ANDERSON-KESTENBAUM OPERATION FOR ASYMMETRICAL GAZE NYSTAGMUS*

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SINCE Kestenbaum (1953) and Anderson (1953) independently recommended a surgical solution to the problem of a certain type of fixation nystagmus, little information has been published on the operative results, except in the last 2 years (Friede, 1956; Bietti and Bagolini, 1960; Sousa, 1955; Pierse, 1959; Krüger, 1960; Nicolato, 1960; Focosi and Guzzinati, 1960). This may be due to the infrequency of such cases or, more probably, to a general reluctance to undertake such an unusual procedure.

We have become interested in the last 2 years in the treatment of this form of nystagmus, and have performed ten bilateral eye-rotating operations according to the methods of Anderson and Kestenbaum. In a further twenty cases prismatic correction was applied† either because the criteria of surgery were not present or because the patients' parents seemed to be content with the results gained by prisms.

In some cases fixation nystagmus lessens or even disappears in one particular direction of the gaze—the neutral zone or position of relative rest in which, in general, the visual acuity is best. Thus a patient with this disorder, in order to obtain his best vision, tends to develop a compensatory head posture of non-paralytic origin and turns, tilts, or twists his head so that his eyes are rotated into the neutral zone. The rest position may develop in various directions and at various angles, including the tertiary gaze positions.

The head is turned in the opposite direction, often with added tilting, so as to rotate the eyes to the required position. Generally this "ocular torticollis" is present when the eyes are looking into the distance and ceases, as a rule, when fixing on a near target—presumably on account of the increased tension of the medial recti.

Although the neutral zone has long been known to exist, due attention has not been paid to the therapeutic possibilities implied in it. Despite the fact that the real causes of eccentric gaze nystagmus are not yet fully understood, the condition itself may be improved symptomatically.

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† Of these twenty patients, seventeen were males and three females. All were children except one man aged 22. Seven prisms base left, six base right, one base-out, one base-up, and five resultant prisms (four base-down and right, one base-down and left) were prescribed and worn.

I. Conservative Procedures

(1) **Metzger Prism Method.**—In order to create the best visual conditions, Metzger applied suitably-placed prisms which shift the ocular images toward the rest position, thus lessening the compensatory head turn. He reported four cases favourably influenced in this way (Metzger, 1950). We adopted his method for twenty patients (see footnote). In one-third of them visual acuity improved by one or two rows of the Snellen test-types, and the rest felt subjective relief. While wearing glasses, the head-tilting decreased considerably in some cases, but to a less extent in others.

(2) **Cüppers-Sévrin After-image Method.**—This procedure is based on the after-image treatment of squint-amblyopia (Cüppers and Sévrin, 1956). According to Cüppers and Sévrin, patients with fixation nystagmus perceive the after-image to be at a standstill. So by having the patient superimpose the image of a real object, *e.g.* of a letter, upon the after-image, the fixational mechanism can be developed and the nystagmic amblyopia ameliorated. Treatment based on this theory has not been undertaken at our Clinic.

II. Surgical Treatment

Principle of and Indications for Surgery.—If the rest position is extremely lateral, prisms do not sufficiently influence the head posture. Experience has shown that prisms above the strength of 12° for each eye are not well tolerated, besides being unpleasantly conspicuous. Since head-tilting is not only a matter of personal appearance, but affects the whole deportment of a growing child, the more effective surgical solution should be chosen.

The theory underlying the Anderson-Kestenbaum operation is that in eccentric nystagmus the position of balance between the opposing muscles can be gained only by conjugate deviation. Hence, if the muscles which bring the eyes into that position of balance are weakened surgically and the counteracting muscles are strengthened, the impulse for conjugate deviation will rotate the eyes to or near the mid-position. Thus surgery has to shift the eyes into the direction opposite to the rest position, *i.e.* towards the side of the greater oscillation, which usually coincides with the direction of head-turn and of the quick component of the nystagmus. For example, if the patient looks to the left and the head is turned to the right, the right-rotators (right lateral rectus and left medial rectus) should be strengthened and/or the left-rotators (right medial rectus and left lateral rectus) weakened. The operation is designed to relieve the patient of the compensatory head turn.

The utmost care is needed in dealing with the more intricate cases, in which the head turn does not correspond to the rest position observed by examination of the eye-movements. Here, fixation nystagmus is lessened, in all probability by a reflex action, by contraction of the neck muscles. In some cases the patient turns his head from side to side to see more accurately. Guidance is offered by Cüppers and Sévrin; they propose that the eyes be

brought surgically into the position where after-image oscillation is largest for that is the place of the least nystagmus. It is known that the apparent motion of real objects is in inverse ratio to the oscillation of the after-image (Cüppers and Sévrin, 1956).

In recommending surgery we have always kept to this course: having determined the area of least nystagmus or of rest, we find out whether it corresponds to the head position and whether this head position agrees with that of the peak visual acuity taken uniocularly as well as binocularly (in cases of super-added latent nystagmus taken only binocularly). Then the same procedure is repeated while the patient is wearing appropriate prisms. If all the above findings agree, prismatic spectacles will be prescribed for a trial of several weeks. If the trial glasses turn out to be beneficial (at least to some extent), then operation will be suggested.

Discussion of Ten Cases Operated On (Table, overleaf).—Seven patients were boys and three were girls, and all were aged between 5 and 11 years. The congenital nystagmus was associated with convergent strabismus in three boys and one girl. Head-tilting had usually been noticed by the parents when the children were 1 to 2 years old. Birth was normal in seven cases, rapid in one, artificially induced in another, and in the last case the newborn child had apoplexy. One patient's maternal grandmother is known to have had nystagmus, and another family included two cases of strabismus.

Significant refractive errors were observed in six cases: hypermetropic astigmatism of 2 to 3 dioptres in two cases, myopic astigmatism of the same degree in two (one with strabismus), anisometropic myopia with 6 dioptres difference in one, and myopic hypermetropic anisometropia in one (with strabismus). The fundi were normal except in one child who had no foveal reflex.

A lateral rotating operation was performed on six patients (Cases 1 to 6), and the head turn improved greatly in all. Before operation, two patients had turned the head to the side only (Cases 1 and 2); the others showed an upward or downward head tilt in addition (elevation in Case 3, depression in Cases 4, 5, and 6). The vertical head tilt was practically eliminated by horizontal surgery alone in three (Cases 4, 5, and 6) and considerably reduced in one (Case 3), whereas the head tilting remained unaltered. In Case 7 the horizontal operation was combined with weakening of the inferior oblique on both sides. In Case 8, some 6 months after the horizontal intervention, the inferior rectus muscles had to be weakened bilaterally, so as to elevate the eyes. In Cases 9 and 10 only vertical surgery was undertaken. Owing to the elevation, the backward head tilt was greatly diminished in both cases and an almost normal head position was obtained by a base-up prism-pair of 10° and 6° respectively.

As a rule, in the surgical treatment of nystagmus, we adhere to the principle that recession of the medial rectus should not exceed 3 mm. Moreover, if possible, it is advisable to avoid the weakening of this muscle in order to

TABLE
PARTICULARS

Case No.	Age (yrs)	Rest Position of Eyes	Direction of Head Turn	Head Tilt	Squint	Type of Operation	No. of Muscles Operated
1	7	Right	Left (Fig. 1a)	None	None	<i>Left Rotation:</i> Resection left lateral and right medial Recession left medial and right lateral	4
2	5	Left	Right	None	None	<i>Right Rotation:</i> Resection right lateral and left medial Recession right medial and left lateral	4
3	11	About 30° left, slightly down	Right	Slight elevation	None	<i>Right Rotation:</i> Resection right lateral and left medial Recession left lateral	3
4	9	Extreme right	Extreme left	Slight depression	None	<i>Left Rotation:</i> Resection left lateral and right medial Recession right lateral	3
5	11	Left	Right	Slight depression	Alternating esotropia 12° far 20° near	<i>Right Rotation and Squint Operation:</i> Resection right lateral Recession right medial and left lateral	3
6	5	About 20° right	Left	Slight depression	25° left esotropia	<i>Left Rotation and Squint Operation:</i> Resection left lateral Recession left medial and right lateral	3
7	6	Right and slightly up	Left	Slight depression and towards right shoulder	None	<i>I. Left Rotation:</i> Resection left lateral Recession left medial and right lateral <i>II. Slight Down Rotation:</i> Myotomy both inferior obliques	I:3 II:2
8	9	Extreme left and slightly down	Extreme right	Elevation and towards shoulder	20° left esotropia	<i>I. Right Rotation and Squint Operation:</i> Resection right lateral and left medial Recession right medial and left lateral <i>II. Elevation:</i> Recession both inferior recti	1:4 II:2
9	6	Downwards and slightly right	Slight left	Marked elevation and towards right shoulder	No deviation but left eccentric fixation	<i>I. Elevation:</i> Recession both inferior recti. Intrasheath tenotomy both superior obliques <i>II. Resection both superior recti and both inferior obliques</i>	1:4 II:4
10	7	Downwards and to the left	Right (Fig. 2a)	Marked elevation (Fig. 2a)	None	<i>Elevation:</i> Resection both superior recti Recession both inferior recti	4

OF TEN CASES

Stages	Visual Acuity		Grade of Binocular Vision		Result			
	Pre-op.	Post-op.	Pre-op.	Post-op.	Post-operative Heterophoria	Immediate Effect on Head Position	Follow-up (mths)	Head Position at Current Check-up
One	With correction 5/6 5/6	Same	III	III	2° Esophoria	Straight	9	Straight (Fig. 1b)
One	With correction 5/10 5/10	Same	III	III	Orthophoria	Nearly straight	8	Relapse 4 mths postoperatively Head turned to the right again
One	5/5 5/5	Same	III	III	2° Esophoria L/R 1 ^Δ	No head-turn Slight elevation	3	Straight with 6-6° prisms base-up
One	5/5 5/6	Same	III	III	4° Exophoria	Straight	12	Straight
One	With correction 5/10 5/10	5/8 5/8	—	II? Suppression tendency	3° Esophoria	Just noticeable depression	20	Same
One	With correction 5/25 5/35	5/15 5/25	—	III	2° Esophoria	Just noticeable head-turn to left	23	Same
Two	5/7 5/7	Same	II	III	3° Exophoria R/L 1.5 ^Δ	No perceivable depression	6	Same
Two	With correction 5/10 5/25	Same	—	—	3-4° Left esotropia	Tilt to left shoulder Slight elevation Head-turn to left!	24	Same, but just noticeable turn to right again
Two	5/7 Finger counting at 2m.	Same	—	—	—	Slight elevation	22	Nearly straight with prisms 10-10° base-up
One	With correction 5/7 5/7	Same	III	III	2-4° Esophoria	Slight elevation Tilt to right shoulder	12	Same (Fig. 2b)

