line, and 4+ errors are defective, to be retested, and fully evaluated using three or more tests.

completion of a plate within three seconds. The subjects of our study took approximately 10 seconds per plate, the average time taken overall, being one minute less for the CUCVT, as this has 10 plates and the Ishihara has 17 plates.

Hill[1] considers that illumination levels do not affect error scores using the Ishihara and CUCVT when testing at 200 lux, 400 lux or 600 lux. However, it is recommended to use 400 lux ± 100 lux for the Farnsworth-Munsell 100 hue test. For these reasons, this study looked at errors scored above and below 600 lux (level recommended in CUCVT instructions), and above and below 300 lux, to as low as 179 lux. It is clinically important to note that no difference in error score occurred with these changes in illumination, as so often clinical environments can vary in their availabilities of light intensities.

As there seemed to be some discrepancies in number of errors indicative of a defect (see Table 2), this study defined two or more errors on either test as borderline or defective; 20.25% (16) of this group recorded errors at this level using the CUCVT, and 6.25% (5) were recorded, using the Ishihara. Of these 16 and five subjects respectively, three were common to both tests. Of these three children, all had had the CUCVT presented first to them. There were two females and one male.

If the borderline to referrable criteria is to apply to one but not both tests, 22.22% of this population requires follow-up. If this criteria, however, must occur on both tests (or have at least six errors on one test), then 4.9% of this population requires follow-up. (Congenital colour defects are said to affect 8% males, 0.5% females, averaging 4.25% of the population). Three children showed errors common to both tests, and one child showed six errors on the CUCVT, but none on the Ishihara. There was no difference in male/female percentages of errors recorded.

From the recording of the Ishihara test it was not possible to categorise the errors detected, however, of the 16 subjects recording errors, using the CUCVT, 15 chose tritan errors alone or in combination with protan or deutan errors. The range of overall errors was 1-6, the range of tritan errors 1-5. Two subjects each recorded two tritan errors alone and one subject showed one deutan error in combination with five tritan errors out of the total possible score of 10. This leads to the possibility that the CUCVT may be more sensitive or biased towards detecting blue/yellow defects as opposed to, or even at the expense of detecting red/green problems. There is also the factor that with the arrangement of dots on this test, tritan responses are situated on the right-hand side which may be easier to indicate than a left-handed response.

Three children did not finish one of the tests, all being second presentations. One subject did not finish the Ishihara, and had recorded two errors on the CUCVT. The two subjects who did not finish the CUCVT, had not recorded errors on the Ishihara. The probable element here is fatigue or lack of co-operation for a second test.

CONCLUSION

These findings support those of Hill[1] in that there is a poor correlation between the Ishihara and CUCVT when screening for congenital red/green colour deficiencies in four year olds. Although the CUCVT is a much quicker test to perform (one minute less overall), the level of difficulty was comparable to the Ishihara and did not have a bearing on the number of subjects failing to finish, or on the number of errors recorded. Normal clinical examintion does not require sophisticated lighting conditions for

either test. No effect on errors scored was found by order of presentation of tests, or instructions given.

Neuber[5] recommended the use of three or more colour tests when quantifying acquired colour defects stating the pseudoisochromatic tests to be least reliable for this group, with hue tests more reliable. The converse may indeed apply for congenital colour problems, with the hue tests being least reliable.

The recommendations of this study are for subjects three to five years. Where two or more errors are recorded, a retest is required, especially with the CUCVT which has poor retest reliability. Three colour tests should be performed to quantify and describe a colour defect. The CUCVT seems to be sensitive to blue/yellow rather than red/green defects, therefore the Ishihara test may be more appropriate as the initial test of choice for this age group. Further areas requiring investigation include the detection of tritan errors (CUCVT) and handedness; the retest reliability of both tests, investigating the lowest level of illumination before effects on errors are seen, and comparing the Ishihara with a pseudoisochromatic test that incorporates blue/yellow as well as red/green confusion.

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VISUAL ACUITY IS NOT THE BOTTOM LINE: SOME TECHNIQUES OF VISUAL REHABILITATION

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Abstract

This paper details some of the specific methods which we have found to have positive visual results for clients with central vision loss (eccentric viewing training) or with nystagmus which is dampened or eliminated in a particular direction of gaze (null point training).

Key words: *Visual rehabilitation, eccentric viewing, null point, central field loss, nystagmus.*

"You are blind there is nothing more can be done for you". Many of my clients arrive to see me with this message still ringing in their ears. The reaction to this statement is varied. Many people are angry, this anger may subside to bitterness. Other people are very accepting and need to be actively encouraged to seek assistance. Often the initial anger becomes frustration as each task is more difficult and emphasises that which has been lost. Ultimately, many clients become determined to succeed and regain lost ground.

What are the realities of a sudden loss of vision? Independence is severely compromised. How do you check your accounts when you cannot read the bills? Relying on other people to read your personal mail is frustrating and an infringement of your privacy. Cooking a meal, doing the shopping, commuting to work, that is if you still have a job, become cumbersome if not impossible tasks.

An orthoptist can make a large difference to the quality of life of people in the above situations. By offering the positive suggestion that something can be done, setting short-term attainable goals gives the client support and a future to aim at. Not all visually impaired clients have a sudden onset of visual loss, many have a congenital problem.

The reactions vary considerably between clients, however, the response to achieving a better functional use of vision is generally the same, very positive.

This paper details some of the specific methods which we have found to have positive visual results for clients with central vision loss, (eccentric viewing training) or with nystagmus which is dampened or eliminated in a particular direction of gaze (null point training). Orthoptists can play an important role in assisting visually impaired clients to improve their quality of life; it is essential that some of us look to taking up this challenge.

ECCENTRIC VIEWING TRAINING

A current ophthalmologist's report is necessary; this should indicate the diagnosis and stability of the condition. If the ocular condition is stable, eccentric viewing training may commence. Visual

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acuity, both near and distance, should be tested as should the field of vision with particular emphasis on the central field.

The area of retina to be used for eccentric viewing can be ascertained from the field. The closer this point is to foveal vision the better the prognosis. Having decided on the most viable area(s) of retina, this can be confirmed both subjectively and objectively.

(a) Subjectively: Instruct the client to look directly at a selected area of an object. A large print playing card is suitable using the number and suit in the top corner. When looking directly at the number it should not be visible, the client then moves their eyes into the selected position of gaze stopping as soon as the number and suit become visible, e.g. moving the eyes into dextroversion will stimulate temporal retina in the right eye and nasal retina in the left.

(b) Objectively: Instruct the client to look straight ahead. Place a prism of selected strength before one eye whilst instructing the client not to move his or her eye. By manipulating the base direction and the strength of the prism the degree and direction of eye turn can be established. For example, a 10^{Δ} base out prism before the right eye will shift the image 5° temporal to the fovea. The objective method has the advantage of giving the client a preview of the clarity of vision they may hope to attain. This is good incentive for the tedious hours of training ahead.

Not all clients can see successfully with the prism and many clients, particularly the elderly, have trouble with fine control of eye movements when using the subjective method.

There may be a difference in field between eyes with a resultant difference in potential vision. Unless there are contra-indications the best eccentric point in the eye with the least field loss is preferred. The need to use good lighting properly placed is an important factor in training. The client should be allowed to choose their preferred lighting from a range of incandescent and fluorescent types, allowing changes in intensity and light colour.

Having established the area to be used for eccentric viewing commence training using large print materials, e.g. N36 or N24. The emphasis at this stage should be on the technique. A stimulus object which is relatively easy to see allows concentration on technique and the satisfaction of achievement.

Constant feedback is essential, many clients are uncertain as to the accuracy of their vision: this time can be used to promote confidence in the client. As each task becomes easier, reduce the print size. Single words are preferable until N16, then paragraph material becomes useable.

The client should be encouraged to find the eccentric viewing point on the first word or few letters of that word on each line. When the clearest vision is obtained the eyes are kept in this position and the reading material moved (from right to left), to maintain the one eccentric viewing area.

A line guide may be required not just to maintain the place on the page but to reduce the amount of visual input. Clients with visual pathology seem to suffer a problem similar to the crowding phenomenon. The use of a line guide covering both the lines above and below, and a card to cover the letters to the right of those being read can reduce this problem.

Ocular dominance can be another problem, particularly if vision has been unequal in the past, and what has been the good eye is now more severely affected. Initially doing training covering the dominant eye forces the use of the now better eye. Once clients become aware of the quality of vision available in the non-dominant eye the patch can be discontinued.

