Surgical management of large angle congenital esotropia

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SUMMARY Ninety-seven patients with congenital esotropia with deviations of 50 prism dioptres or greater underwent large (6 and 7 mm) bimedial rectus recessions. The overall success rate with one operation was 83.5%. Judgment of final alignment was made at the last follow-up examination, six to 61 months (average 23.4 months) postoperatively. Large bimedial rectus recessions for congenital esotropia are an effective surgical treatment which does not significantly alter adduction.

The best surgical treatment of large angle congenital esotropia continues to be controversial. Success rates ranging from 40 to 80% have been described with a variety of surgical techniques.1-4 Traditionally the maximum recession of the medial recti has been approximately 5 mm.7 Several investigators have successfully corrected large angle esotropia with bimedial rectus recessions in excess of the traditional 5 mm.9-10 Mittelman and Folk have presented favourable results following re-recession of the medial rectus 13.5 mm from the limbus for undercorrected esotropia.11

In a preliminary report we showed a 91% success rate with 6 or 7 mm bimedial rectus recessions in 45 congenital esotropes with deviations of 50 prism dioptres or greater.12 Judgment of final alignment was made six weeks postoperatively, with an average follow-up of 13 months. This report presents the long term follow-up of 6 and 7 mm bimedial recessions for the treatment of large angle congenital esotropia.

Material and methods

The records of 321 patients with congenital esotropia who underwent surgery at the Pediatric Ophthalmology Service of Wills Eye Hospital between 1979 and 1985 and 136 patients from Albany Medical College between 1981 and 1985 were reviewed.

Ninety-seven patients met the criteria for inclusion in this study, which were as follows: (1) constant esotropia present by 6 months of age by history and documented by one of the authors by 1 year of age; (2) preoperative deviation of 50 prism dioptres or greater; (3) alternation of fixation; (4) age of initial operation 2 years or younger; (5) no overt evidence of central nervous system abnormalities or organic eye disease; and (6) follow-up of six months or more.

 Cycloplegic refraction with 1% cyclopentolate, and in some cases 1% atropine, was performed in all cases. Patients in whom the spherical equivalent was greater than +3.00 dioptres were fitted with spectacles. If the hyperopic correction reduced the esotropia to less than 50 prism dioptres, the patient was eliminated from the study.

 Deviations were evaluated by the Hirschberg or Krimsky methods (base out prism in front of each eye) or by the prism and cover test when possible.

 All patients underwent bimedial rectus recessions of 6 or 7 mm by the Parks cul-de-sac approach. For this study an alignment measured between orthophoria and less than 10 prism dioptres of esotropia was considered a success. For the purposes of data analysis the measurement obtained at the last follow-up visit (six months or greater) was used as the final alignment except in those patients subsequently requiring reoperation. In patients reoperated upon the alignment obtained before the second operation was used as the final result from the first operation. If a recurrent esotropia developed, full cycloplegic hyperopic correction of +1.50 dioptres or greater

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was prescribed. For these patients final ocular alignment was recorded with their spectacles.

Results

Eighty-eight patients had deviations in the range 50 to 70 prism dioptres and underwent bimedial rectus recessions of 6 mm. The remaining nine patients had deviations in excess of 70 prism dioptres and had bimedial rectus recessions of 7 mm. The average deviation in the 6 mm group was 58-2 prism dioptres of esotropia and the average for the 7 mm group was 75 prism dioptres. The ages at the initial surgery ranged from 4 months to 24 months (average 12-2 months) for the 6 mm group and 6 months to 20 months (average 9-9 months) for the 7 mm group. Refractive errors ranged from -4-75 to +4-50 dioptres (average 1-68 dioptres) for the 6 mm group, and +0-25 to +3-00 dioptres (average +1-86 dioptres) for the 7 mm group (Table 1). Follow-up ranged from six months to 61 months, average 23-3 months, for the 6 mm group, and ranged from seven months to 48 months, average 23-8 months, for the 7 mm group.

Of the 85 patients who underwent 6 mm recessions 73 (83%) had ocular alignment between orthophoria and 10 prism dioptres of esotropia at the last follow-up visit (six months or greater). Four of the 73 patients redeveloped esotropia of 15 prism dioptres or greater, which was corrected with hyperopic spectacles averaging 3-44 dioptres. The esotropia redeveloped on average 21-5 months after the initial surgery.

