The Surgical Outcome of Inferior Oblique Recession on Bilateral Superior Oblique Palsy in Children†

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Objective: To study the surgical effects of bilateral graded inferior oblique muscle (IO) recession on the reduction of the V pattern deviation and severity of inferior oblique muscle overaction (IOOA) in children who had bilateral superior oblique muscle palsies (SOP) with secondary inferior oblique muscle overaction.

Material and Method: Seven patients who presented with bilateral SOP with secondary IOOA were included. All patients had V pattern deviation and bilateral graded IO recession was done. The data of age, sex, deviation in primary position, V pattern and severity of IOOA was recorded both pre- and post-operatively. The comparison of pre-operative and post-operative amount of V pattern and IOOA was analyzed with non-parametric statistical analysis.

Results: Four females and three males had the average age of 5.7 ± 1.8 years old. The mean pre-operative severity of IOOA was +3 and the mean pre-operative deviation of the V pattern was 36 ± 11.4 prism diopters (PD). The mean post-operative severity of IOOA was +0.4 and of V pattern deviation was 10.7 ± 4.4 PD. Comparing the pre-operative and post-operative severity of IOOA and V pattern deviation by non-parametric statistical analysis and the result was statistically significant.

Conclusion: Bilateral graded IO recession is an effective surgical procedure to reduce the V pattern and the severity of IOOA in the children who are suffering from bilateral SOP with secondary IOOA.

Keywords: Eye movements, Oculomotor muscles, Bilateral superior oblique palsy, V pattern, Inferior oblique recession

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tucking or bilateral SO tucking plus bilateral IO recession, which is better than bilateral IO recession alone.

In the aspect of IO recession, this surgical technique is an easy operation, no post-operative complication of abnormal lid position or muscle restriction. Therefore, the study is concentrated in the surgical effect of bilateral graded IO recession in the children with the bilateral SOP accompanied by secondary IOOA on the reduction of the V pattern and IOOA severity.

Material and Method

Seven patients in the muscle clinic, Queen Sirikit National Institute of Child Health who had bilateral SOP with secondary IOOA were included between April 1, 2007 and September 30, 2007. The criteria for the diagnosis of bilateral SOP consisted of the evidence of a SOP by three-step test, alternating hypertropia at right and left gaze, presence of hypertropia on head tilt in either side, V pattern esotropia in downgaze, and underaction of both SO muscles onduction. The severity of IOOA and SO underaction (SOUA) before and after surgery was graded. This was done by recording the difference between the corneal limbus height in each eye according to the degree of over-elevation of the eye in adduction for IOOA and of underaction of the eye in adduction for SOUA. The over-elevation and the underaction scale ranged from 0 to +4 for IOOA (Fig. 1) and 0 to -4 for SOUA (Fig. 2) respectively.

In the aspect of deviation in the primary position, the measurement was performed by prism cover test at distance (6 meters) and at near (33 centimeters). For V pattern deviation, prism cover test and photograph of the eye movement in the primary position, as well as upgaze and downgaze at distance was recorded. However, if the patients were not co-operative, the Hirschberg test was performed.

Considering the surgical technique, an inferotemporal conjunctival fornical incision was made. The conjunctiva and tenons were open separately in layers. The IO muscle was identified and hooked under direct vision. The IO muscle was cleared of its surrounding intermuscular septa. A double-armed 6-0 vicryl suture was passed through the muscle with lock-bite at either side, and then the IO muscle was disinserted from the globe between the suture and its insertion.

The amount of recession was titrated according to the degree of IOOA severity. In +2 severity of IOOA, a 10 millimeters recession was done with the needle site entering from the anterior border of the disinserted muscle at the sclera 3 millimeters posteriorly and 2 millimeters temporally to the lateral border of the inferior rectus muscle insertion. For +3 to +4 severity of IOOA, the surgery required a 14 millimeters recession.

Fig. 1 Shows grading of inferior oblique overaction (IOOA = inferior oblique overaction; RT = right; LT = left)
with the needle site was in front of the exit of the vortex vein or 8 millimeters posteriorly to the lateral border of the inferior rectus muscle insertion. Furthermore, the surgical correction of the deviation in primary position was done in the same operation and then the conjunctiva and tenons were closed in separate layers using interrupted 8-0 vicryl suture.

The authors recorded the age of the patients, the fundus findings, the deviation in the primary position, and the pre-operative and post-operative data of the amount of V pattern, the severity of IOOA and SOUA. The authors compared the pre-operative and post-operative data of the amount of V pattern, the severity of IOOA, and SOUA by using Wilcoxon sign-rank test at significance level p < 0.05.