The level of training can be varied depending on the client's needs. A younger client who may want to enter the workforce (or remain there) or undertake tertiary study will need a more demanding programme. For these clients the most efficient use of residual vision is necessary. Even if normal print size cannot be attained reducing the amount of magnification required allows a greater field of vision, therefore increasing reading efficiency. Elderly clients

TABLE 1
Eccentric Viewing

Client	Age	Near Visual Acuity		Ocular Complaint
		Before	After	
Male	15	N48	N18	Leber's O/A
Male	21	N80	N12	Leber's O/A
Male	23	N6	N6	Stargaardts
Female	24	N36	N10	Stargaardts
Male	30	N48	N24	Optic atrophy?
Male	30	N24	N16 (N12)	Optic atrophy
Male	33	N32	N24	Stargaardts
Male	33	N48	N24	Leber's O/A
Male	35	N36	N16	Optic atrophy
Female	48	N18	N12	Junius-Kuhnt
Male	52	N12	N8	Pseudoxanthoma elasticum
Male	65	N48	N24	Retinal haemorrhage
Male	66	N80	N24	Angoid streaks
Male	67	N48	N5	Senile macular degeneration
Female	70	N24	N16	Senile macular degeneration
Male	79	N64	N24	Senile macular degeneration

generally require a less rigorous training programme as their needs often relate to larger objects, e.g., relatives' faces, utensils on the kitchen table, etc.

At present the above programme is run on the basis of two one-hour sessions per week for a minimum of eight weeks. However, sessions rarely extend for the full hour as training is very tiring, generally 35-40 minutes is sufficient.

NULL POINT TRAINING

Before commencing null point training the orthoptist should have the results of the client's current ophthalmological report. Lighting requirements should be assessed. Even lighting on the page is important in these cases as a change of lighting can result in a loss of control of the nystagmus. Null point can be ascertained by a careful study of ocular movements. The nystagmus may not completely null so select the position of gaze where movement is least or controlled.

The position of gaze should also be as practical as possible, e.g., if nystagmus nulls both in dextroelevation and dextroversion, then dextroversion will be the more useful position.

Use a flexible reading board, e.g. typing copy holder, to place the written material into the specified position of gaze. The client sits comfortably in the primary position moving only the eyes to take up fixation. This places the client's eyes at null point. To read the material the client should move the head across the reading material, therefore maintaining the eyes at null point. The orthoptist is required to monitor the eyes at null point, stopping the client whenever movement commences. Immediate feedback as to the accuracy of the reading is highly desirable.

Initial training can begin on columns of words, followed by paragraph material when this becomes appropriate. Null point training is generally quicker than eccentric viewing, the technique is easier to establish.

Tables 1 and 2 summarise some of the findings of clients undertaking eccentric viewing and null point training. Results so far indicate eccentric viewing is not only decreasing the print size the client is able to read but providing a more efficient use of vision for work, study and socially. Null point training is perhaps of greatest value in a reading situation, thus being helpful at work or during tertiary study.

The visual rehabilitation programmes to date have successfully improved functional vision which can be applied to many situations. This work is therefore very necessary to the visually impaired community and a very satisfying use of orthoptic training.

TABLE 2
Null Point

Client	Age	Visual Acuity	
		Before	After
Male	18	N15	N10
Male	18	N80	N48
Male	25	N12	N10
Female	35	N12	N8

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THE CARING ORTHOPTIST

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Abstract

This paper gives a general overview of counselling situations in an ophthalmological/orthoptic practice or hospital eye clinic. It suggests ways orthoptists may be able to handle these situations especially when confronted with a distressed or anxious client. Emphasis is placed on allowing clients to work through the crisis point through patience, empathy and good listing skills.

Key words: *Counselling, blindness, low vision.*

INTRODUCTION

In many instances, orthoptists are the first eye-care professionals with whom a client has contact within a private ophthalmological/orthoptic practice or hospital eye clinic. Consequently, orthoptists may find themselves in a position where many questions are directed at them or where the client is in an anxious or depressed state. How does the orthoptist handle these situations, particularly if the client has not specifically asked for any help but is obviously not coping?

Counselling is a process which is usually planned and has specific goals.[1] A counsellor is not necessarily a person who has been especially trained in the area of counselling but can simply be someone who is dealing with people and is in the position of offering advice. Orthoptists usually take on this role to some extent.

An orthoptist is sometimes still perceived in a different light from that of a medical practitioner. Accordingly, clients may direct more questions to the orthoptist than to the ophthalmologist because they feel more relaxed with him/her. In addition to this, when coming into contact with someone who obviously has some knowledge of eye conditions, the tendency for clients may be to immediately seek advice on the many questions that may have arisen since the eye condition first became known.

As it is recognised that each individual has needs that are unique, this paper does not attempt to discuss all the various counselling situations that may arise. Rather, it gives a general overview on how to handle common situations that the orthoptist may encounter. This will be done by considering the following questions:

Question 1

How do you recognise if a client does not fully understand the implications of the eye condition present and whether or not they are coping with the situation?

Question 2

How do you cope with the many questions asked by a client about the eye condition present?

Question 3

What do you do if you are confronted with a distressed person in the clinic?

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Question 4
Who do you go to for follow up help?

QUESTION 1
Being able to recognise body language is a very useful skill to have when attempting to gain some insight into what a client is thinking or feeling. For example, sitting on the edge of a chair "fidgeting", or not making eye contact with the examiner may indicate a nervous state, reflecting a fear of the unknown and a first time experience in an eye clinic. They may also be indicating that the client is not understanding all that is being said or is not coming to terms with the eye condition present.

The client's line of questioning can also provide hints as to their understanding of the eye condition. However, one must be careful not to interpret that someone is familiar with the medical facts, just because he is using ophthalmological terms such as "refractive error". They may have picked up the words during many visits to ophthalmologists but may never have had them fully explained.

When clients do not ask any questions this can also indicate a lack of understanding of the diagnosis. The client may have been frightened to ask questions in the past, thus creating a situation where he has not had any feedback on the implications or prognosis of the eye condition.

An appropriate way to handle the above situations is to encourage conversation with the client. This can be done by explaining each test that is performed or simply talking about topical events (should the time permit) to help "break the ice". This will allow the client to be more at ease and will let them know that the examiner cares about them as an individual and not just another ocular condition that has walked into the room. In a relaxed state the client is more likely to return the conversation and let you know where they stand.

The orthoptist should always find out what their exact role is in the clinic, determining with the ophthalmologist how much they can say to the client. Orthoptists should recognise that they are a professional and in a professional relationship with an ophthalmologist and should communicate as such. If the orthoptist's role is clearly defined in the first instance, including what extra things they can do (such as follow up phone calls), then a better working relationship with employer and client can be obtained.

At any time, the fact that a client is distressed should be immediately reported to the ophthalmologist. This will enable the client to be seen by the doctor as soon as possible and also prepare the doctor for a longer than normal consultation.

At the end of each busy day it is worthwhile for the orthoptist and ophthalmologist to talk to each other for a few minutes about any anxious clients or interesting cases they may have encountered during the day. This provides a supportive and learning environment for both and can prepare each for any future similar cases.

QUESTION 2
It is important to be a good listener and immediately answer any appropriate questions. If it is not possible to answer any of the client's questions fully it is not a good idea to attempt to answer them at all or give your opinion, especially if it relates to the prognosis of their eye condition or a particular factor of that condition that may have a number of reasons for its presence. Instead, the relevant questions should be written down and handed to the doctor. One should never be too proud to acknowledge that another person may be better qualified to answer their questions.

Clients feel more at ease if they are asked whether or not they have any questions or concerns about their eye condition. It is important that they are fully informed of the medical facts but the information should be given in such a way that others do not have to pick up the pieces.

An illustration of this is that of a 35 year old man who was told that he had retinitis pigmentosa and would eventually go blind. This was the only information given to him. Not knowing anything about the condition, on returning home from the doctor's surgery he

consulted a medical dictionary to learn more about his eye condition. To his great concern he found many other conditions and syndromes that can be associated with retinitis pigmentosa. Fearing the worst for himself and his family he became very anxious every time his children complained of a sore eye. Fortunately, in time, and after meeting others with the same condition, he became more aware of his condition and its implications for the future. If he had been properly counselled in the first instance, he could have been spared many anxious years.

When clients are given a visual acuity recording this should be fully explained. In most instances it is more valuable to inform the client of the functional implications of a certain degree of visual impairment. Advice should be individually tailored to his own unique situation, rather than spending much time in explaining what the figures represent. Unless one is working with acuity recordings on a regular basis, the notations are often difficult to fully comprehend in the context of every day situations.

