Consecutive exotropia following surgery

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SUMMARY We studied 250 patients with consecutive exotropia. The interval between the surgical procedure and the onset of the consecutive exotropia may take many years. Consecutive exotropia occurred with all types of corrective esotropia surgery that we studied. Amblyopia and medial rectus limitation postoperatively seemed to be common factors associated with consecutive exotropia.

Surgically overcorrected esotropia is a frequent problem confronting the ophthalmologist. Most reports on the subject¹⁻⁷ analyse the characteristics of the preoperative esotropia state, the amount of surgery, and the postoperative findings. Factors usually mentioned as being responsible¹⁻⁷ for the overcorrection include excessive amount of surgery, amblyopia, high hyperopia, and failure to recognise the patient and evaluate his condition preoperatively. We reviewed a large series of patients with consecutive exotropia to determine common characteristics that contributed to overcorrection.

Patients and methods

We analysed 250 patients with consecutive exotropia seen during a 10-year period from 1970 to 1980. All the patients were examined by the authors or by the late Dr Martin Urist. These patients were from 4 different sources: the motility clinics of Cook County Hospital and of the Illinois Eye and Ear Infirmary (82;33%), the Motility Consultation Clinic (131;52%) of the Infirmary (patients referred by ophthalmologists in private practice), and the private practice of one of the authors (37;15%). By using these 4 different sources a variety of surgical procedures could be evaluated in terms of their effect on the production of consecutive exotropia, different management regimens could be assessed, and a large population with consecutive exotropia could be studied.

Only patients who had a manifest exotropia in the primary position greater than 10 prism dioptres or 5° for distance or near were included in the study. Those

who had an exotropia in the up or down position, but had straight eyes or an eso deviation in the primary position, were excluded.

Results

The age of onset of the esotropia was one of the factors investigated. The majority of patients were younger than 1 year at the onset (Table 1). This is not unusual, because early-onset esotropia most often requires surgical correction. It could also be speculated that children with an early-onset deviation are less likely to have stable binocular vision and are more likely to develop a consecutive exotropia.

We investigated the age of the patient at the time of surgery and the interval between the onset of the deviation and the surgical intervention. There seemed to be no difference in these groups of patients with respect to an increased frequency of consecutive exotropia. However, it should be noted that only 5 patients had surgery before the age of 1 year. The more recent patients tended to undergo surgery at an earlier age or closer to the onset of their deviation, which reflects a current trend throughout the country.

We found that all surgical procedures we studied (Table 2) could produce consecutive exotropia. Patients with initial medial rectus recessions of more

Table 1 Age of onset of esotropia as reported by patient or parent

Age	Number of patients
Birth	98 (39%)
≤ 1 year	53 (21%)
> 1 year	82 (33%)
Unknown	17 (7%)

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Table 2 Types of surgery performed for correction of esotropia

Surgery	Number of patients
Bilateral medial rectus recession (without displacement)	57 (23%)
Recess/resect	118 (47%)
Other*	75 (30%)

* Patients having a variety of surgical or multiple surgical procedures, e.g., bilateral medial rectus recession and a resection of one lateral rectus.

than 5 mm were excluded from this study. A surgical procedure that is generally considered relatively ineffective, namely, a unilateral 10 mm lateral rectus resection, produced a consecutive exotropia in 2 patients.

The majority of patients in this study developed a consecutive exotropia after a single surgical procedure, although 33 patients had multiple surgical procedures before becoming exotropic. Frequently one surgical procedure (i.e., one medial rectus) would leave the patient undercorrected, and the same procedure on the fellow eye would produce a significant overcorrection.

A high degree of hyperopia has been thought to be responsible or an important factor in producing a consecutive exotropia. Our study did not show this to be true (Table 3). Only 28 of 250 (11%) patients showed a hyperopia in excess of 2.50 dioptres. In addition 3 patients showed a myopia in excess of 9.00 dioptres (1%). The remainder of the patients (219) had a refractive error between +2.50 and -1.50 (88%). A high degree of anisometropia, which had been expected, was also not found.

Amblyopia has commonly been identified as one of the factors important in the development of a consecutive exotropia. This was true in our series as well (Table 4). Of 250 patients 94 had amblyopia (38%). Amblyopia was defined as a visual acuity difference of 2 lines where the visual acuity in the poorer eye could not be improved with lenses.

