Surgical management of third nerve palsy

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Abstract

Aims—A surgical technique has been developed in order to obtain ocular alignment in the primary position in patients with third nerve palsy.

Methods—A method for surgically correcting the vertical deviation and the pseudoptosis is described in three patients with longstanding third nerve palsy. By decreasing the ability of the non-involved eye to elevate, a fixation duress was created which eliminated the secondary deviation that characteristically occurs in such patients when the involved eye fixates. As a result of this technique, both eyes in all patients on attempted fixation were under similar duress, therefore requiring equal amounts of stimulation to move into the primary position. When the fixation duress was sufficient, elimination of the hypotropia and ptosis was achieved. Additionally, in order to correct the exotropia, generous recession and resection procedures in the involved eye and recession of the lateral rectus in the non-involved eye were performed.

Results—Between 8 and 10 prism dioptres of esotropia were achieved and maintained in two patients. One patient had 20 prism dioptres of exotropia. Two patients had no residual ptosis and one required an additional anterior levator resection to achieve a satisfactory result.

Conclusion—Patients with a third nerve palsy and a pseudoptosis may be candidates for this approach.

(*Br J Ophthalmol* 1995; 79: 431-434)

It is generally accepted that surgery for correction of paralytic strabismus associated with oculomotor palsy can be the most challenging for the ophthalmologist.^{1,2} The eye becomes fixed in a down and out position because of unopposed action of the lateral rectus and superior oblique muscles. When the medial rectus muscle is paretic and significant function is retained, the horizontal forces on the globe can be restored and balanced by a generous recession of the lateral rectus muscle and resection of the accompanying medial rectus muscle. Where the contractility of the medial rectus muscle is negligible, strengthening techniques such as resection, advancement or tuck fail to restore the muscle's potential for ocular rotation. Such techniques, however, permit the globe to be fixed in a more acceptable position by strengthening the muscle, its associated check ligaments, and intramuscular septum. Improved alignment in the primary position, is therefore the final goal regardless of which surgical procedure may be employed.

Transposition of the superior oblique muscle, with or without trochleotomy, along with horizontal recti surgery, has been the mainstay of treatment in achieving ocular alignment in third nerve palsy.³⁻¹³ Management of the ptosis in this condition has, however, proved more difficult, as a brow suspension in an eye with an absent Bell's phenomenon may lead to corneal exposure.

In this study we treated three patients with longstanding unilateral oculomotor nerve palsy. The exotropia was corrected by a combination of recess/resect in the involved eye and a lateral rectus recession in the fellow eye. The ptosis (which in our group of patients proved to be a pseudoptosis) was approached by the creation of a fixation duress, as described by Jampolsky (personal communication), in the non-involved eye. The fixation duress is proposed to decrease the elevation of the non-involved eye, thereby creating similar forces of duress in both eyes when fixation takes place. Using this technique, the extra stimulus needed to elevate the fixing eye creates transference of neuromuscular stimuli to the yoke muscles in the paretic eye in accordance with Hering's law. This fixation duress, along with adjunctive inferior rectus surgery will correct the hypotropia and the pseudoptosis seen in third nerve palsy. The aim of the surgical technique herein described was to obtain ocular alignment in the primary position.

Patients and methods

Over a 3 year period, three patients with third nerve palsy (two congenital and one traumatic in origin) were treated at our institution. All patients had recovery of the levator palpebrae muscle, so that their ptosis disappeared when the involved eye fixated. All patients had functioning lateral recti and superior oblique muscles. The goal of surgery was to align the eyes within 12 prism dioptres of orthophoria in the primary position. Adjustable surgery was performed on all patients. If the desired result was not achieved after the first surgical session, additional procedures were performed.

CASE 1

A 13-year-old girl presented with a 9 year history of a right traumatic third nerve palsy. This eye was amblyopic with a visual acuity of 6/36. Fixation preference was the non-involved eye and there was no evidence of aberrant regeneration. Before being assessed at our institution, an 8 mm recession of the right lateral rectus, a 4 mm recession of the right inferior rectus, and a 5 mm recession of the left superior rectus had been performed elsewhere.

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Accepted for publication
9 January 1995

Fig 1c

Fig 1a

Fig 1d

Fig 1f

Fig 1b

Fig 1e

Fig 1g

Figure 1 Postoperative findings in case 1, showing alignment in the primary position, with a marked decrease in elevation in both eyes.

Fig 2c

Fig 2a

Fig 2d

Fig 2e

Fig 2b

Fig 2f

Figure 2 Postoperative findings in case 2, satisfactory alignment in the primary position, with some residual elevation in the non-involved eye.

Motility examination in the primary position, revealed a 45 prism dioptre (PD) exotropia and a 30 PD right hypotropia. The ptosis in this patient was a pseudoptosis, in that when the patient fixed with the right eye there was considerable secondary deviation (elevation) in the left eye with no residual ptosis in the right. Ductions in the non-involved eye were normal. In the affected eye, there had been some recovery in the medial and inferior rectus, allowing some adduction and depression. There was virtually complete limitation of elevation in up, up and left, and up and right gaze, both on ductions and on versions.

Further strabismus surgery was performed at this time. To correct for the exotropia, the right lateral rectus was further recessed 7 mm (total recession 12 mm) and the left lateral rectus was recessed 10 mm. To create a fixation duress in the left eye, the left superior rectus was further recessed 7 mm (total recession 12 mm). The left inferior rectus was resected 5 mm, and the right inferior rectus was recessed 8 mm (total recession 12 mm). The result after surgery was an esotropia of 8 PD, a right hypertropia of 6 PD, and no residual ptosis. The patient has been unable to elevate either eye. Postoperatively although the intrapalpebral fissure was wider in the non-involved eye than in the other eye, suggesting lid retraction, there was no visible sclera above the cornea. This result has remained stable over a 3 year period (Fig 1).