Thirteen patients in the 6 mm group required a second operation for esotropia at an average interval of 11-2 months after the first surgery. Five of the 13 patients were initially controlled with a hyperopic correction before the condition decompensated, requiring surgery at an average interval of 22-6 months after the first surgery. Two patients in the 6 mm group developed a consecutive exotropia at six months and 18 months following the initial surgery for esotropia. Neither patient had developed amblyopia.

Eight of nine patients (88-8%) in the 7 mm group had a successful surgical result. Only one of the nine patients in this group required a second operation for esotropia at 28 months after the first surgery. One additional patient redeveloped esotropia of greater than 15 prism dioptres at 30 months following the initial surgery, which was corrected with +2-50 dioptre spectacles. None of the patients in this group developed a consecutive exotropia. Overall 83-5% of both groups combined were successfully aligned. In addition no limitation of convergence or adduction was noted in any of the patients.

Discussion

The correction of congenital esotropia has been attempted by a variety of surgical techniques. Proponents of two-muscle surgery advocate as the initial procedure either symmetrical bimedial rectus recession or monocular medial rectus recession combined with lateral rectus resection regardless of the size of the preoperative deviation. Further surgery, either bilateral rectus resections or medial rectus recession and lateral rectus resection on the fellow eye, is performed if the patient needs additional surgery. In the past surgeons favouring bimedial rectus recessions for congenital esotropia have encountered an unacceptable incidence of undercorrections in patients with large deviations. For this reason many have turned to three- and four-muscle surgery as an initial procedure.

Ing and coworkers reported a success rate for bimedial rectus recession of only 30% in 40 patients with esotropia measuring 50 prism dioptres or greater. Although the authors did not specifically indicate how much medial rectus recession was performed, in 1966, when the paper was published, it would be reasonable to assume the maximum recession was 5 mm.

Helveston and colleagues reported a 72% success rate for congenital esotropia using graded bimedial rectus recession (maximum recession of 5-5 mm) with the measurement performed from the limbus, combined with recession of conjunctiva and Tenon’s capsule. However, the average preoperative deviation was only 38-3 prism dioptres, and assessment of final alignment was made six weeks postoperatively. More recently they described an 82% success rate using a similar recession technique with a five-month to seven-year follow-up. In this study 63-9% of the patients had a preoperative esotropia of 40 prism dioptres or less.

Kushner and Morton recently reported an 84% success rate for congenital esotropia with preoperative deviations of 35 prism dioptres or greater, assessed six months postoperatively, using non-

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Table 1 Summary of clinical data

<table>
<thead>
<tr>
<th>Bimedial rectus recessions</th>
<th>6 mm group</th>
<th>7 mm group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average deviation (PD)</td>
<td>58-2</td>
<td>75</td>
</tr>
<tr>
<td>Average age (mon)</td>
<td>12-2</td>
<td>9-9</td>
</tr>
<tr>
<td>Average refraction (D)</td>
<td>+1-68</td>
<td>1-86</td>
</tr>
<tr>
<td>Success rate</td>
<td>83%</td>
<td>88-8%</td>
</tr>
<tr>
<td>Average follow-up (mon)</td>
<td>23-3</td>
<td>23-8</td>
</tr>
</tbody>
</table>

PD = prism dioptre. D = dioptre. Mon = months.
graded bimedial recessions measured from the limbus. The medial recti were recessed so that the
distance from the corneoscleral limbus to the
recessed muscle equaled 10-5 mm. Although the
average preoperative deviation was 53 prism
dioptres, 35-9% of the patients had a deviation less
than 50 prism dioptres with 15-4% having a deviation
of 35 prism dioptres.

In 45 congenital esotropes with deviations of 50
prism dioptres or greater we reported a 91% success
rate using large (6 and 7 mm) bimedial recessions.
However, judgment of final alignment was made six
weeks postoperatively.12

von Noorden and coworkers performed a monocular
recess-resect operation on 50 congenital esotropes
with a 42% success rate after one operation; 40% of
the patients had a preoperative deviation of less than
40 prism dioptres. The maximum medial rectus
recession performed, although not stated in the
paper published in 1972, would presumably have
been 5 mm.

The alternative approach to the treatment of
congenital esotropia with surgery on three or four of
the horizontal rectus muscles has been reported by
several investigators. Foster and coworkers
described a 79% success rate with a 5-19 years'
average follow-up with one operation using this
approach. However, 67-6% of their patients had
preoperative deviations of less than 50 prism dioptres
and 38-2% had 30 prism dioptres of esotropia or less.
Lee and Dyer reviewed 36 congenital esotropes who
underwent bimedial rectus recessions and bilateral
rectus resections with a 61% success rate. In their
report 83-3% of the patients had preoperative devia-
tions of 40 prism dioptres or less.

Hirsch and Scott studied 107 congenital esotropes
with deviations of 50 prism dioptres or greater in
which 57 had a bimedial rectus recession, two had
monocular resection-recession, and 48 had three- or
four-horizontal-muscle surgery.15 The success rate
for the two-muscle surgery was 37-3% compared with
64-5% for the three- or four-muscle procedure. No
mention is made about how much medial rectus
recession was performed.

Helveston and coworkers suggested that under-
corrected esotropia or large consecutive exotropia
requiring further surgery was obvious soon after the
initial operation. Recently Bateman and coworkers
used computer based discriminant analysis to study
the results of congenital esotropia surgery. They
discovered that the preoperative deviation, amount
of medial rectus recession, and the interval between
the onset of the esotropia and surgery were all
statistically significant predictive variables for the
surgical outcome six weeks postoperatively. In
addition they found that only the postoperative
deviation at six weeks was predictive of the long term
deviation.

We found that for the 13 patients in the 6 mm
group who required a second operation for esotropia the
average interval was 11-2 months after the first
surgery. Five of the 13 patients required further
surgery at an average interval of 22-6 months. In
addition the two patients with a consecutive exotro-
pia developed the deviation at six months and 18
months.

Freeley and coworkers reported on a group of
patients with congenital esotropia who were surgically
aligned prior to 18 months of age. They found that
28% of these patients later redeveloped esotropia,
with an average time of onset at 14 months
postoperatively. 78% of this group were corrected
with hyperopic spectacles. Five patients in our study
fell into this category, and the eyes were straightened
with hyperopic spectacles averaging +3.25 dioptres.
The esotropia redeveloped an average of 23-6
months after the initial surgery.

Hess and Calhoun were early proponents of
bimedial rectus recessions in excess of the traditional
5 mm in patients with large angle esotropia. They
reported 30 patients ranging in age from 5 months to
12 years, with an average age of 4 years, who
underwent graded bimedial rectus recessions of 6 to
8 mm. 84% of the patients in the 6 mm group
(average preoperative deviation 57 prism dioptres)
and 60% in the 7 mm group (average preoperative
deviation 78 prism dioptres) were within 10 prism
dioptres of orthophoria following the initial pro-
cedure. The one patient who had 8 mm recessions
for an esotropia of 90 prism dioptres was under-
corrected. Prieto-Diaz, who was also an early
advocate of large bimedial rectus recessions for
congenital esotropia, reported that slightly over 80%
of his 85 patients had successful realignment which
remained stable over a three-year follow-up period.

Our overall success rate of 83-5% for the 6 mm and
7 mm groups corroborates the experience of Prieto-
Diaz. Although our results are similar to those of
Kushner and Morton and Helveston and coworkers, our
series included only congenital esotropes of 50 prism dioptres.

We have found that bimedial rectus recessions of 6
and 7 mm, although larger than the conventional
maximum, do not result in limitation of convergence
or adduction. Avoiding surgery on additional
muscles saves anaesthesia time and minimises poten-
tial surgical complications. Our overall success rate
of 83-5% suggests that patients with large angle
congenital esotropia can be effectively aligned with
graded two-muscle surgery and that this postopera-
tive alignment is generally stable over an extended
follow-up period. We therefore recommend large
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bimedial rectus recessions as the initial surgical management for this condition, recessing each medial rectus 6 mm for 50 to 70 prism dioptries of esotropia and 7 mm for greater than 70 prism dioptries.

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