It must be understood that one short session in a busy clinic is usually insufficient for the client to absorb all of the necessary information. Follow up appointments or telephone calls can be very useful, even if they are only designed to give the client a second opportunity to understand his eye condition in a more comprehensive way by asking additional questions that he may have forgotten to ask during the initial consultation. This is an area where I feel orthoptists can be used more, perhaps on days when the ophthalmologist is performing surgery.

QUESTION 3

The first thing to ascertain when encountering an anxious person in the clinic is the reason for his distress. Perhaps the client's agitation is because of a long wait to see the doctor, or he may have learnt that his eyesight will deteriorate to the point of blindness and has not accepted this circumstance. Or maybe he has just witnessed a bad car accident before arriving at the clinic and is in a state of shock. Again these factors can be exposed more readily if the client is made comfortable and is given time to relax and an opportunity to air his feelings.

When listening to the client it should be done with empathy. While it is important to project yourself into the client's problem, one must be careful not to overdo it. It is important to recognise a client's anxiety and it must be remembered that if a client is angry or sad it does not follow that they are depressed.

A useful technique is to mirror or clarify a feeling expressed by saying such things as:

"I guess you felt angry about that"

or

"That seems to have been very frustrating"

One certainly should not say such things as:

"There is nothing to worry about"

or

"Oh come on, everything is OK"

It would be more appropriate to say:

"Are you OK?
Is there something I can do?"

or

"do you want to talk about it or just sit there quietly"

Once the client becomes more relaxed it may be useful to ask him:

"Have you been to an ophthalmologist before?"

If not, you can explain the system and any tests you are about to administer. This will help to lessen the anxiety.

The environment a distressed person is placed in can prove to be a vital factor in helping him feel at ease to discuss his problem. Fundamental things such as a cup of coffee can be a practical way to help calm the situation. The orthoptist must present as being relaxed and try to normalise the client's anxiety. The presence of a box of tissues is one way of indicating to the client that he is not the first person to shed tears in the clinic.

QUESTION 4

As each client has his unique problems the decision as to where to go for follow-up help will be dependent on his individual needs. To prepare for all counselling situations, a clinic should always have a resource file listing professionals.

that clients can be referred to for extra assistance. This list should include such professionals as social workers, psychologists, family therapists or psychiatrists if the case is severe.

A list of agencies handling specific disabilities should also be left, such as the Royal Blind Society for blind and visually impaired clients.

Clients can often be referred to the local community health centre where additional information and resources may be available.

Some situations may be simple and easily solved in the clinic. After recognising the exact nature of the problem, follow up telephone calls or appointments, including a long consultation, may be all that is necessary to rectify things.

CONCLUSION

As can be seen by the above discussion, the essential ingredients of successful counselling are time, patience and empathy of how clients may feel. There are several ways in which professionals who do not have the opportunity for further training, may attempt to acquire the skills necessary for appropriate counselling. These will include gaining experience, teaching about the subject, listening to what people are saying whilst attempting to analyse why they may have said a certain thing, as well as talking to social workers about any anxious cases they have encountered.

The total management of clients should include provisions for their general well-being and opportunities for them to fully come to terms with their situation by giving them a complete explanation of the eye condition present. The orthoptist can help to achieve this by becoming a caring mediator between doctor and client.

ACKNOWLEDGEMENTS

I would like to sincerely thank Ms Merrianne Sinclair, social worker, for her advice when preparing this paper.

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INTRAOCULAR LENS CALCULATION: THE WAIKATO'S FIRST YEAR

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Abstract

Prior to cataract surgery, patients had keratometry readings and ocular axial length measurements performed. The required dioptric power of intraocular lens implant was calculated using this information. The post-operative refractions of 173 eyes were reviewed to determine the effectiveness of this procedure. Some inaccuracies were found. However, overall results were satisfactory. It was concluded that pre-operative intraocular lens calculation was a useful procedure.

Key words: *Cataract, keratometry, ocular axial length, refraction, spherical equivalent.*

INTRODUCTION

The use of intraocular lenses, as a treatment of aphakia, has become more widespread in recent years. This, in turn, has led to the development of methods of pre-operatively calculating the dioptric power of implant required for each eye. The equipment used for this comprises a keratometer, an ultrasound capable of measuring ocular axial length and a computer with suitable programme.

In February 1985 the Eye Department of Waikato Hospital obtained a new ultrasound unit and programmed computer. After a brief period of familiarisation, the orthoptist set about calculating intraocular lens strengths. This paper reviews the results after the first year of these calculations.

METHOD

Patients

The review includes all patients (173 eyes) who had pre-operative calculations performed by the orthoptist and whose follow-up notes were available to her. Unfortunately, a number of public hospital patients from outlying areas could not be included as, following surgery at Waikato Hospital, their post-operative care was transferred back to their regional hospital.

Equipment

A standard Topcon keratometer was used to take keratometry readings. Initially a Sonometrics DBR 310 ultrasound was used for axial length readings, until this was replaced by the biometry option of the Sonometrics Ocuscan 400. For both instruments the probe used housed a transducer resonant at 12.5 MHz. The computer used was a Texas Instruments Compact Computer 40 with the Binkhorst Intraocular Lens Power Calculation Programme.

Procedure

Patients had their keratometry reading carefully taken and noted. They were then transferred to the slit lamp and, after the installation of local anaesthetic drops, were instructed to keep their eyes still and widely open. The ultrasound A-scan probe was then lightly placed on the cornea and

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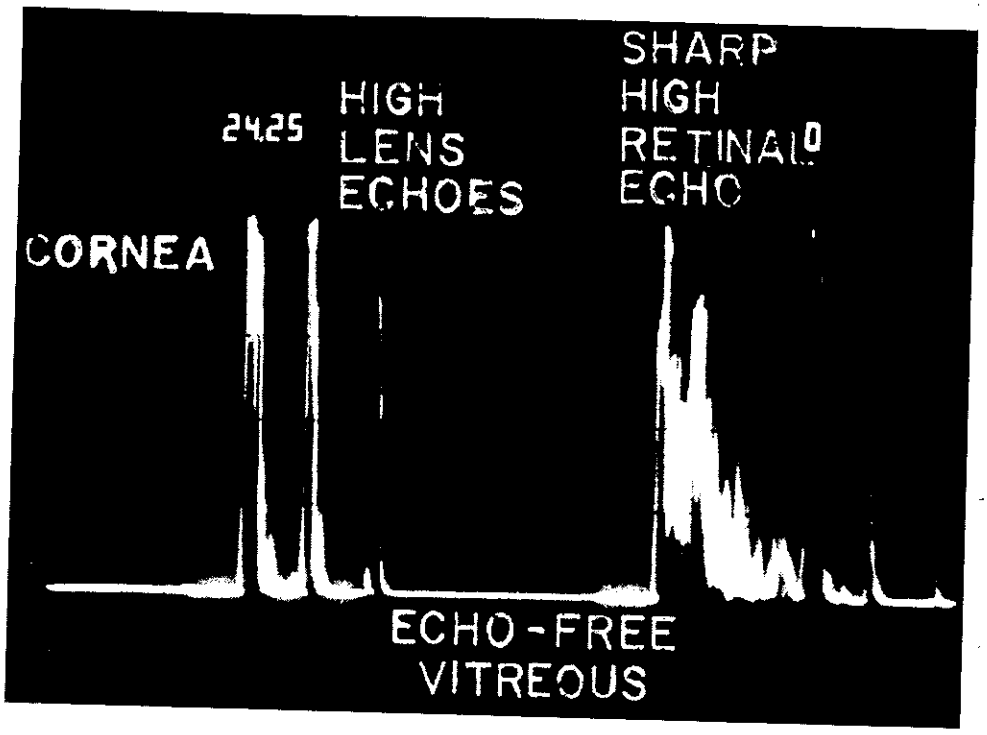

Figure 1: The echoes produced by a well aligned A-scan measuring the axial length.

manoeuvred until a satisfactory series of echoes was obtained (see Fig. 1). The axial length measurement was then noted.

Results were computed and, as suggested by Binkhorst,[1] the figures of 2.93 mm, for a vaulted anterior chamber lens, and 4.20 mm, for an angulated posterior chamber lens, were used as estimates of the post-operative cornea to implant distance.

In the case of aphakic patients having a secondary implant, the lack of lens echoes meant the ultrasound beam could not be aligned accurately. However, by using the keratometry readings and refraction, including back vertex distance, the axial length could be calculated.

RESULTS

This review covered 173 eyes measured between February 1985 and January 1986. Of these, three had poor vision post-operatively and were not prescribed glasses — one had optic atrophy, another an infection and the third a posterior staphyloma, which was not recognised during the A-scan. Subsequently, this condition was detected in another patient and, similarly, a previously undiagnosed retinal detachment was picked up on A-scan and confirmed by B-scan ultrasonography. Neither of these patients proceeded to surgery.

