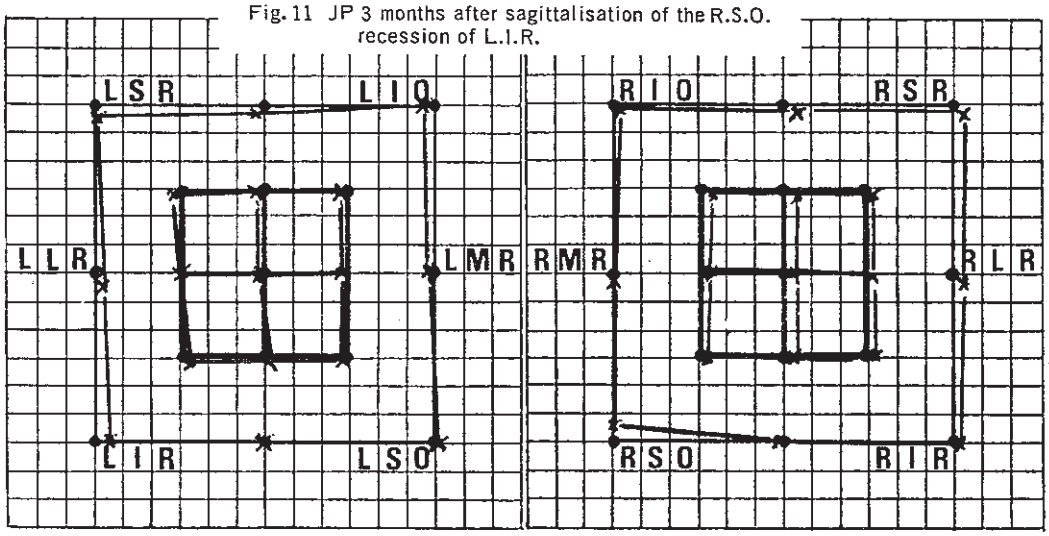
2 weeks after operation, the hypotropia measured 5Δ, and single vision was obtained in the primary position. JP was instructed to try to control the diplopia and continued to practice exercises at home.

3 months after surgery the Hess Chart (Fig.11) was almost perfect, there was orthophoria for distance and a small exophoria for near, with binocular single vision in all directions of gaze.

Fig. 11 JP 3 months after sagittalisation of the R.S.O. recession of L.I.R.



The simple procedure of advancing the paresed muscle appears to be the treatment of choice in partial IV nerve palsy. It may well be the treatment of choice for all oblique muscle weakness.

Acknowledgment

I would like to take the opportunity of thanking Professor Hollows, Dr. Paul Beaumont and the orthoptists at the Prince of Wales Hospital for their help and encouragement in preparing this paper.

ALTERNATING SURSUMDUCTION: THREE CASE HISTORIES

Diana Craig

Presented in Adelaide, April 1974.

Alternating sursumduction presents the most fascinating and challenging problems that orthoptists encounter. When it is the only disorder, it is no obstacle to binocular vision; it is evident on dissociation only, disappearing when both eyes are uncovered. But it commonly occurs together with other motor anomalies, the most usual being latent nystagmus and the A phenomenon (Lang 1968). Signs of alternating sursumduction (=ASD) and the other anomalies present may be marked or very slight , often affecting one eye more than the other. The picture may be further complicated by refractive error and temperament.

Our problem is to distinguish the signs of ASD and nystagmus, which we cannot treat, from secondary effects which we may be able to reduce by orthoptics and accompanying disorders which may be corrected by glasses or surgery. The following cases illustrate some of the phenomena encountered, and methods of examination which are sometimes helpful.

CASE 1

Ms.SD. aged 3½, wore +1.50 sph. each eye, (Retinoscopy +3.25 +4.25 each eye). Intermittent left or alternating squint had been noticed from birth. Glasses and atropine (R eye) had helped but the squint was becoming more frequent.