An attempt was made to estimate the length of time between the last surgical procedure and the beginning of the consecutive exotropia. Previous reports⁷ indicate that most of the deviations occurred in the immediate postoperative period. In our series

Table 3 Refractive error in patients with consecutive exotropia (spherical equivalent calculated and included)

Refractive error	Number of patients
-1.50 to +2.50	219 (88%)
Hyperopia over +2.50	28 (11%)
Myopia over -1.50	3 (1%)

Table 4 Incidence of amblyopia

	Number of patients
Amblyopia present	94 (38%)
Amblyopia absent	156 (62%)

40 patients were observed to be exotropic on the first postoperative visit (Table 5). This figure probably represents iatrogenic cases or those perhaps due to some slippage of the muscle or to an excessive amount of surgery for the deviation. The usual course for patients who developed a deviation later was an acceptable initial postoperative period with a gradual development of an exotropia. Only about a third of these patients developed an exotropia of more than 10 prism dioptres in less than one year. An exotropia did not develop until at least one year after surgery in 50% of the patients; 25% did not develop an exotropia until 5 years after surgery. Many of these patients were orthophoric for distance and near vision and were straight in all positions of gaze in the immediate postoperative period. The surgeon thought an excellent result had been achieved. The subsequent exotropia was a disturbing finding. Many of the 250 patients demonstrated an exodeviation in the straight up or straight down position prior to developing a deviation in the primary position.

The function of the medial rectus muscle was evaluated by the Urist version reflex test⁸ (normal medial rotation greater than 35°). All patients who had adduction of less than 24° were described as having limited medial rectus function. A comparative study of 50 surgical patients who either had an esotropia that was undercorrected or did not show an exodeviation demonstrated medial rectus function of 30° or more by the Urist test. In patients with consecutive exotropia the incidence of limitation was almost twice that of patients with an absence of limitation or a normal function. The greatest degree of limitation seemed to be in patients who had multiple surgical procedures. The incidence was the same in the group that underwent a bilateral medial rectus recession as in the recess-resect group. However, in the rectus recession group an occasional

Table 5 Duration between time of operation and appearance of exotropia

Exotropia noted	Number of patients
Overcorrection noted at first postoperative visit	40 (16%)
Overcorrection < 1 year	55 (22%)
Overcorrection 1-4 years	51 (20%)
Overcorrection 5-8 years	31 (12%)
Overcorrection > 8 years	37 (15%)
Unknown	36 (15%)

patient had one medial rectus with a function of less than 24° and a normal postoperative medial rotation in the other.

Discussion

This study emphasises the necessity of studying the long-term history of strabismus. The success or failure of a surgical approach cannot be evaluated within a short follow-up period. The consecutive exotropia may not develop until years after the surgery for esotropia. Not infrequently consecutive exotropia occurred after 'successful' esotropia surgery. The incidence in reported series of consecutive exotropia ranged from 4%⁹ to 20%.¹⁰ It is noteworthy that the 20% incidence occurred in the group of patients with the longer follow-up. This would indicate that consecutive exotropia is a much more frequent condition than is otherwise reported. It is very important that amblyopia be fully corrected. After surgery the patient should continue with amblyopia therapy and should have the smallest hyperopic correction consistent with good vision and straight eyes.

If undercorrection is associated with limitation of the medial rectus muscle, it is good preventive medicine to defer further surgery or to plan for a more moderate procedure than ordinarily performed. The incidence of consecutive exotropia is extremely high, and it is possible for the patient who demonstrates medial rectus underaction to develop a consecutive exotropia. Similarly, an exodeviation in the up and down positions should be a warning to the surgeon before any further surgery is planned. It is better to avoid any esotropia surgery than run the risk of medial rectus limitation, unless this is the only way to correct the deviation. Large recessions of the medial rectus (in excess of 5 mm) should be carefully evaluated in order to determine the long-term effect. Burian¹¹ has commented on the dangers of large

recessions. Urist (personal communication) too was always concerned about the possibility of consecutive exotropia. Large resections of the lateral rectus can cause a limitation of medial rectus function. Undoubtedly some of the patients in this study with medial rectus underaction represent flaws in the surgical technique of rectus recession. However, the long duration postoperatively before the onset of exotropia suggest⁵ that control is possible, and everything should be done to maintain this.

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