The implant power required was calculated to two decimal places but, as the lenses were manufactured in 0.50 dioptre increments, most calculations had to be rounded up or down. For the purposes of this review, a calculated strength with the decimal places between 0.25 and 0.74 were rounded to the half dioptre and between 0.75 and 0.24 to the whole dioptre. Often, however, the surgeons preferred to round up in order to leave the patient slightly myopic, rather than hypermetropic.

Figure 2 shows the strength of intraocular lens used plotted against the spherical equivalent of the final refraction of each of the 170 successful eyes. The different symbols indicate patients

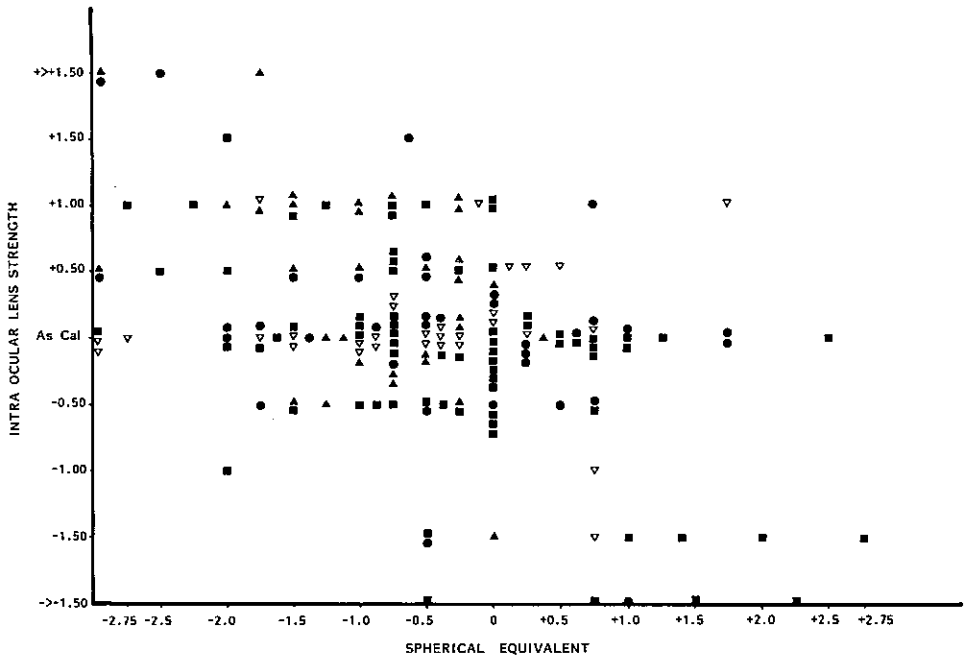

Figure 2: 170 cases showing the spherical equivalent of the post-operative refraction plotted against the strength of intraocular lens inserted.

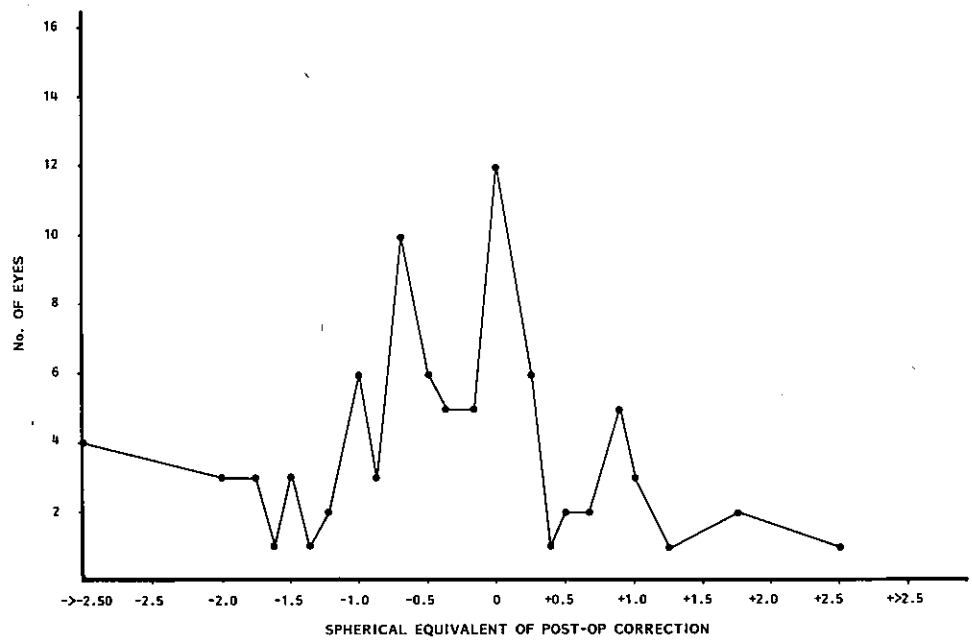

Figure 3: The refractive outcome of 87 eyes which had an intraocular lens of the calculated strength inserted.

under the care of each of the four Hamilton ophthalmologists. One hundred and eight eyes (63.5%) were given lenses as calculated or to the next strongest half dioptre and, of these, 59 (54.6%) had a post-operative refraction with the spherical equivalent of between 0 and −1.00 dioptres. Of the total 170 cases, 13 (7.6%) did not require glasses, but for 33 cases (19.4%) the post-operative refraction included a cylindrical correction equal to, or greater than, ±3.00 dioptres.

Figure 3 shows the post-operative correction of the 87 eyes which had an implant of calculated strength inserted. Ideally, all would have had a spherical equivalent of 0, but this was so in only 12 cases (13.8%). However, 56 (64.4%) had spherical equivalents of between −1.00 and +0.50 and 70 (90.8%) were between −2.00 and +1.00 dioptres. The worst result had a spherical equivalent of −3.50.

In 142 cases the final visual acuity was formally noted. Wearing the appropriate correction, 102 eyes achieved 6/6 or better and another 35 had between 6/9 and 6/12. Four eyes could only achieve 6/18 and one 6/24.

DISCUSSION

Within a short time of the advent of this new technique, many patients were being seen preoperatively. Early results were encouraging and the number of patients being measured rapidly increased until all those booked for surgery had intraocular lens calculation performed as a routine. As experience with the equipment and procedure increased, so did operator expertise — however, it would have been unrealistic to expect perfect technique. Thus, operator error was, no doubt, partly responsible for those results which were poor. Patient co-operation was another factor capable of influencing the reliability of results, as was the degree of cataract present. The more dense the cataract, the greater the difficulty in aligning the ultrasound lens echoes.

The surgeons occasionally chose to use an implant of different strength to that calculated, for example, to approximate the refraction of the other eye, but in other cases the substitution was unavoidable. This was due to the limited stock of lenses held and was particularly so when the calculated strength was unusually high or low. Figure 2 shows that, generally, when a stronger than calculated implant was used, the result was a myopic eye and the reverse was so if a weaker than calculated implant was inserted. This was the expected result and those eyes which fell outside this pattern were of particular concern. Similarly, those eyes at the extremes of the graph in Figure 3 indicate that the calculation was not sufficiently accurate.

Patient satisfaction with the outcome of their surgery was high, even in those rendered moderately myopic, as it allowed them to dispense with their glasses for some tasks.

CONCLUSION

Overall, the results were pleasing, with no very large post-operative errors and two patients having been spared fruitless surgery. The need for increased accuracy of measurements was shown in several cases, although the majority were able to obtain good vision with a relatively low post-operative correction. The calculation of intraocular lens strength appears to be a worthwhile procedure and one which, when performed accurately, is of considerable value to both surgeon and patient.

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VISUAL FIELDS IN RETINITIS PIGMENTOSA

LIN MULHALL, DOBA

Abstract

Retinitis Pigmentosa is an hereditary retinal dystrophy which is characterised by night blindness and visual field defects.

This paper describes the visual fields of twenty consecutive patients attending the Ocular Diagnostic Clinic of the Royal Victorian Eye and Ear Hospital. The fields have been classified on a scale from one to seven. The patients with the most severe field defects also tended to have the highest dark adaptation thresholds and extinguished electroretinograms. Those patients with the earliest age of onset of symptoms had the most severe field defects.

Partial ring scotomata showed sparing in the nasal or lower region, and when annular scotomata broke through to the periphery they did so in the upper part of the field.

It is anticipated that some types of Retinitis Pigmentosa may be treatable within ten to twenty years so it is important to identify patients and to gather data.

Key words: *Retinitis Pigmentosa, annular scotoma, dark adaptation, Goldmann perimetry, visual field, hereditary retinal dystrophy.*

Retinitis Pigmentosa (RP) can be defined as an hereditary retinal dystrophy which diffusely affects photoreceptors and pigment epithelium. It is characterised by its onset, (usually in adolescence), by night blindness, and by constriction of the visual fields.