22.8.73 Cover test: left convergent squint for near and distance
Chin down
V eso, marked overaction of both inferior obliques
Vision: 6/12 (single E) each eye
Angle with glasses : +20°, occasionally less. Fusion +10° to +40°.
without glasses: +25°, variable
At end of visit eyes momentarily appeared straight.
Part time occlusion advised

19.9.73 Small LCS/ACS with alternating sursumduction on accommodation
Vision 6/12 each eye. Turns head to reduce nystagmus when either eye occluded

28.11.73 Intermittent convergent squint with ASD and nystagmus
Angle with glasses +25°
without glasses +35°
Fusion: two pictures seen, but eyes converge steadily, following pictures from +25° to +50°
Father convinced that eyes are often straight, undertakes to give exercises

19.2.74 Intermittent ACS with ASD. SD can usually straighten eyes with encouragement.
Vision : right eye 6/6, left eye 6/6 partly, (single E)
Angle with glasses: −5°%, found subjectively, correct objectively;
without glasses: +5° to + 20°
Vergence with SMP slides: −5° to + 50°;
normal correspondence (lion in cage) −5° to + 20° approx.,
lack of NRC (lion out, on contralateral side of cage) +20° to +50°
Fusion: steady with both controls −5° to + 20° approx.
continued steady vergence, pictures separate, to +50°

Latent nystagmus was not noted on the first visit, probably because of the excessive convergence, nor on the last visit when the child had grown accustomed to us. Latent nystagmus in congenital squint is usually more noticeable in distant fixation, and when the subject is excited or apprehensive. It tends to be less in convergence, and children so afflicted are particularly likely to converge violently (possibly to reduce the nystagmus) under stress, in the presence of strangers. A single visit might, and sometimes does lead the examiner to a mistaken diagnosis of constant squint requiring surgery. In this case, fortunately, eyes were occasionally straight on the first visit.

The vertical deviation was attributed on the first visit to overacting inferior oblique muscles, and to alternating sursumduction subsequently.
ASD in association with marked convergent squint in an unco-operative child often leads to mistaken diagnosis of superior oblique overaction, because of the upturn of the convergent eye. This has applied in some cases in which underaction of inferior obliques or inferior rectus muscle, with A phenomenon was later demonstrable.

The measurements given show no vertical deviations, although if this paper had at that time been planned, such measurements could have been provided. In any case of alternating sursumduction, different measurements are obtainable according to the procedure adopted. The typical updrift occurs

1) when the eye is not fixating
2) when its illumination is reduced

Covering one eye tends to "send it up" on both these counts. Other factors including accommodation, attention, and degree of amblyopia, appear to affect it also, but unpredictably.

In measurement of the angle of deviation, a choice must usually be made. Does one need to learn the best, or the worst ? To estimate the potential for binocular single vision, or to record the presence and extent of the sursumduction? A four-year-old's attention soon flags.

Once SD was keeping her eyes relatively straight, ASD was readily seen by the upward deviations under cover. Our aim in measurement was to discover the resting angle when the eyes were unembarassed. On her fourth visit when asked to put the lion in the cage, she chose angles at which corneal reflections appeared symmetrical. If, with targets still in this position, one switched off either light, the other eye made no movement other than a slight nystagmoid one, so one could accept her choice objectively as correct. As both lights are on at the moment of choice, our notation for such a measurement is "angle, lights on". Had we used the common "light off" procedure of objective measurement, beginning by switching off the light of the non-fixing eye, alternate hyperphoric measurements would have been obtained.

The readiness to fixate binocularly was extraordinary. Even with glasses at the synoptophore, SD would occasionally converge one eye noticeably. If one moved the target to confront the converging eye, and then returned it to the zero position, the deviating eye readily followed while the other continued to fixate its own target. Both converging and diverging movements could be obtained in this way, with slow or quite quick movements of the target. One had the impression that each eye was maintaining fixation independently.

Subjectively, SD reported that the lion remained in the cage, or in the case of fusion slides, that there was one picture only with correct stereopsis, for angles up to about $+20^{\circ}$. During convergence to greater angles the pictures appeared to separate, and remained apart heteronymously. I have noted the same surprising phenomenon in at least two other cases.

The response to training, or perhaps one should say to gentle encouragement at home, was impressive. Single binocular vision to cover test, improved visual acuity, normal retinal correspondence, and a small divergent angle on the synoptophore were gained in the interval between the last two visits. That is, latent normal function had become manifest as the child gained confidence and learnt what was required in the test situation.

CASE II

MC, aged 6, wore no glasses. Intermittent alternating convergent squint and ASD were noticed soon after birth, Atropine occlusion had been given at 10 months for a constant left convergent squint. There had been operations at 2½ years (RMR recession, RLR resection) and at 4 years (LMR recession, RIO myectomy)

Further surgery for a conspicuous left hypertropia was under consideration when she was referred to us for investigation.

We found a left esotropia of 16^{Δ} for distance and 2^{Δ} for near, with 15^{Δ} hypertropia. Left fixation was well held, with similar degrees of R esotropia, and 2^{Δ} R hypotropia These measurements refer to the deviations normally manifest; the appropriate prism was placed before the uncovered deviating eye, then checked by covering the fixing eye. Under cover, the left eye drifted further up, and the right eye became hyperphoric.

Vision right eye 6/9, left eye 6/12

Synoptophore angles: right fixing $+ 15^{\circ}$, L/R 10^{Δ} } objective measurements under
left fixing $+ 17^{\circ}$, L/R 2^{Δ} } "lights on" conditions

Subjectively the state of correspondence was uncertain, because of variability in horizontal and vertical angles. No fusion was demonstrable.

First inspection of ocular movements gave an impression of marked left inferior oblique overaction (see Figures 1a and 1c) with upshoot of the left eye in dextroversion and eyes in approximate alignment in laevoversion. But if one watched the left eye carefully while a target was moved slowly from right to left, a wave-like or rolling motion was seen, the left hypertropia increasing steadily (Fig. 1b) until well beyond the midline, then subsiding rather suddenly. A cover test with eyes in laevoversion showed that in fact the left eye had now taken up fixation, with the right eye deviation slightly inwards and down. If one held a screen before the left eye to ensure right fixation in laevoversion, one could see, looking behind the screen, that the left hypertropia reached a maximum in full abduction.

Figure 1. Diagram of appearance as MC follows target right to left.

(a) Fixing right eye in dextroversion

(b) Fixing right eye in primary position.

(c) Fixing left eye in dextroversion

Showing changing deviations when following a target from right to left.

The investigation of muscle palsy

To investigate the signs of muscle palsy, if any, in a case of ASD, the effects on vertical deviations of fixation changes must be temporarily eliminated. This may be done by screening one eye from the target, and watching the screened eye while the fixing eye watches a moving target. It may also, in many cases, be done using the Hess screen.

One's first attempts to obtain a Hess chart from an ASD patient are apt to be discouraging. The patient complains that he cannot see both together; they keep moving away. The secret is to insist that he watches the fixed light or target while moving the other towards it. An alert child of six or even five years can do it, providing one reiterates the fixation instructions at every step. He soon appreciates the way steady monocular fixation prevents disconcerting changes in the apparent relative position of targets.

Figure 2

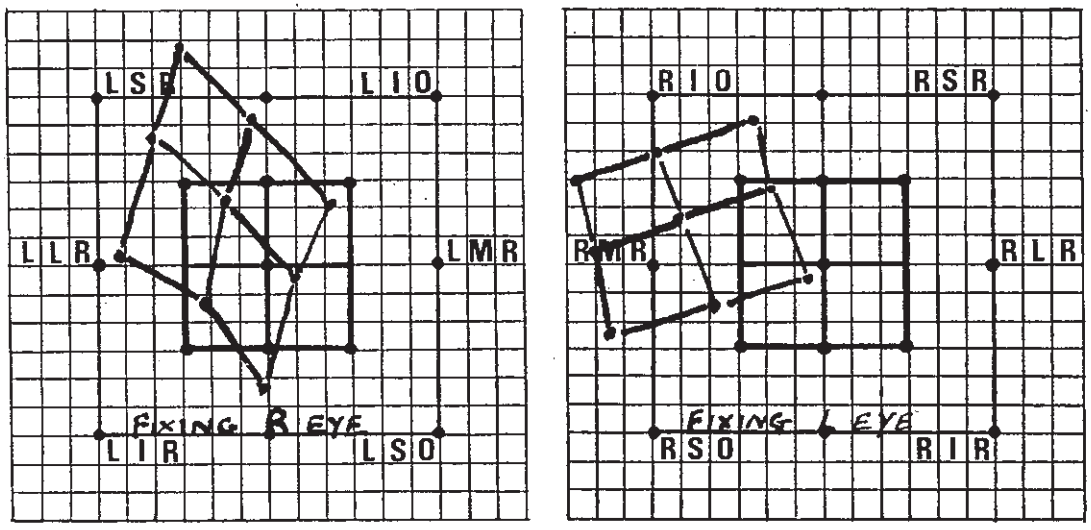
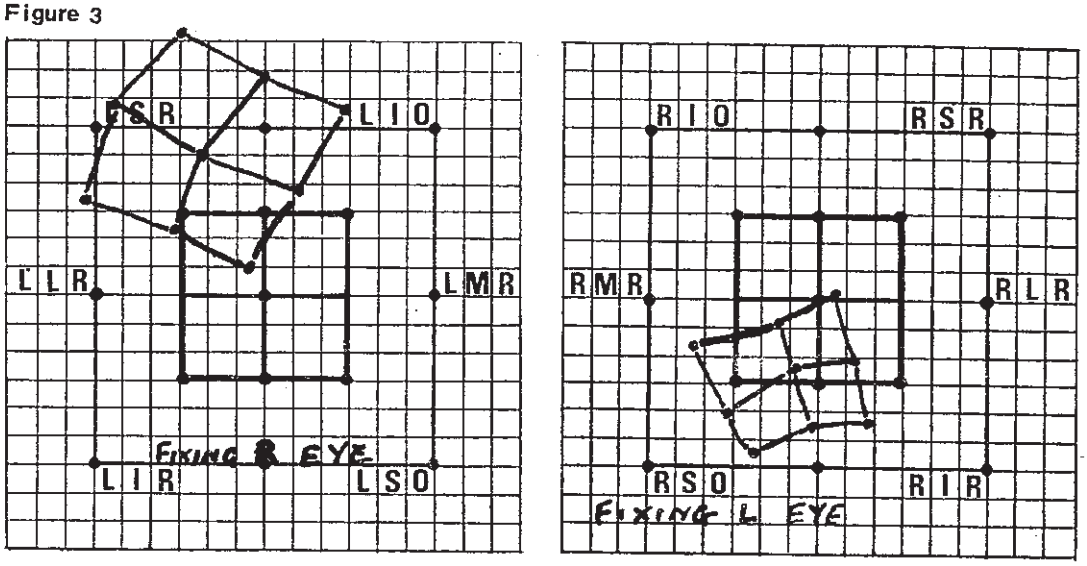


Figure 2 shows the first record obtained in this way from MC. Because of the updrift of the non-fixing eye, the right and left eye charts are not complementary in the normal way. The record suggests that each eye is hyperphoric, so that one cannot determine whether elevators or depressors are at fault. But it does reveal a marked A pattern, with hyperophorias which increase in abduction, indicating relative underactions of inferior obliques or inferior recti. The chart also suggests an esophoria with left eye fixing, and exophoria with the right eye fixing. I cannot explain this.

The second chart (Fig.3) was obtained some weeks later, when the right eye had been atropinised to reduce left suppression. It is included as another of the unexpected findings in ASD cases. Possibly the dilated pupil, admitting more light to the right retina, caused the greater left hyper/right hypo-phorias. But why has the right chart shrunk? There must be information here which as yet we cannot unravel.

Figure 3



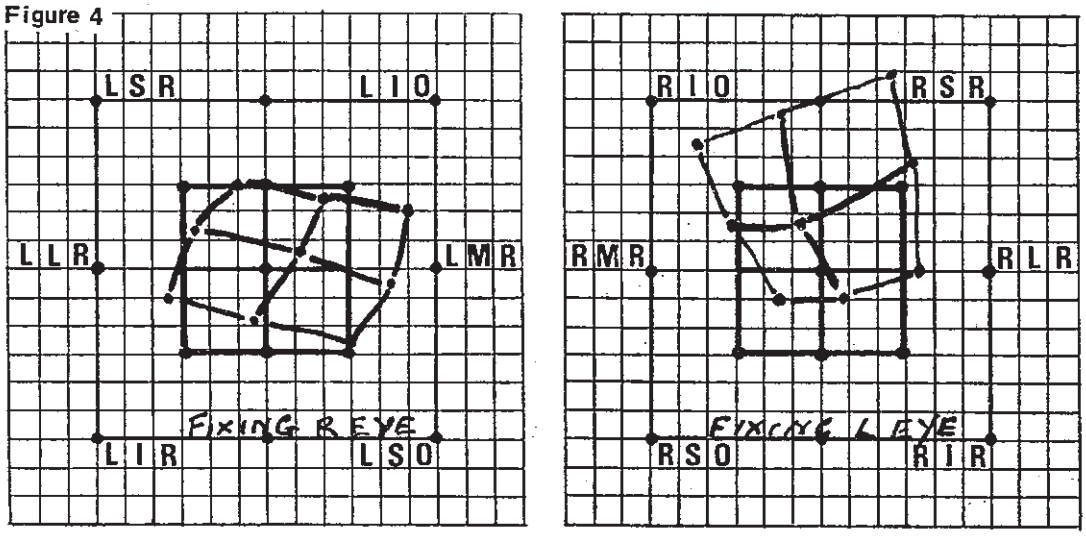
Retention of binocular single vision

In spite of her muscle anomalies, MC used binocular single vision for reading. When we gave her a book, she held it a little to the right, tilted her head a little to the left, kept her chin up, and was able to read N8, if not smaller letters, with both eyes fixing.

CASE III

Ms. JF. had shown a right or alternating convergent squint from birth
RMR recession, RLR resection aged 2
LMR recession aged 8
Orthoptic exercises from 7½ to 8½ years.
She came to Melbourne aged 9 years, when we found on cover test
at 6m.: right hypertropia/small LDS : each eye up under cover
at 1/3m: right convergent squint,

Figure 4



There was a marked A pattern of movement, with esotropia in elevation, exotropia in depression, hypertropia of each eye in abduction. Synoptophore angles, obtained subjectively and checked objectively, were

with right eye in primary position: $+5^{\circ}$

with left eye in primary position: $+5^{\circ}$ R/L 3

with much alternating suppression. Fusion was doubtful, not surprisingly in view of the great variation in vertical and horizontal angles for different directions of gaze.

Nevertheless, when JF was asked to demonstrate the exercises which Miss Kirby had taught her, she turned her head a little to the right, tilted it left a fraction, and followed a pencil with steady binocular fixation from 33 cm to about 10 cm, maintaining physiological diplopia all the while.

The Hess Chart (Fig.4) agrees with the observed pattern of ocular movements and is similar to Case 2, but without the gross asymmetry.

Comment

These cases serve to show that alternating sursumduction is no bar to binocular single vision. The potential for good or useful binocular single vision is far better retained in ASD cases than in any others of birth onset and complex muscle anomalies.

Unless one is forewarned, it would be easy to misdiagnose such cases. As regards objective signs, a marked intermittent convergent squint, apparently purposive to reduce nystagmus or vertical deviation, often suggests a constant convergent squint on early visits; and the alternating vertical movement might wrongly be interpreted as bilateral or unilateral inferior oblique overaction (This does not imply that constant convergent squint and/or inferior oblique overaction are never associated with ASD) Subjectively, difficulty in superimposing targets, due to alternating vertical deviation, may be misinterpreted as loss of correspondence.

These problems may be solved by caution in long-term management, and by particular techniques of investigation using careful direction of the patient in fixation with one eye or the other or both.

In addition, bizarre behaviour occurs from time to time, such as vergence movements in pursuit of SMP slides, or changes in vertical deviations on Hess charts after monocular instillation of atropine. These (who knows) may be clues by which, when carefully collected and collated, the aetiology of ASD may ultimately be unravelled.

Acknowledgment

I am grateful to Drs. G. Morlet, K. Lidgett and F. Billson for allowing me to use the case histories recorded here.

REFERENCE:

Lang, J., *First International Congress of Ophthalmology*, 231

CASE HISTORY : HEADACHES

J. Fitzsimmons

Presented in Sydney, April 1975.

Michael A, aged 12 years, first attended the Outpatients Department of the Sydney Eye Hospital complaining of blurred vision in his left eye, and of headaches after school. On referral to the Orthoptic Clinic he was found to have a convergence insufficiency; one month later, on his third visit, he was discharged as symptom free.

Michael returned twelve months later, again complaining of headaches. His convergence was fair, his accommodation somewhat below normal. A refraction showed that no glasses were necessary. Treatment was again attempted. Michael's convergence and accommodation improved steadily. His responses to all orthoptic tests were soon satisfactory, but his headaches persisted without improvement, and were now always in the morning.