ABSTRACT

**Purpose:** To study the prevalence, characteristics, indications for and results of strabismus treatment secondary to congenital cataracts.

**Materials and methods:** This was a retrospective study of 21 cases from 29 with congenital cataracts with strabismus (unilateral in 11 and bilateral in 10 cases). In 20 patients surgery on the cataracts was performed, with an intraocular lens inserted in 15 patients. Botulinum toxin and/or strabismus surgery were deemed to be indicated when the deviation was stable after rehabilitation therapy. A good motor end result was considered when the final deviation was ≤5º, and a good sensorial result was when there was no suppression in the Worth test even without stereopsis in the TNO test.

**Results:** The strabismus prevalence was 72.4%. Strabismus was present before cataract surgery was performed in 12 cases, eight with esotropia (ET) and four with exotropia (XT). Strabismus which appeared after cataract surgery was classified as 13 ET, five XT, one ET with vertical anisotropia in «V», and two XT with dissociated vertical deviation (DVD). The strabismus angle was variable in six patients and was not treated. The other six cases required strabismus treatment: one with botulinum toxin, four with surgery and one with botulinum toxin were used in another case. The average age at the treatment was 5.2 years. The motor result was good in five cases (83.3%) and the sensorial result was only in two (33.3%).

**Conclusion:** The strabismus secondary to cataract congenita was very frequent and increased after surgery.

RESUMEN

**Objetivo:** Estudiar la prevalencia, características, indicaciones y resultados del tratamiento del estrabismo asociado a catarata congénita.

**Método:** Estudio retrospectivo de 21 casos de 29 con cataratas congénitas que presentaron la asociación estrabismo y catarata (unilateral en 11 y bilateral en 10), de los que en 20 se realizó su extracción, introduciendo lente intraocular en 15. Se indicó tratamiento del estrabismo con toxina o cirugía si la desviación era estable después de completar la rehabilitación visual. Se consideró buen resultado motor si el ángulo final era ≤ de 5º y buen resultado sensorial si no existía supresión con test de Worth incluso en los casos sin estereopsis con TNO.

**Resultados:** La prevalencia del estrabismo fue del 72,4%. El estrabismo previo a la extracción de la catarata se observó en 12 casos, ocho con endotropía (ET) y cuatro con exotropía (XT). El estrabismo posterior a la cirugía se dividió en 13 (ET), cinco (XT), uno ET con anisotropía vertical en V y dos XT con DVD. En seis casos el ángulo era variable. Se realizó tratamiento del estrabismo en seis enfermos: uno con toxina botulínica, cuatro con cirugía y uno con cirugía y toxina. La edad media del tratamiento fue de 5,2 años. El resultado motor fue bueno en cinco casos (83,3%) y el sensorial sólo en dos (33,3%).

**Conclusiones:** El estrabismo secundario a catarata congénita fue muy frecuente y aumentó después su
the time of treatment was 5.2 years. The motor result was good in 5 cases (83.3%) and the sensorial result good in two (33.3%).

Conclusions: Strabismus secondary to congenital cataracts occurred in a significant number of patients and increased after cataract extraction. Esotropia occurred twice as often as exotropia. Strabismus surgery was not required in most of the cases. The motor results were better than sensorial results (Arch Soc Esp Oftalmol 2007; 82: 623-628).

Key words: Esotropias, exotropias, congenital cataract, strabismus surgery, botulinum toxin.
Average age of cataract surgery was 28.9 months, SD (standard deviation): 31.9 months (range, 4 months–9 years). Refraction was conducted 10 days after surgery with sciascopy and autorefractometry, the latter if there was collaboration, with subjective verification if age allowed. Total occlusions were indicated from the first postoperative visit in 19 cases. In two they were not conducted due to being aged 8 and 9. The motor study was conducted with the cover test with prisms or with the corneal reflex (Hirchsberg test) if there was poor binding or poor collaboration. The deviation angle was noted in degrees. VA examination was conducted with the Pigassou test in verbal children under 4, and with the Snellen test in those over 4, recording VA at last check-up and prior to strabismus surgery in the cases operated on. Sensorial examination was conducted with the Worth test and TNO.