Features include signs of retinal pigmentary changes, constriction of arterioles and optic atrophy. There is a steady progression of visual loss over the years, with macular problems usually developing at a later stage.

According to Krill[1] the classical field defect is an annular scotoma, which is nearly always present in early cases, located between 30° and 50° of fixation. It may not be a complete ring. It later spreads both towards the centre and peripherally, in severe cases leaving a temporal and central island of field, which is insufficient for orientation. The patient can be legally blind as a result of field loss, whilst still retaining reasonably good central vision. Ultimately the remaining field can be lost, the centre being the last to go. Generally, the earlier the presentation, the worse the prognosis, as in late onset RP the field loss is not so great.

It has been stated[2] that the prevalence of RP in Victoria may be as high as one in two thousand. Bunker et al[3] found a prevalence of one in four thousand seven hundred in Maine, U.S.A.

There are three different modes of inheritance:

(i) Autosomal recessive, which is the most common. An example of this group is Usher's syndrome, which consists of sensorineural deafness (usually congenital) and RP with onset in the teenage years.

(ii) Autosomal dominant, which is less common

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(iii) X linked recessive, which is the most severe, and the least common.

The aim of this paper is to introduce a classification system for the visual fields of RP patients, and to describe data on twenty patients with this condition.

SUBJECTS

A consecutive sample ($n = 20$) was taken over a three month period (3.4.86 to 3.7.86) of patients attending the Ocular Diagnostic Clinic of the Royal Victorian Eye and Ear Hospital, who had a definite diagnosis of RP and who were able to give a reliable visual field. Two eyes were excluded from the series due to additional pathologies.

The subjects' ages ranged from nine to 68 years, with a mean age of 43. There were 13 males and seven females. The age of onset ranged from less than 5 years to 56 years, with a mean age of 18.

Nine were diagnosed as definite and four as probable autosomal recessive type (with five cases of Ushers syndrome and one congenital amaurosis of Leber). There were four definite and three probable cases of autosomal dominant type. None were of the X linked recessive type.

Forty-five per cent of the eyes had visual acuity of 6/9 or better, 13% had 6/60 or worse.

All patients had a full ophthalmic examination including fundus examination, visual acuity, visual fields, electroretinography, dark adaptometry, and colour vision testing (using the Ishihara test).

The visual fields were tested using the Goldmann perimeter, usually using targets size I intensity 4, size III intensity 4 and size IV intensity 4, as recommended by Marmor et al.[4] The standard method was used with movement of the target from the periphery to the centre, and from non seeing to seeing areas.

Dark adaptometry was performed using the Goldmann/Weekers dark adaptometer, with the patient sitting in a totally dark room whilst their threshold sensitivity to light was measured at specific intervals.

RESULTS

To aid in the comparison and description of patients, the following classification devised by

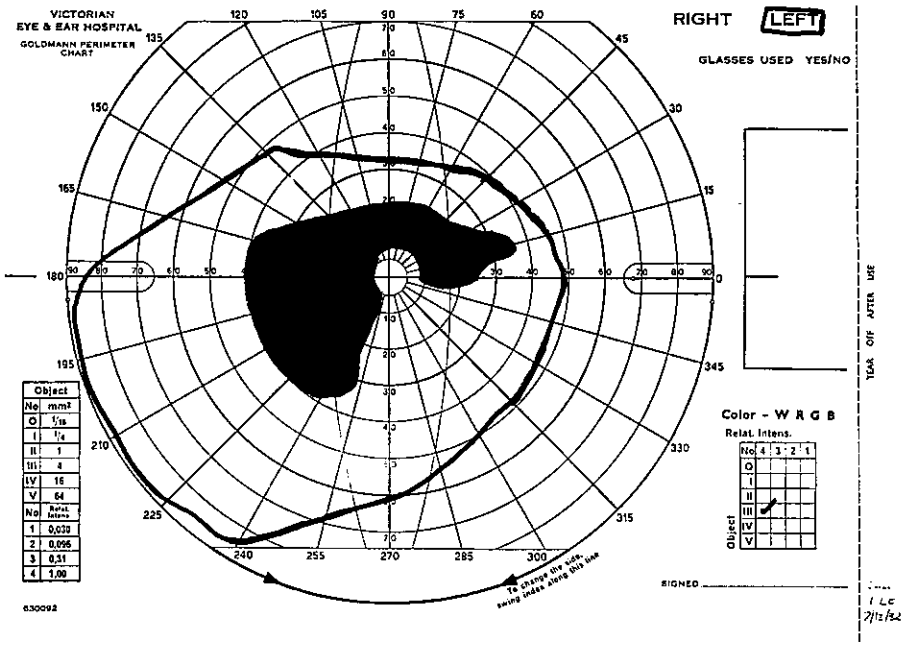

Figure 1: Example of Field Type 2 (partial ring scotoma).

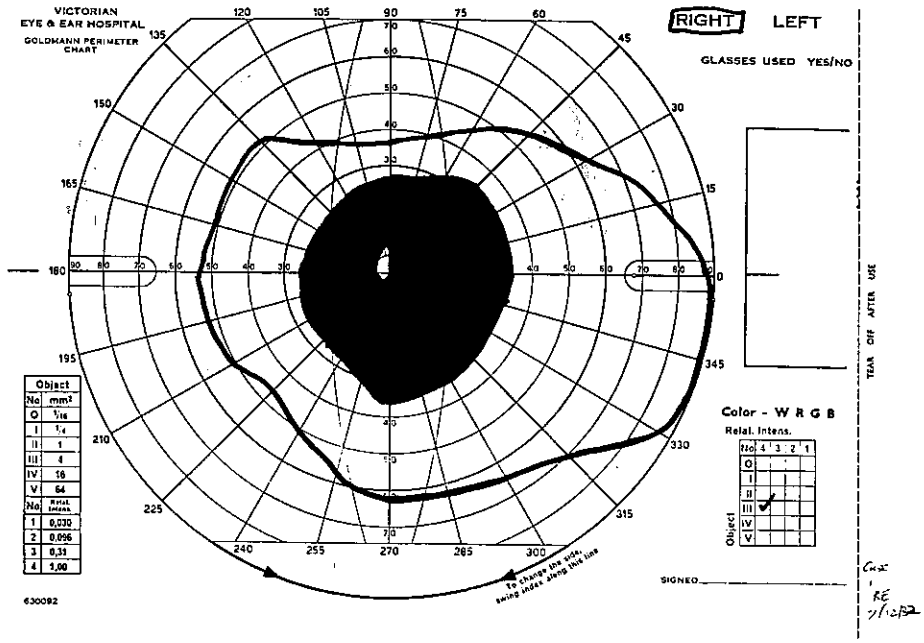

Figure 2: Example of Field Type 3 (complete ring scotoma).

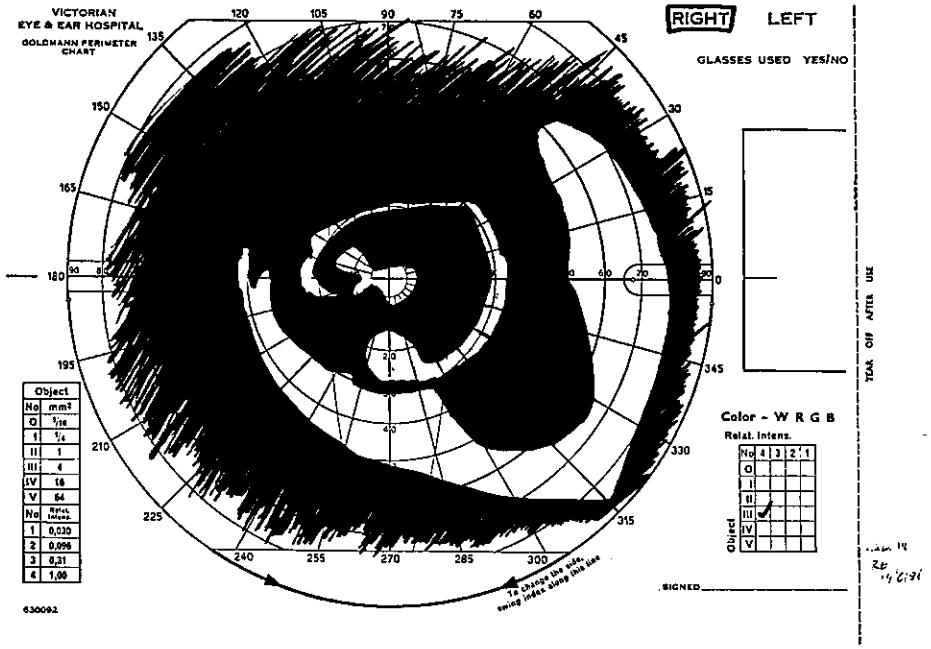

Figure 3: Example of Field Type 4 (ring scotoma with partial breakthrough to the periphery).