Results

Seven patients with four females and three males had the mean age of 5.7 ± 1.8 years old. All patients had normal fundi. Most of the pattern of deviation in the primary position was esotropia (Table 1). The mean pre-operative deviation of V pattern was 36.4 ± 11.4PD, the mean severity of pre-operative IOOA was +3.14 (+2 to +4), and of SOUA was -2.5 (-2 to -4) (table 1). Postoperatively, the mean deviation of V pattern was 10.7 ± 4.4 PD, the mean

Table 1. Shows the pre-operative measurements of the patients

<table>
<thead>
<tr>
<th>No.</th>
<th>Deviation in primary position (PD)</th>
<th>Bielschowsky head tilt test</th>
<th>Pre-operative V pattern (PD)</th>
<th>Pre-operative IOOA</th>
<th>Pre-operative SOUA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RE</td>
<td>LE</td>
<td>RE</td>
</tr>
<tr>
<td>1</td>
<td>ET 30</td>
<td>-</td>
<td>50</td>
<td>+2</td>
<td>+4</td>
</tr>
<tr>
<td>2</td>
<td>ET 18</td>
<td>Positive to RT &gt; LT</td>
<td>35</td>
<td>+3</td>
<td>+2</td>
</tr>
<tr>
<td>3</td>
<td>ET 65</td>
<td>Positive to RT &gt; LT</td>
<td>50</td>
<td>+3</td>
<td>+3</td>
</tr>
<tr>
<td>4</td>
<td>ET 65</td>
<td>Positive to RT &gt; LT</td>
<td>40</td>
<td>+3</td>
<td>+3</td>
</tr>
<tr>
<td>5</td>
<td>RDVD 12 with RHT 8</td>
<td>Positive to RT</td>
<td>25</td>
<td>+4</td>
<td>+4</td>
</tr>
<tr>
<td>6</td>
<td>ET 12 with RDVD</td>
<td>Positive to RT</td>
<td>20</td>
<td>+4</td>
<td>+4</td>
</tr>
<tr>
<td>7</td>
<td>ET 45</td>
<td>Positive to RT &gt; LT</td>
<td>35</td>
<td>+3</td>
<td>+2</td>
</tr>
</tbody>
</table>

ET = esotropia; RDVD = right dissociated vertical deviation; RHT = right hypertropia; PD = prism diopters; RT = right side; LT = left side; RE = right eye; LE = left eye; IOOA = inferior oblique overaction; SOUA = superior oblique underaction
severity of IOOA was +0.43 (0 to +2), and of SOUA was -0.57 (0 to -2) (Table 2). All patients underwent muscle correction to treat the deviation in the primary position at the same session of bilateral IO recession (Table 3). When comparing the pre-operative and post-operative V pattern and the severity of IOOA with the non-parametric test, the results were statistically significant. Furthermore, the mean severity of SOUA was also reduced from -2.5 to -0.57 (Fig. 3, 4).

Discussion
From the results, the bilateral graded IO recession was an impressive surgery to decrease V pattern in bilateral SOP with secondary IOOA i.e. it reduced 66% of the pre-operative deviation of V pattern. Moreover, this procedure prominently reduced the severity of IOOA and improved the clinical SOUA.

The clinical features of bilateral SOP, although the patients usually presented with no vertical deviation in the primary position, the patients had findings of left hyperdeviation in right gaze, right hyperdeviation in left gaze, right hypertropia on right head tilt, left hypertropia on left head tilt, large degree of excyclotorsion, and V pattern\(^9\). Because of the age and co-operation of patients in the present study, excyclotorsion testing was not done. However, the diagnosis of bilateral SOP was done by the evidence of three-step test and V pattern deviation.

Various surgical methods were reported to treat bilateral SOP with V pattern as the followings bilateral SO tucking\(^3\), bilateral inferior rectus muscle recession\(^2\), bilateral medial rectus muscle infraplace\(^5\) and bilateral IO weakening\(^2,3,4,5\). However, a study recommended bilateral IO recession.

<table>
<thead>
<tr>
<th>No.</th>
<th>Pre-operative deviation in primary position (PD)</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ET 30 PD</td>
<td>BMR recess 4.5 mm RIO recess 10 mm LIO recess 14 mm</td>
</tr>
<tr>
<td>2</td>
<td>ET 18 PD</td>
<td>RMR recess 4.5 mm BIO recess 14 mm</td>
</tr>
<tr>
<td>3</td>
<td>ET 6 PD</td>
<td>BMR recess 6.5 mm BIO recess 14 mm</td>
</tr>
<tr>
<td>4</td>
<td>ET 5 PD</td>
<td>BMR recess 6.5 mm BIO recess 14 mm</td>
</tr>
<tr>
<td>5</td>
<td>RDVD 12 PD with RHT 8 PD</td>
<td>RSR recess 3.0 mm + Faden 15 mm from limbus, BIO recession 14 mm</td>
</tr>
<tr>
<td>6</td>
<td>ET 12 PD with RDVD</td>
<td>BIO recess 14 mm</td>
</tr>
<tr>
<td>7</td>
<td>ET 45 PD</td>
<td>BMR recess 5.5 mm RIO recess 14 mm LIO recess 10 mm</td>
</tr>
</tbody>
</table>