CASE 2

A 13-year-old girl presented with a congenital third nerve palsy in her right eye. This eye was amblyopic with a visual acuity of 6/36. This patient fixed with the non-involved eye. She had a pseudo-Argyll Robertson pupil secondary to aberrant regeneration of the third nerve, this being the only feature of aberrant regeneration present. Preoperatively the patient had a 30 PD exotropia and a 20 PD right hypotropia in the primary position. Forced duction test in the right eye was negative. When fixing with the involved eye there was marked secondary deviation in the other eye, and no ptosis. There was recovery of medial and inferior rectus function, allowing almost complete range of movement in the field of action of these muscles. In this patient, similar to the patient in case 1, there was limitation of elevation in up gaze. Ductions in the non-involved eye were normal.

A bilateral lateral rectus recession of 10 mm was performed and a right medial rectus resection of 6 mm, to correct for the exotropia. To create a fixation duress the left superior rectus was recessed 10 mm. Three months after surgery the patient had a 10 PD esotropia, a residual 6 PD of left hypertropia and unexpectedly 4 mm of ptosis. A 12 mm anterior levator resection was performed as a secondary procedure. There was lid retraction in the non-involved eye postoperatively with 1 mm of sclera being visible above the cornea, but this did not require surgery. The result has remained stable over the past 3 years (Fig 2).

CASE 3

A 29-year-old man presented with a left congenital third nerve palsy. He was amblyopic in this eye and had no previous surgery. He fixed with the non-involved eye and his ptosis was a pseudoptosis. There was no evidence of aberrant regeneration. In the left eye he had some recovery in the inferior rectus, partial recovery in the medial rectus, and no elevation. Ductions in the non-involved eye were normal.

Operatively the right superior rectus was recessed 15 mm, a right inferior oblique myectomy, and a 4 mm right inferior rectus resection was performed. This was accompanied by a 12 mm left lateral rectus recession and a 3 mm left medial rectus resection for his associated exotropia. On the first postoperative day the patient had 10 PD of exotropia and was vertically aligned (that is, 4 PD of left hypertropia). Three months postoperatively a residual 20 PD of exotropia remained, and the 4 PD of left hypertropia remained stable. There was no lid retraction in the non-involved eye postoperatively. He declined further surgery.

Discussion

In the management of third nerve palsy, as in any paralytic strabismus, the ophthalmologist has to balance the muscular forces acting on the globe.¹ A supramaximal recession of the lateral rectus allows the eye to move towards the midline and renders it completely ineffective as a rotator of the globe as the tonus of the recessed muscle returns postoperatively. The resected medial rectus can then act as a leash or tether holding the eye in the primary position. Two patients required recession of the lateral rectus in the fellow eye to achieve horizontal alignment. The amount of surgery required in the non-involved eye depended on the severity of their third nerve palsy. Recession of the lateral rectus alone, for example, may not be sufficient in the long term. Our third patient (case 3) had a residual 20 PD of exotropia, following a recess/resect procedure in the involved eye. Because of the inherent risks of anterior segment ischaemia (the two vertical recti muscles in the fellow eye had undergone concurrent surgery) it was proposed to postpone further rectus surgery at the initial operation. In planning a second operation we anticipated bringing the involved eye into the primary position, assessing the newly adopted position of the normal eye and substituting a corrective fixation duress.¹⁴

All of our patients had recovery of the levator palpebrae muscles. When the patients fixed with the paretic eye, the involved eye moved into the primary position, with elimination of the ptosis. Our second patient had some residual ptosis postoperatively, and our only explanation for this is that this eye was still hypotropic (6 PD). There was no ptosis when this eye fixed preoperatively. This was correctable by an anterior levator resection. To date the surgery performed has not been associated with corneal exposure which occurs in patients with complete third nerve palsy who

have a brow suspension due to the absence of a Bell's phenomenon.

Our surgical aim was to limit elevation in the non-involved eye and also achieve a good cosmetic appearance in the primary position. Along with the superior rectus recessions, two patients had a resection of the inferior rectus in the non-involved eye. The purpose of this was to strengthen the antagonist of the superior rectus, thereby making the recession more effective. The recession of the inferior rectus in the involved eye (case 1) reduced the hypotropia and was an adjunct to the vertical muscle surgery in the fellow eye. A recession of the inferior rectus alone would not be sufficient to obtain a cosmetically satisfactory result in the primary position. Large recessions of the superior rectus are associated with retraction of the upper lid. In case 1 there was some lid retraction, but it did not require any intervention.

We achieved cosmetically satisfactory results in two of our three patients. The third patient (case 3) had a residual 20 PD of exotropia and elected to have no further surgery. To achieve these results, we recommend at least a 13–15 mm recession of the ipsilateral lateral rectus, along with a resection of the medial rectus. Recession of the lateral rectus in the non-involved eye certainly helped to improve the horizontal alignment. Crippling elevation of the non-involved eye eliminates pseudoptosis and hypotropia. If there is recovery of

the levator palpebrae, we propose that this technique, along with adjunctive surgery on the inferior rectus in some patients, can deal effectively with many of the problematic features seen in third nerve palsy – namely, the hypotropia and the pseudoptosis.

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