Dr H. MacLean of the Ocular Diagnostic Clinic was used. This classification uses the Goldmann size III intensity 4 target wherever possible. If a larger target is needed, the smallest possible is used.

Type 1. Full field.
Type 2. Partial ring scotoma. (Fig. 1.)
Type 3. Complete ring scotoma. (Fig. 2.)
Type 4. Ring scotoma with partial breakthrough to the periphery. (Fig. 3.)
Type 5. Complete breakthrough to the periphery, but with a radius of more than 30° in one or more sectors. (There were no eyes in this category in this series.)
Type 6. Constricted to a radius of less than 30° of fixation. (Fig. 4.)
Type 7. Constricted to a radius of less than 10° of fixation. (Fig. 5.)

Table 1 shows the incidence of patients in each of these categories.

TABLE 1
Showing Incidence of Each Field Type of the 38 Eyes Studied

Field type	1	2	3	4	5	6	7
Number in series	2	4	3	7	0	7	15

Electroretinography (ERG)

The ERG is a mass retinal response which is only affected if a large proportion of the retina is diseased or malfunctioning. None of the eyes in this study had a normal ERG, and, as would be expected, the eyes with the most severe field defects were more likely to have extinguished ERGs. The ERG was extinguished in 13 out of the 15 eyes with type 7 fields, six out of the 14 eyes with type 4 or 6 fields, and in only two out of the nine eyes with types 1 to 3 fields.

Dark Adaptation

A moderate correlation ($\rho + 0.46$) was shown to exist between the type of field and the dark adaptation threshold. Only one patient with type 1 fields and one with type 2 fields had dark adaptation thresholds within normal limits.

Onset

As the exact age of onset is often difficult to determine, for the purposes of this study it was regarded as five years if an adult stated that symptoms had been present all his life. If the age of later onset was unknown, but the adult stated that it had been present from childhood, then the onset was recorded as 10 years.

Comparison of 11 cases with onset before 15 years with five cases of onset after 30 years shows that those with early onset had a slightly greater proportion of extinguished ERGs, slightly higher dark adaptation thresholds, and poorer vision. Thirty-three per cent of early onset eyes had vision of 6/9 or better, whereas this vision was obtained in 67% of the late onset eyes. The cases with the earliest onset also tended to have the most severe field loss.

Duration

Although there was no particular relationship between severity of field defect and age, generally the longer the duration of the condition the more severe is the field defect. This becomes particularly apparent for those with onset after 30 years, when there is a strong correlation ($\rho + 0.83$). Some of the early onset cases reached type 6 or 7 fields in less than 10 years.

Residual Central Field

There were 11 eyes of eight patients with a central field of less than 5° radius, although in five of these some peripheral field could be demonstrated using a larger target. Patients in this group tended to be older, with a longer duration of symptoms, and visual acuity and colour vision were also worse than the group as a whole. There were also, proportionally, more males in this group.

Genetic Type

Of the 25 eyes of patients with autosomal recessive type, 17 (66%) had type 6 or 7 visual fields, whereas of the autosomal dominant type (13 eyes) only 5 (40%) had severe field loss. These two groups were of similar ages, and had similar ages of onset. ERGs and dark adaptation thresholds were also similar for the two groups.

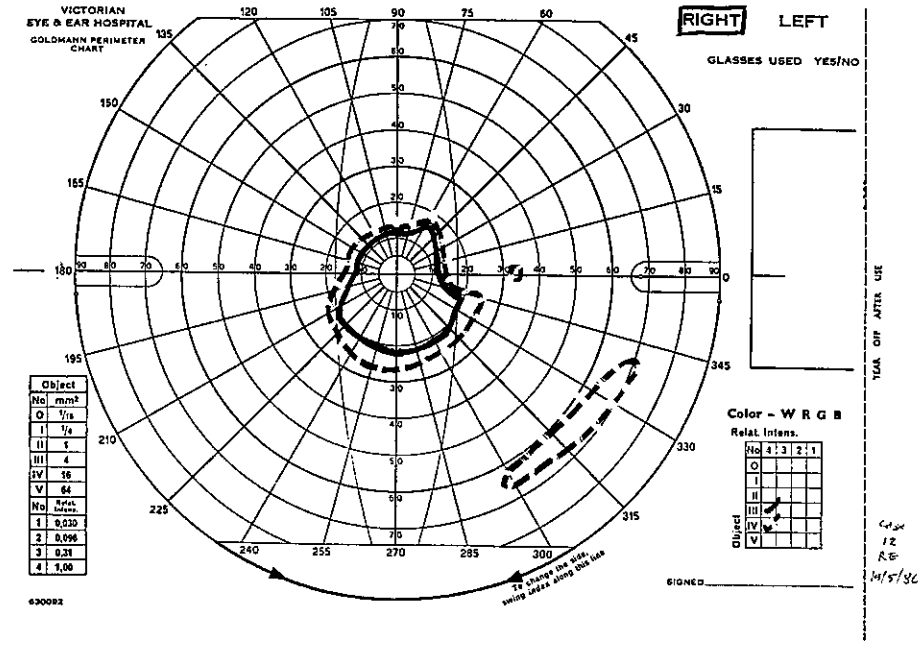

Figure 4: Example of Field Type 6 (field constricted to a radius of less than 30 of fixation).

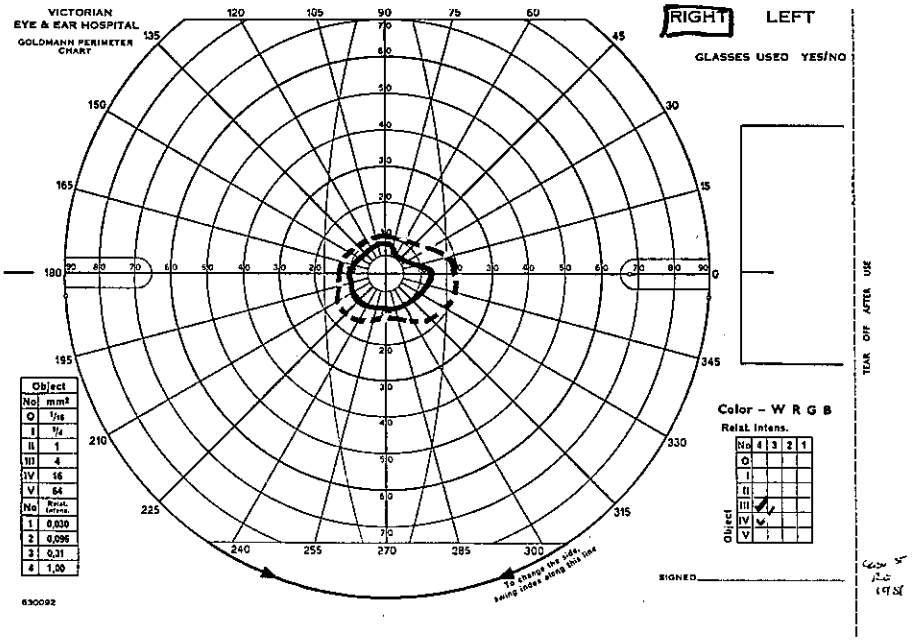

Figure 5: Example of Field Type 7 (field constricted to a radius of less than 10 of fixation).

DISCUSSION

In this series of thirty-eight eyes all cases of partial ring scotoma (type 2) had sparing of the nasal or lower nasal region; in all cases of annular scotoma with partial breakthrough to the periphery (type 4) the breakthrough was in the upper or upper and temporal part of the field.

Krill[1] states that the ring scotoma in RP usually occurs between 30° and 50° of fixation. In the present study it was not possible to specify the precise position of the initial field defect, because most were too advanced. At the time of this study seven eyes (of four patients) had partial or complete ring scotoma (type 2 or 3). Examination of the earlier fields of the five patients who had attended previously, provided a further five eyes (of three patients) with fields type two or three. So 12 eyes of seven patients are considered.

In these 12 eyes the inner boundary of the scotoma occurred between 2° and 5° in seven eyes, at 10° in three, at 15° in one and at 30° in one. The outer boundary occurred between 10° and 20° in four eyes, between 30° and 50° in seven, and at 70° in one. So seven out of 12 eyes had a scotoma with the outer boundary between 30° and 50°, and one more peripheral, but in all but one eye the inner boundary was nearer to fixation than 30°. This finding was surprising, it would be interesting to study patients at an earlier stage of the disease to discover whether most scotomata do start between 30° and 50° and extend centrally at a greater rate than peripherally.

According to Krill[1] a temporal island of field often remains as well as the centre. In this study, in all eyes which had small peripheral islands of field, these were located in temporal, lower temporal or lower region at about 70° from fixation and were usually approximately 10° wide.

All eyes had an area of field remaining in the centre. If the twenty-six eyes with the worst field defects are considered, 15 had only a central island of vision, four had a temporal arc of field between 60° and 80°, three had a lower temporal arc between 70° and 90° and four had a lower arc between 30° and 55°.

Although conditions such as congenital stationary night blindness, vitamin A deficiency and night myopia can cause difficulties with night vision, perimetrists should be alterted to the possibility that a patient with this symptom may have RP, and if so, peripheral fields are required. The upper, temporal and lower areas should be searched for scotomata between 15° and 50°.

Visual field testing is an important part of the examination of RP patients, and provides information to aid diagnosis and assessment of progress of the disease, and for assessment of eligibility for the blind pension. In addition, early diagnosis provides the opportunity for genetic and career counselling.

As a result of genetic research[5] it is possible that some forms of RP may be treatable within twenty years. With the possibility of treatment within the lifetime of some of the current patients, or their children, it is becoming increasingly important to maintain comprehensive records of these patients.

ACKNOWLEDGEMENTS

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3. Bunker et al. Prevalence of retinitis pigmentosa in Maine. Am J Ophthalmol 1984; 97: 357-365.
4. Marmor et al. Retinitis pigmentosa, a symposium on terminology and methods of examination. Ophthalmol 1983; 90: 126-131.
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ABSTRACTS OF STUDENTS PAPERS

N.S.W.

The following are abstracts of research papers by third year orthoptic students at Cumberland College of Health Sciences, N.S.W. Copies of particular papers of interest may be obtained by writing to:

The School of Orthoptics,
Cumberland College of Health Sciences,
P.O. Box 170,
Lidcombe, N.S.W. 2141. Tel. (02) 646 6444.

THE EFFECT OF HETEROPHORIA ON STEREOACUITY — **Colette McGee**

Fifty three normal subjects' stereoacuity was tested with the TNO test in the conventional manner (crossed disparity) and with the book inverted (uncrossed disparity). Thirty perceived a difference; these were mainly orthophoric and esophoric. Generally the esophorias were better with uncrossed disparity and the orthophorias with crossed disparity. Therefore, esophorias should have stereoacuity tested with both crossed and uncrossed disparity, particularly if reduced stereoacuity is found with conventional stereoacuity testing.

FIXATION — WHAT IS ECCENTRIC? — **Tonia Harrison**

Forty subjects with equal 6/5 acuity, no demonstrable squint and positive Four Dioptre test each eye, were examined by visuscope.

This study found two subjects (5%) did not appear to fixate on the foveal reflex in either eye, probably due to an abnormal foveal reflex.

This study concludes that there is a small number of people in the population who, due to an atypical foveal reflex, appear to have a slight degree of eccentric fixation combined with excellent vision and full stereoacuity.

THE EFFECT OF CEREBRO VASCULAR ACCIDENT ON CONTRAST SENSITIVITY — **Jacqueline Lawes**

Twenty five patients who had suffered a cerebro vascular accident (CVA), were compared with 25 normal subjects matched for age, to determine if the CVA had any detrimental effects on the detection of contrast sensitivity.

All patients were tested with Arden gratings, enabling various grades of contrast sensitivity to be tested over a range of spatial frequencies.

It was found that contrast sensitivity was affected by CVA. A general reduction in contrast sensitivity across the wide range of spatial frequencies was found, with the greatest difference occurring in the higher spatial frequencies. Snellens visual acuity remained normal in all subjects.

The reasons for this decreased sensitivity are unknown, but may be due to selective effects of the CVA on channels in the visual pathway tuned to high spatial frequency.

THE INCIDENCE OF OCULAR ANOMALIES IN METHADONE MAINTAINED SUBJECTS — **Robert Sparkes**

Twenty one subjects on a methadone maintenance programme were orthoptically screened to determine whether they had specific visual problems.

Reduced convergence and accommodation were particularly evident and were possibly the cause of any aesthenopic symptoms.

Visual field defects were also evident. This is possibly due to the toxic effects many drugs have with long term usage, or from a slow response which may be attributed to the methadone.

These defects may inhibit orthoptic treatment of an affected subject. The importance of thus recognising such factors when carrying out treatment is stressed.

CEREBROVASCULAR ACCIDENT AND IT'S EFFECTS ON STEREOACUITY LEVELS — **Judith Huntley**

This study was undertaken to compare stereoacuity levels as measured with the Titmus Stereo Test in subjects who had suffered a cerebrovascular accident, with normal stereoacuity levels, and also to determine whether there is any significant association with reduced stereoacuity and the lesioned hemisphere.

One hundred and one case histories of cerebrovascular patients from Lidcombe Hospital were studied to extract relevant information. Equal numbers of patients had suffered right versus left hemisphere lesions.

Results showed no significant reduction in stereoacuity levels when cerebrovascular accident patients were compared to normal individuals of the same age. There was also no significant difference in stereoacuity levels between subjects with lesions of the right or left hemisphere.

VISUAL IMPROVEMENT IN THE CORTICALLY BLIND CHILD — **Lynda Hodgson**

At the Child and Adolescent Services Unit of the Royal Blind Society, 22 patients with "pure" cortical blindness were selected from an original sample of 63, to determine whether or not visual improvement

occurs. The children were cortically blind from birth and had no optic nerve or retinal pathology. They ranged in age from six months to six years eleven months.

All but five of the sample improved. Of these, 12 did so within their first year, five within the second year, and none afterwards. Children tended to improve most significantly between three to six months of age. In three children improvement was reported within one month.

Present theories as to why this improvement occurs are discussed, along with other features of this condition and difficulties involved with the diagnosis and assessment of these children.

COLOUR VISION ANOMALIES: IMPLICATIONS FOR THE ELDERLY DIABETIC — **Anne Stuart**

The Farnsworth Munsell 100 Hue Test and the City University Colour Vision Test were used to assess the colour vision of twenty five diabetic patients between 60 and 80 years of age. The diabetics showed a significantly higher Farnsworth Munsell 100 Hue Score than the published age normals, the majority demonstrating a generalised loss.

The diabetics' performance of various colour dependent blood and urine glucose tests was assessed in good and bad lighting. Although 56% of the group showed errors in good light, the performance did not appear to be affected by age or colour vision.

NEAR POINT OF ACCOMMODATION AND DIRECTION OF GAZE — **Gregory Hayes**

This study investigates the effect of the position of gaze on the near point of accommodation. Sixty two normals were tested and it was found that there was a significant improvement in near point of accommodation in depression and in the reading position, but no significant improvement on adduction compared to abduction. This finding only partially supports previous studies, but has implications for orthoptic treatment for accommodative linked disorders.

SACCADIC EYE MOVEMENTS AND CEREBRAL PALSY — **Carolyn Harris**

In cerebral palsy, the neuromotor pathways are damaged, possibly also affecting saccadic movements. As precise saccadic movements are required for accurate fixation, it is suggested that poor vision in those with cerebral palsy may be due in part to defects of the saccadic pathways.

Visual acuity and saccades were tested in 50 cerebral palsied children. Twenty six subjects had normal vision and eight had reduced vision, unable to be attributed to any pathological cause. The remaining 16 subjects had either a peripheral ocular motility problem that influenced their saccadic result or reduced visual acuity due to a known cause.

A majority of cerebral palsied children were found to have abnormal saccades (62%), while only a minority had normal saccades (38%).

A significant relationship was found between abnormal vision of less than $\frac{6}{9}$ and normal saccades that were not caused by a peripheral defect in the motor pathway.

THE EFFECT OF AGE ON ABSOLUTE AND RELATIVE FUSION RANGES — **Stacey Cannington**

Absolute and relative fusional amplitudes are important in the treatment of symptom producing heterophoria, convergence insufficiency and intermittent squint.

To investigate the effect of age on these net total and fusional reserves, three different emmetropic and orthoptically sound age groups were compared. Norms were established in a previous study of 92 young school children (Group 1). Group 2 and 3 were examined and consisted of 50 young adults and 20 presbyopes wearing their first near correction.

It was established that age plays a significant role in affecting these amplitudes. From childhood to adulthood absolute convergent (33 cm and 6 m) and divergent (6 m) amplitudes increased, as did positive relative fusion (33 cm and 6 m) and negative relative fusion (6 m). The absolute divergent and negative relative fusional amplitudes decreased slightly at 33 cm.