prevent post-operative convergence insufficiency. We prefer to strengthen the lateral muscle of the same side.

On the other eye, where the lateral rectus has to be weakened, the intervention may be more extensive, but naturally, the new insertion must not be placed behind the equator.

The eyes can be rotated sideways by surgery on only *one* pair of the contralateral synergists. However, we have preferred to operate on three muscles at least and in four cases out of the six this proved to be satisfactory. If possible, we made the two resections first (*e.g.* right lateral, left medial), and their immediate effect dictated the extent of further measures.

The outcome of the operation in Cases 1 and 10 is shown in Figs 1 and 2.

FIG. 1 (a).—Case 1 before operation, showing marked head turn to the left. The position of ocular rest is looking to the right.

FIG. 1 (b).—Case 1 after operation, showing head kept straight by surgical rotation of the eyes to the left.

FIG. (2a)

FIG. 2 (a).—Case 10 before operation, showing head turned slightly to the right and tilted well backwards.

FIG. 2 (b).—Case 10 after operation, showing eyes elevated by surgery of the four vertical recti. The patient is wearing prisms base-up.

FIG. (2b)

The visual acuity improved slightly in two cases, and remained unchanged in the others. Five patients had binocular vision before operation and this was maintained. In one patient the pre-operative facultative binocular vision became complete (Case 7). Two amblyopic squinters (Cases 8, and 9)

failed to develop binocular vision, and a third (non-amblyopic) who had had esotropia of 20° (Case 5) attained an unstable fusion faculty. Case 6, also a former strabismic subject, developed binocular vision of the 3rd grade.

The immediate outcome was satisfactory in all patients. The follow-up ranged over a period of 3 to 24 months for the various cases, with an average of 9 to 10 months. In Case 2 a slight relapse occurred 4 months or so after surgery, and this boy again turns his head to the right. Case 8 is of special interest as the patient took up a slight head turn opposite to the pre-operative head posture for 3 months after the operation, and the area of least nystagmus shifted over accordingly. Since then negligible head-turning into the original direction has developed, with the rest position near the mid-line. The patient reads test-types at a distance with slight compensatory head jerks.

Discussion

Surgical intervention in ten cases of asymmetrical (eccentric) fixation nystagmus with ocular torticollis produced encouraging results.

We resorted at first to surgery for patients suffering from nystagmus associated with strabismus, since we were not certain that the intervention might not impair binocular vision. Further experience told us that if no mistake had been made in the planning and extent of the operation, the strongly developed fusional mechanism preserved binocular vision. Apart from the two amblyopic strabismic subjects, the horizontal heterophoria after operation ranged from -2° to $+4^\circ$ in the various cases, and the maximum of latent vertical deviation was as small as 1.5° .

Like other authors, we favour the Kestenbaum-Anderson operation, and stress the importance of careful preliminary examination in selecting patients who will benefit from the treatment. The standard rules of muscle surgery for strabismus hold good for the amount of intervention.

Summary

The possible treatment of asymmetrical (or eccentric) fixation nystagmus is reviewed. The results in a series of ten patients operated on confirm previous reports of the good effect of properly-indicated surgery on head position, visual acuity, and binocular vision.

REFERENCES

- ANDERSON, J. R. (1953). *Brit. J. Ophthalm.*, **37**, 267.
 BIETTI, G. B., and BAGOLINI, B. (1960). *Ann. thé.*, **11**, 269.
 CÜPPERS, C., and SÉVRIN, G. (1956). *Bull. Soc. franç. Ophtal.*, **69**, 359.
 FOCOSI, M., and GUZZINATI, G. C. (1960). *Ann. Ottal.*, **86**, 109.
 FRIEDE, R. (1956). *Klin. Mbl. Augenheilk.*, **128**, 451.
 KESTENBAUM, A. (1953). *Bull. Soc. Ophtal. Fr.*, **69**, 599.
 KRÜGER, K. A. (1960). *Klin. Mbl. Augenheilk.*, **136**, 477.
 METZGER, E. L. (1950). *Amer. J. Ophthalm.*, **33**, 1796.
 NICOLATO, V. (1960). *Arch. Ottal.*, **64**, 30.
 PIERSE, D. (1959). *Brit. J. Ophthalm.*, **43**, 230.
 SOUSA, M. (1955). *Arq. port. Oftal.*, **7**, 52.