We indicated strabismus treatment with toxin or surgery in the cases of unilateral cataract if the deviation angle was stable after completing visual rehabilitation, or before if the VA achieved was greater than 0.6, and in bilateral cases if VA was symmetric in both eyes. When horizontal deviation was > 5º and < 10º botulinum toxin was indicated (Botox, ALLERGAN) and if ≥ 10º classic surgery was indicated. For vertical deviations we indicated surgery when it was manifest and constant. A good motor end result was considered when the final deviation angle was ≤ 5º, and a good sensorial result was when there was no suppression in the Worth test even without stereopsis in the TNO test.

RESULTS

Prevalence of strabismus represents 72.4% of all congenital cataracts diagnosed in children under 9 (21 of 29 cases).

Of the 29 cases with congenital cataracts, in 21 it was diagnosed (before or after cataract surgery or visual rehabilitation) in association with strabismus. We observed prior strabismus in 12 (57.1%), representing 41.4% of the 29 cataracts, eight had ET and 4 XT (table I), seven had unilateral cataract, and five bilateral. Subsequent strabismus was observed in the 21 patients comprising this sample: 13 ET, one ET with vertical anisotropy in V, five XT and two XT with DVD. In six cases the angle was variable. We observed that a prior XT became ET.

Table I. Strabismus and congenital cataracts

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Uni/Bi</th>
<th>Cataract diagnosis</th>
<th>Age cataract Qx (months)</th>
<th>Prior strabismus</th>
<th>Subsequent strabismus</th>
<th>Occlusion</th>
<th>Final spheric equivalent</th>
<th>Final VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>RE</td>
<td>15 d</td>
<td>9</td>
<td>NO</td>
<td>ET 8º</td>
<td>Yes</td>
<td>+2.75</td>
<td>0.3</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>RE</td>
<td>3 m</td>
<td>60</td>
<td>XT 7º</td>
<td>ET 2º</td>
<td>Yes</td>
<td>-4</td>
<td>0.3</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>LE</td>
<td>Birth</td>
<td>108</td>
<td>ET 20º</td>
<td>ET 4º</td>
<td>No</td>
<td>+7.5</td>
<td>Cf</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>RE</td>
<td>3 y</td>
<td>60</td>
<td>NO</td>
<td>ET 4º</td>
<td>Yes</td>
<td>-0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>BO</td>
<td>3 m</td>
<td>4</td>
<td>NO</td>
<td>ET 5º</td>
<td>Yes</td>
<td>+6 / +6</td>
<td>0.8 / 0.3</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>BO</td>
<td>Birth</td>
<td>96</td>
<td>NO</td>
<td>XT 5º</td>
<td>No</td>
<td>-3.75 / +6</td>
<td>0.25 / 0.175</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>BO</td>
<td>Birth</td>
<td>6</td>
<td>ET 10º</td>
<td>ET 5º</td>
<td>Yes</td>
<td>-3 / -3</td>
<td>0.25 / 0.5</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>LE</td>
<td>Birth</td>
<td>4.5</td>
<td>NO</td>
<td>Variable XT</td>
<td>Yes</td>
<td>+3</td>
<td>0.3</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>BO</td>
<td>Birth</td>
<td>12</td>
<td>NO</td>
<td>ET 20º</td>
<td>Yes</td>
<td>+18 / +20</td>
<td>p/p / 0.25</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>BO</td>
<td>Birth</td>
<td>20</td>
<td>NO</td>
<td>ET variable</td>
<td>Yes</td>
<td>+12 / +10</td>
<td>0.3 / 0.8</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>BP</td>
<td>Birth</td>
<td>36</td>
<td>ET 15º</td>
<td>ET 15º</td>
<td>Yes</td>
<td>+12 / +12</td>
<td>0.4 / 0.3</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>LE</td>
<td>Birth</td>
<td>24</td>
<td>Variable ET</td>
<td>ET 20º</td>
<td>Yes</td>
<td>+4</td>
<td>0.5</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>LE</td>
<td>Birth</td>
<td>6</td>
<td>XT 7º</td>
<td>XT + DVD variable</td>
<td>Yes</td>
<td>+4</td>
<td>Cf</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>BO</td>
<td>Birth</td>
<td>3</td>
<td>NO</td>
<td>XT variable</td>
<td>Yes</td>
<td>+8 / +8</td>
<td>No collaboration</td>
</tr>
<tr>
<td>15</td>
<td>M</td>
<td>RE</td>
<td>Birth</td>
<td>5</td>
<td>ET 15º</td>
<td>ET 15º + SV</td>
<td>Yes</td>
<td>+3</td>
<td>0.3</td>
</tr>
<tr>
<td>16</td>
<td>M</td>
<td>BO</td>
<td>Birth</td>
<td>36</td>
<td>ET 15º</td>
<td>ET 5º</td>
<td>Yes</td>
<td>-1 / +0.5</td>
<td>1 / 0.8</td>
</tr>
<tr>
<td>17</td>
<td>F</td>
<td>BO</td>
<td>Birth</td>
<td>12</td>
<td>Variable ET</td>
<td>ET variable</td>
<td>Yes</td>
<td>+2 / +1</td>
<td>0.125 / 0.125</td>
</tr>
<tr>
<td>18</td>
<td>F</td>
<td>LE</td>
<td>Birth</td>
<td>4</td>
<td>NO</td>
<td>XT + DVD variable</td>
<td>Yes</td>
<td>+4</td>
<td>0.1</td>
</tr>
<tr>
<td>19</td>
<td>F</td>
<td>BO</td>
<td>9 m</td>
<td>60</td>
<td>XT 15º</td>
<td>XT 15º</td>
<td>Yes</td>
<td>+3 / +1.5</td>
<td>0.3 / 0.8</td>
</tr>
<tr>
<td>20</td>
<td>F</td>
<td>RE</td>
<td>Birth</td>
<td>12</td>
<td>XT 20º</td>
<td>XT 20º</td>
<td>Yes</td>
<td>+3</td>
<td>0.3</td>
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<tr>
<td>21</td>
<td>F</td>
<td>LE</td>
<td>Birth</td>
<td>No QX</td>
<td>ET +5</td>
<td>ET 5º</td>
<td>Yes</td>
<td>+6</td>
<td>0.3</td>
</tr>
</tbody>
</table>

M: Male; XT: Exotropia; RE: Right eye; BO: Both eyes; cf: counts fingers; F: female; ET: Endotropia; LE: Left eye; p&p: perceives and projects; Qx: surgery; SV: vertical anisotropy in V; y: years; m: months; d: days; Uni: unilateral; Bi: bilateral.
In 11 cases the cataract was unilateral and in 10 bilateral.

In 12 patients, VA of the worst eye during the last examination recorded was $\geq 0.3$, which represents 57.1%.

Strabismus treatment was provided in six cases with stable angle, four ET (one with vertical anisotropy in V) and two XT. Four classic surgeries were performed (cases 11, 12, 16, 19), one with an injection of 2.5 u. of botulinum toxin in MR (case 1) and one with classic surgery associated to two injections of botulinum toxin (case 20) with results shown in table II. In four patients, cataract was unilateral and in two bilateral.

With the toxin injected as the only treatment in one patient with endotropia less than 10º we achieved good motor results. We also injected toxin as complementary treatment to surgery in another case, applying two injections: the first for surgical hypercorrection, injecting 2.5 u. in medial rectus and the 2nd one for hypocorrection, injecting 5 u. in lateral rectus.

Average age of strabismus treatment was 5.2, SD 2.5 years (range: 2-9 years). The motor end results achieved were good in five cases (three with orthophoria and two with microtropia) and poor in another, the one receiving surgical treatment at 2 years and subsequently with two toxins, remaining with residual exotropia of 7º. Sensorial results were only good in two cases.

VA of the eye or eyes affected, prior to strabismus treatment was greater than 0.4 in the six cases, with a mean of 0.6, SD 0.2. A worsening of final VA was observed in five of the patients operated on (table I and II). Average follow-up time since strabismus surgery or botulinum toxin was 2.7 years, SD 2.3 (range 1-7 years).

### DISCUSSION

The association of congenital cataracts with sensorial strabismus is presented very frequently (1,2). We have found a prevalence of 72.4%, a figure that is consistent with most studies published in literature on this topic (3,4,7,8).

There is also agreement on the fact that the percentage of strabismus increases after cataract surgery (1-3,9), although in some cases the cataract extraction can compensate a prior ocular deviation (4).

Of the 21 cases, 12 (57.1%) had prior strabismus but following cataract surgery and visual rehabilitation 100% presented strabismus, therefore in no case was deviation compensated with the medical or surgical treatment applied. In one case we observed inversion of XT to ET.

Some authors have found a greater predisposition to strabismus in unilateral cataracts than in bilateral ones (10). We, as in other studies, (4) have observed no significant difference (11 unilateral and 10 bilateral).

We have studied the type of strabismus observed coinciding with other authors (4) in which endotropia was double than exotropia, eight endotropias in prior strabismus, and 14 in subsequent strabismus. We diagnosed four prior exotropias and seven subsequent ones. The more frequent association of endotropia with congenital cataracts, and of exotropia with acquired or traumatic cataracts is something reported by other authors (3,4). Vertical strabismus was observed only in two cases with DVD and one patient presented vertical anisotropy in V. Its limited incidence has also been published in literature (4).

The type of surgery conducted for cataract extraction was the same in all the sample patients,
inserting an IOL in all patients except five. We found a similar incidence of strabismus to studies published where surgery was conducted with IOL or contact lenses (9,10). We did not find, contrary to other authors, a decrease in the number of cases of strabismus when an IOL is implanted (5).

The best time to treat strabismus may be early, as soon as it is diagnosed according to the preference of some authors (6), or later, after completing visual rehabilitation (4,11). We agree with the authors who prefer operating later, after completing total occlusions and observing stability in ocular deviation with regular check-ups. The authors who endorse early surgery reason that it shortens the time of visual rehabilitation, improves binocularity and favors the use of contact lenses (6). However, it should be noted that deviation instability and variability is a very frequent characteristic of this type of strabismus (4), observed in six cases in our study. This is why, until a stable deviation angle is noted in successive check-ups, it would not be wise to indicate surgical treatment of strabismus. Some authors have observed compensation of strabismus with time, not requiring surgery (4).

With our criteria, six of the 21 patients (28.6%) required strabismus treatment, in five we performed classic surgery (23.8%), and one only required treatment with botulinum toxin. These figures are in line with some papers published on unilateral and acquired congenital cataracts and ranging from 41.7% (9), or 34.5% (3) to 20-29% (5,7). Hiles and Sheridan in their long series published an incidence of 23.4% of strabismus surgeries conducted in patients with childhood cataracts, both bilateral and unilateral (4).

The motor end results achieved with strabismus treatment were good in five of the six cases (83.3%). Of these five, we performed classic monocular retroinsertion/ resection or binocular retroinsertion surgery, weakening the inferior oblique in a patient presenting vertical anisotropy in V with hyperfunction of these muscles. In another patient we injected 5u. of botulinum toxin as MR treatment in the pseudophakic eye. In three of the five cases we achieved orthotropia and in the other two microtropia. Only one case had poor motor end results. This was the only patient who had been operated earlier than the others, at age 2, since he had achieved 0.8 VA and good alternation. After surgery, two botulinum toxin injections were given, the 1st in medial rectus, 2.5 u. for hypercorrections, and the 2nd 5 u. in lateral rectus for hypocorrection, remaining with a residual deviation of 7°. Other studies have also published excellent motor results although some needed more than one operation, 76.5% increasing to 94.1% with a second surgery (7).

Sensorial results were worse than motor ones since only in two cases did we match Worth’s test (33.3%), one of them also with 480° stereopsis. Poor sensorial results are consistent with other studies that consider strabismus a factor of bad prognosis to achieve binocularity, already highly affected in patients with congenital cataracts (7,12).

Other papers also highlight that sensorial strabismus darkens prognosis of amblyopia treatment (7,8,13,14). In our sample, final VA ≥ 0.3 was achieved in 12 out of 21 patients (57.1%). Final VA in five of the six patients that needed strabismus treatment worsened with regard to VA prior to surgery or toxin, something which could be related to lower compliance of occlusive treatment once ocular parallelism is achieved, except in case nº 20 where the VA variance may have been due to the fact it was recorded with different optotypes due to patient’s age (Pigassou prior to strabismus surgery and Snellen in final VA).

We may conclude from the study conducted that strabismus secondary to congenital cataract surgery appeared in all patients operated on. The incidence of strabismus increases after extracting the cataract whether an intraocular lens is implanted or not, compared to strabismus prior to surgery. Endotropia doubled exotropia. Not all cases of strabismus required corrective surgery. Variability in the deviation angle is frequent in these patients. Strabismus treatment conducted after completing visual rehabilitation achieves good results from a motor perspective, but not a sensorial one.

REFERENCES

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