From adulthood to the onset of presbyopia, absolute convergence at 33 cm and absolute divergence at 6 m decreased slightly. For the remainder of the net total and fusional reserves no significant differences were found.

VISUAL ACUITY: A QUANTITATIVE ASSESSMENT USING CAKE DECORATIONS — **Katherine Mack, Katrina Bourne**

The aim of this study was to provide reliable estimates of visual acuity levels for certain colour combinations of cake decorations and backgrounds. Nineteen normal adult subjects were artificially blurred to varying visual acuity levels by means of graded filters. Coloured cake decorations of 1 mm and 3 mm in diameter were presented to the subjects against five different backgrounds. A time limit was imposed upon the subjects all of whom were asked to point to whatever they could see for each visual acuity level on each background. The testing distance and room illumination were kept constant. The results allowed guidelines for the estimation of visual acuity levels to be established. It is suggested that clinicians note these guidelines when using the cake decoration test.

SQUINT IN HYPERACTIVE CHILDREN — **Gabrielle Moreland**

A study of 15 hyperactive children from the Child Development Unit of the Royal Alexandra Hospital for Children was carried out to determine whether there is a higher incidence of squint among these children and if it is of a specific type. The types of deviations found differed significantly from the norm. It is suggested that this is a result of a modulatory defect of the brain which also causes the range and variability of behavioural and physical disorders associated with the hyperactive syndrome.

CAN AN ABNORMAL HEAD POSTURE COMPENSATE FOR A VISUAL FIELD DEFECT? — **Andrew Jolly**

Visual field (VF) defects are generally accepted as a possible cause of an abnormal head posture (AHP). However, there is little information to be found that explains this occurrence. This study sets out to clinically observe whether there are patients who do overcome any of their lost field of vision by adopting an AHP.

Seven patients with both VF defect (all homonymous hemianopia), and an AHP were selected. When the head was straight, none of the patients could respond when any part of their lost area was stimulated. However, while the AHP was present, four patients could respond when some parts of this 'lost' area were stimulated. These four patients had slight and intermittent head turns towards the field loss.

Three theories which may have some relevance to this occurrence or its underlying mechanism are discussed.

THE DEVELOPMENT OF OPTOKINETIC NYSTAGMUS IN INFANTS BORN PREMATURELY — **Despina Marias**

The development of both symmetrical horizontal and vertical optokinetic nystagmus (OKN) was compared between 23 normal, full term and nine premature infants.

A delay in development was found for both horizontal and vertical OKN in the premature infants. However, when compared with conceptional age, this delay was slightly present only for the development of vertical OKN.

SUPPRESSION AND THE LEES SCREEN — **Karen Anderson**

Four constant esotropic subjects and four constant exotropic subjects were examined using the Lees Screen, to assess the site of retinal suppression in relation to the direction and size of the deviation.

It was found that the suppression area extended from the fovea to the contralateral image point and two to five prism dioptres beyond this point in all cases.

CHARACTERISTICS OF NASAL TEMPORAL OPTOKINETIC NYSTAGMUS IN DISSOCIATED VERTICAL DEVIATION — **Mary Stylianou**

Monocular horizontal optokinetic nystagmus has been reported to be asymmetrical in both infants younger than nineteen weeks of age and in those with dissociated vertical deviation (DVD). The eyes respond to nasalward image movement but not to a temporally moving image. One theory is that if a child develops a strabismus before this critical period of development, then this symmetry may never develop. The first aim of this study was to determine what proportion DVD patients first squinted prior to the development of symmetrical OKN. Thirty three patients' files were studied to find the age of squint onset. Twenty one (63.6%) of these patients developed the turn before normal development of the nasal temporal (N/T) OKN response, while 12 (36.4%) acquired the squint after 19 weeks.

The second aim of this paper was to determine the component at fault in the OKN response. Thirty one eyes that demonstrated DVD characteristic movements were examined, with the saccadic and smooth pursuit components tested separately. Twenty one (63.3%) showed abnormal pursuit movements temporally and 87.1% normal saccadic movement nasally. This suggests that the abnormal component of N/T OKN in DVD patients is pursuit.

AMBLYOPIA — DOES IT AFFECT THE TITMUS RESULT? — **Maria Paterakis**

Three groups of amblyopes was studied to determine whether amblyopia affects the Titmus steroacuity test.

The amblyopes consisted of 60 anisometropes, 43 intermittent squints and 42 microsquints. All had uniocular or binocular amblyopia. The subjects were required to have visual acuity of at least 6/9 in their better eye.

The results of this study show that as the difference in visual acuity becomes greater between the two eyes, the stereoacuity of the patient decreases. The optimum standard of stereoacuity is reached when the visual acuity is eqal in both eyes or if the difference between the two eyes is one or two lines. These results were consistent in all three groups.

Thus, in order for one to have a high standard of stereoacuity, one must have equal vision or no more than two lines of difference between the two eyes.

The following is an abstract of a research paper by the third year orthoptics' students at Lincoln Institute of Health Sciences, Victoria.

Copies of the paper may be obtained by writing to
School of Orthoptics,
Lincoln Institute of Health Sciences,
625 Swanston Street,
Carlton, Victoria 3053.

COMPARISON OF THREE STEREOACUITY TESTS — FRISBY, TITMUS AND T.N.O. — **Lisa Biggs, Elizabeth Crommy, Helen Gawler, Susan Hardy, Aysil Hudaverdi, Trudy Irwin, Fiona Jesse, Donna Miller, Tanya Phillips, Maria Stamos, Kathyrie Strassnick, Julie White**

A study comparing the stereoacuity results of the Frisby, Titmus and T.N.O. stereo tests was performed on students attending the Carlton campus, Lincoln Institute of Health Sciences. Using the Kendalls co-efficient of Concordance Statistical tests it was found that each subject obtained a similar result in each test.

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Obituary

DR D. C. WILSON

The Orthoptic community in Perth were deeply saddened when on August 9, 1986 Dr D. C. Wilson passed away.

Chris had been Ophthalmologist on the Orthoptic Board for many years, and he was very highly respected.

He had always been active in Orthoptic management in W.A. and on a national basis. He was always supportive and gave maximum encouragement to new Orthoptists to maintain their high professional standards. He was not only highly respected because of his professional acumen but he was also a friend, and as such he will be sorely missed.

All Orthoptists join me in extending to Mrs Wilson and his family our deepest sympathy.

Megan Lewis

NOTES FOR CONTRIBUTORS

(See Vancouver Agreement*)

Papers, case histories and other communications for publication should be sent to The Editor, Central Secretariat, Suite 5, 428 St Kilda Rd, Melbourne, Victoria 3004. Manuscripts with 1 high quality copy should be typewritten in double spacing with wide margins on one side only of quarto or A4 paper.

Begin with a title page giving a title which should be concise, followed by author(s) name, degrees or qualifications, name of place or institution where work was conducted and an address for communication.

On a separate page give a brief abstract of no more than 150 words, giving specific facts, findings, conclusions or opinions. Key words (about 5) or short phrases to assist indexers in cross-indexing the article, should follow the abstract on the same sheet. Key words should not duplicate words in the title but should be mentioned in the abstract.

The text follows, each page being numbered in sequence in the top right hand corner preceded by the author(s) name.

Authors are requested not to underline any part of their work.

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Examples of correct style:

Journals

Young RW. Visual cells and the concept of renewal. Invest Ophthalmol 1976; 15 No. 9: 700-711.

Books

Cornsweet TN. Visual perception. 2nd ed. New York: Academic Press Inc, 1971: 6-26.

Photographs should be kept to the minimum. They, and diagrams, tracings, etc., should be in clear black and white with good contrast. Lettering and figures on diagrams should be clear enough to stand reduction; Letraset or Chartpak Helvetica 8 to 12 pt. is recommended.

Illustrations and **tables** should be marked lightly in pencil on the back with an arrow indicating the top, its number (Fig. 1 or Table 1, etc.) and author(s) name. Care should be taken not to bend them in any way.

Legends or captions for illustrations should be typed with arabic numerals corresponding to the illustrations.

Closing date. Papers for publication in the Australian Orthoptic Journal may be submitted to the Editor at any time up to **1st OCTOBER** in the year prior to the next edition. This date may be extended on request to 31st October, providing an abstract of the proposed paper is received by the Editor before 1st October.

It is a condition of acceptance of any article that only original material is submitted unless suitable acknowledgement has been made in the references and that such articles have not been previously published nor are under consideration for publication elsewhere.

* Refer Med J Aust 1982; Dec 11/25, or apply to the Editor for a copy.