ET = esotropia; RDVD = right dissociated vertical deviation; RHT = right hypertropia; PD = prism dipters; BMR = bilateral medial rectus; RIO = right inferior oblique; LIO = left inferior oblique; RMR = right medial rectus recession; BIO = bilateral inferior oblique; RSR = right superior rectus
in the patients with asymmetrical SOP, small hyper-deviation in the primary position, V-pattern esotropia and IOOA\(^4\). In the present study, all patients had bilateral SOP with secondary IOOA, V-pattern esotropia and no or small hyperdeviation in the primary position. Therefore, the surgical technique of bilateral IO weakening by graded IO recession was selected due to ease of the procedure and the low risk of the surgical
technique. The surgeon could titrate the amounts of recession as the degree of IOOA or repeat the operation and avoid iatrogenic Brown syndrome from SO tucking.

Even though surgical results were good, the present study was not a comparative clinical research and had a small sample size with short follow up. Therefore, further long-term observation and a larger study is required.

In summary, bilateral graded IO recession is an effective procedure to correct V pattern and reduce IOOA from bilateral SOP with secondary IOOA in children.

References
การศึกษาผลการผ่าตัดกล้ามเนื้อตาด้วยวิธี inferior oblique muscle recession ในผู้ป่วยเด็กที่คัดกรอกการวินิจฉัยเป็น superior oblique palsies 2 ตา

พัชรพิมพ์ มัศยาอานนท์, ไอรีน ศุภางคเสน, จุฑาทิพย์ หิริโอตัปปะ

วัตถุประสงค์: เพื่อศึกษาผลการผ่าตัดกล้ามเนื้อตาด้วยวิธี inferior oblique muscle recession ที่มีต่อการลดภาวะ V pattern และ inferior oblique overaction ซึ่งพบในผู้ป่วยที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา และมีภาวะ secondary inferior oblique overactionรวมด้วย

วิสุทธิ์และวิธีการ: เก็บรวบรวมข้อมูลผู้ป่วยเด็ก 7 รายในคลินิกกล้ามเนื้อตาสถาบันสุขภาพเด็กแห่งชาติมหาราชินี ที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา และมีภาวะ secondary inferior oblique overaction รวมด้วยทั้ง 2 ตา (1 เมษายน ถึง 30 กันยายน พ.ศ. 2550) ผู้ป่วยทุกรายตรวจพบภาวะ V pattern ก่อนการผ่าตัด และผู้ป่วยได้รับการผ่าตัดด้วยวิธี inferior oblique muscle recession ทำการเก็บข้อมูล อาทิ เพศของผู้ป่วย, ชนิดและปริมาณมุมเขินท่าหน้าตรง, ปริมาณของ V pattern และระดับความรุนแรงของ inferior oblique overaction ทั้งก่อนและหลังผ่าตัด แล้วนำข้อมูลที่ได้มาวิเคราะห์และเปรียบเทียบโดยใช้สถิติ non-parametric

ผลการศึกษา: ผู้ป่วย 7 ราย เป็นชาย 3 ราย หญิง 4 ราย มีอายุเฉลี่ย 5.7 ± 1.8 ปี ค่าเฉลี่ยของปริมาณ V pattern ก่อนการผ่าตัดคือ 36 ± 11.4 ปริซึมไดออปเตอร์ (PD) และค่าเฉลี่ยของปริมาณ inferior oblique overaction ก่อนการผ่าตัดคือ 3 ภายหลังการผ่าตัดมีค่าเฉลี่ยของปริมาณ V pattern และปริมาณ inferior oblique overaction เป็น 10.7 ± 4.4 PD และ 0.4 ตามลำดับ ขณะที่ค่าเฉลี่ยของปริมาณ V pattern และปริมาณ inferior oblique overaction ก่อนและหลังการผ่าตัดมาเปรียบเทียบโดยใช้สถิติ non-parametric ผลการเปรียบเทียบมีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ

สรุป: การผ่าตัดกล้ามเนื้อตาด้วยวิธี inferior oblique muscle recession เป็นวิธีการผ่าตัดที่ได้ผลดีที่สุดในทางการรักษาภาวะ V pattern และ inferior oblique overaction ในผู้ป่วยที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา