SCIENTIFIC CORRESPONDENCE

Modified Anderson procedure for correcting abnormal mixed head position in nystagmus

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Background/aim: Treatment of nystagmus is controversial mainly in cases where it is combined with abnormal head position. This study was carried out to demonstrate that patients with abnormal head position in all three axes associated with nystagmus show improvement in the torsional and vertical components if only horizontal factors are addressed by surgical weakening of the horizontal muscles.
Methods: 21 patients with horizontal nystagmus and abnormal head position were studied. All had an abnormal head position in all three axes with a predominant head turn. In all cases a modified Anderson procedure was performed—that is, 2 mm retroequatorial recessions of the horizontal yoke rectus muscles responsible for the blockage position, plus corrective surgery for strabismus when needed.
Results: The three components of the abnormal head position were improved with surgery of horizontal yoke rectus muscles only (p=0.001).
Conclusion: Large recessions of the horizontal yoke rectus muscles in nystagmus with blockage position, when the head turn predominates over the vertical and torsional components, are effective in diminishing the abnormal head position on all three axes.

The three objectives in the surgical treatment of patients with nystagmus are: (1) to diminish the amplitude and frequency of nystagmus movements, (2) to transfer the nystagmus blockage position from an extreme position to a frontal one, in order to improve abnormal head position, and (3) to correct strabismus when it is present.

Initial description of treating congenital nystagmus was reported by Metzger,[1] who prescribed spectacles with prism for four patients with nystagmus. The prisms were placed with the vertex pointed to the area with minimal nystagmus or neutral zone, thus obtaining an improvement in the abnormal head position.

In 1953, Kestenbaum[2] modified the abnormal head position, recommending recession of the yoke muscles responsible for the slow phase of nystagmus and resection of their antagonists. He suggested surgery in two stages: first in one eye and, after a period of stabilisation, in the second eye. He also suggested performing the same quantity of surgery for both weakening and reinforcement procedures.

Anderson[3] stated that the horizontal yoke rectus muscles, responsible for the slow phase of nystagmus, have greater tone than their antagonists and may cause the abnormal head position. He suggested that weakening them is the correct operation. On the other hand, Goto[4] in 1954, showed by electromyography that the muscles responsible for the fast phase of nystagmus were hypotonic and recommended they should be reinforced. Parks[5] made modifications in the Kestenbaum technique and proposed that to symmetrise the horizontal ductions of the two eyes surgery should be a 5 mm recession of the medial rectus and a 8 mm resection of the lateral rectus for the eye in adduction, and 6 mm resection of the medial rectus and a 7 mm recession of the lateral rectus of the fellow eye. This became known as the classic measurements for the Kestenbaum procedure. Other authors modified these measurements increasing the amount of surgery because the classic measurement failed to fully correct the abnormal head position. Subsequent reports by many authors appear on the classic plus additional amounts of surgery, such as classic plus 40% or classic plus 60%, which have improved the results.

The first report of surgery for a vertical bilateral nystagmus was presented by Pierse[6] on two patients with chin up or chin down position. Superior oblique and inferior rectus weakening surgery was performed, obtaining improvement of the abnormal head position and visual acuity in the primary position. Berger and Del'Aquila,[7] in a case with chin elevation and head turn, performed recession of the inferior rectus muscle, and in a second procedure, weakening of the horizontal rectus muscles. Focosi and Guzzinati[8] described a patient with blockage position in supraversion in which they performed a 5 mm resection of both inferior rectus muscles. Harada and Ito[9] proposed a technique based on the different torsion action of the superior oblique muscle fibres. The fibres responsible for the torsion action are the anterior ones. If the nystagmus movement manifests a predominance of incyclorotating action they suggested weakening the superior obliques, or if there was a predominance of excycloduction action they suggest a reinforcement procedure. Prieto-Diaz and Souza-Dias[10] treated the torsion component by operating on either the superior or inferior oblique muscles.

Limón de Brown and Corvera-Berbadelli[11] corrected the horizontal, vertical, and torsional components of the abnormal head position by simultaneously weakening procedures on both the horizontal and vertical muscles.

Since 1981 surgeons at the ophthalmology department at Hospital General de Mexico have performed a modified Anderson procedure in every case of nystagmus with blockage zone with or without associated strabismus. Most of the patients had combined abnormal head positions in the three axes with predominance of the horizontal component. Nevertheless, all patients received weakening surgery on only the horizontal muscles. It became apparent that these horizontal muscle procedures alone improved the vertical and torsional components of abnormal head position.

PATIENTS AND METHOD

All patients with nystagmus treated in the ophthalmology department at Hospital General de México, between September 1990 and July 1999, were studied.

Patients presenting with horizontal nystagmus with a neutral zone and abnormal head position in all three axes with predominance of head turn in the vertical axis with or without strabismus, were included in the study.

Patients with congenital pendular nystagmus, nystagmus secondary to organic lesions such as albinism, macular scars,

Table 1 Summary of changes in abnormal head position

			Preoperative (degrees)			Postoperative (degrees)		
Patient	Sex	Age	Turn	Tilt	Chin	Turn	Tilt	Chin
1	M	9	40L	20L	15E	10L	0	0
2	M	7	40R	15L	10E	10L*	0	5E
3	M	8	40R	10R	20D	15L*	5R	0
4	M	8	45L	20L	15E	10R*	10L	0
5	M	7	40L	20L	15E	15L	10L	0
6	M	9	40L	15L	10D	10L	0	5D
7	F	5	35R	10L	10E	0	0	0
8	M	2	45R	10L	20D	0	0	0
9	M	9	40L	20L	20E	0	0	5E
10	M	1	40L	30L	10D	15L	30L	10D
11	M	6	35L	15R	15D	0	0	0
12	F	7	40R	15L	10D	10R	0	0
13	F	8	35R	10L	10D	15R	0	0
14	M	19	40R	10L	10E	10R	5L	5E
15	M	27	35L	12L	10E	10R*	0	0
16	M	11	40L	20R	10E	0	0	0
17	M	11	35L	10R	20E	15R*	0	0
18	F	5	40R	20L	10E	10R	10L	5E
19	M	6	35L	10R	10D	0	0	0
20	M	9	40L	10R	15D	25L	0	0
21	M	6	40L	10R	10D	10L	0	0
							p=0.01	

R = right, L = left, E = elevation, D = depression.
*Overcorrected patients.

neurological disorders, and vertical associated strabismus were excluded.

Each patient initially had a thorough ophthalmological examination, including a dilated fundus examination. The clinical characteristics of nystagmus were noted. The abnormal head position and all three possible components of the abnormal head position were analysed. These included, in the vertical axis, the head turn to the left or the right; in the sagittal axis the head tilt to the left or right shoulder; and in the horizontal axis chin depression or elevation. The abnormal head position was measured in degrees while the patient was examined with both eyes open and fixating at 6 metres. The visual acuity was measured with both eyes open, using Snellen optotypes at 6 metres in primary position and in the preferred compensatory position.

In each case, only horizontal surgery using a modified Anderson procedure was performed: a 2 mm retroequatorial recession of the muscles responsible for the compensatory head position and additional surgery for strabismus correction whenever needed.

The postoperative results were evaluated at 1 week, 1 month, and every 6 months after that. The minimum period of follow up was 6 months.

Student's *t* test was used for statistical analysis.

RESULTS

This study included 21 patients, all with horizontal jerk nystagmus, 17 males and four females. The age when first examined ranged from 1 to 27 years with a median of 18 years. The follow up ranged from 6 months to 84 months, averaging 18.5 months.

During the postoperative period all but one patient demonstrated improvement in the head turn. The only case in which no tilt improvement was found (patient No 10) was the result of paralysis of the IVth cranial nerve which had not been detected during the preoperative evaluation (Table 1).

Five patients developed overcorrection of the head turn, although the magnitude of the opposite turn was not sufficient to warrant further surgery. No patient showed more than minimal limitations of ductions during the postoperative follow up. In every case except one, the resulting stability prevailed throughout the follow up.

DISCUSSION

Our experience corroborates the results reported by Garcia *et al*.[12] We found in patients with nystagmus and a null zone that abnormal head position is generally mixed—that is, there is head turn and tilt, together with chin elevation or depression.

In our experience, cases of nystagmus with blockage position which present a frank predominance of the tilt or the vertical component were seen much less frequently. An observation with which Prieto-Diaz and Souza-Dias agree.[10]

Numerous reports of abnormal head position correction for the horizontal component, without mention of the vertical or torsion alterations, are found in the literature.[3 4 12–14] Others specifically mention treatment in cases with primarily vertical or torsional components.[6 8 9]

Only two previous studies have considered nystagmus with abnormal head position in all three axes.[5 11] These authors performed surgery on the horizontal muscles in order to correct head turns and, during the same surgery, operated on the cyclovertical muscles to correct chin elevation/depression and head tilts.

In this study, we have demonstrated that, at least when the head turn predominates, it is not necessary to perform surgery on the vertical or torsional muscles. The head tilt and chin up or down position improves with the weakening surgery of the horizontal rectus muscles. Prieto-Diaz and Souza-Dias do procedures on the vertical muscles only if the vertical or torsional components are severe. They suggest that supra-insertion or infra-insertion of the horizontal rectus muscles corrects the vertical component of abnormal head position when it is moderate. We have performed this procedure in some cases and have obtained good results.

It is important to emphasise that secondary vertical and torsional deviations have occurred when the vertical and torsional components are corrected by surgery on the oblique muscles.[6 7 10]

Long term follow up studies report undercorrection and recurrences with the classic Anderson procedure. With our modification of the Anderson procedure the magnitude of correction is larger and recurrence is less frequent. Moreover, we suggest that if similar results can be obtained by both the Anderson and Kestenbaum procedures, the former should be chosen as it is simpler and a smaller number of muscles are operated on.

For all the above reasons, we consider it unnecessary to perform surgery on cyclovertical muscles if the head turn predominates. Such surgery should be performed only in those cases with predominantly vertical or torsional positions or, secondly, in those cases with significant vertical or torsional positions following horizontal surgery.

It is unclear why surgery on the horizontal muscles alone tends to ameliorate the torsional and vertical components of abnormal head positions. One explanation may be that the blockage area is so far from the primary position that the vertical and torsional effects of cyclovertical muscles are exaggerated. With surgery on the horizontal muscles, the blockage point is moved to the primary position where the cyclovertical actions are diminished.

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REFERENCES

1 **Metzger EL**. Correction of congenital nystagmus. *Am J Ophthalmol* 1950;**33**:1976.
2 **Kestenbaum A**. Une nouvelle opération du nystagmus. *Bull Soc Ophtalmol Fr* 1953;**6**:599.
3 **Anderson JR**. Causes and treatment of congenital nystagmus. *Br J Ophthalmol* 1953;**37**:267.
4 **Goto N**. A study of optic nystagmus by the electrooculogram. *Acta Soc Ophthal Jap* 1954;**58**:851.
5 **Parks MM**. Congenital nystagmus surgery. *Am Orthopt J* 1973;**23**:35–9.
6 **Pierse D**. Operation on the vertical muscles in cases of nystagmus. *Br J Ophthalmol* 1959;**43**:230.
7 **Berge GP Von**, Dell'Aquilla A. Ulteriore contributo alla terapia chirurgica del nistagmo congenito con torciollo. *Riv Otoneurooftalmol* 1962;**37**:485.
8 **Focosi M**, Guzzinati FC. Intervento sui muscoli verticali in un particolare caso di nistagmo. *Ann Oftalmol* 1960;**86**:109.
9 **Harada M**, Ito Y. Surgical correction of cyclotropia. *Jap J Ophthalmol* 1964;**8**:88.
10 **Prieto-Diaz J**, Souza-Dias C. Nystagmus treatment. In: *Estrabismo*. Spain: Jims, SA, 1986:405.
11 **Limón de Brown E**, Corvera-Berbadelli J. Weakening surgery for nystagmus treatment. *Rev Mex Oftalmol* 1989;**63**:65.
12 **Garcia-Guzmán G**, Washington-Cruces R, Villaseñor-Solares J. Anderson's surgery. *Rev Mex Oftalmol* 1990;**64**:59.
13 **Dell'Oso LF**, Flynn J. Congenital nystagmus surgery. A quantitative evaluation of the effects. *Arch Ophthalmol* 1979;**97**:462–9.
14 **Kushner BJ**. Ocular causes of abnormal head postures. *Ophthalmology* 1979;**86**:2115–25.