Long-Term Results of Hang-Back Medial Rectus Recession

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ABSTRACT

**Purpose:** To report long-term results with the hang-back technique for medial rectus muscle recession.

**Methods:** Medical records of 341 consecutive patients who underwent unilateral or bilateral hang-back medial rectus recession were reviewed. The amount of recession was based on the size of the esotropia as measured at near fixation. Patients were divided into two groups according to age at onset of esotropia: patients <1 year comprised group 1 and patients ≥1 year comprised group 2. Surgical outcomes were analyzed for all patients included in the study.

**Results:** A total of 189 patients met the inclusion criteria. In group 1 patients (n=32), average deviation improved from 48.3 prism dipters (PD) preoperatively to 1.1 PD postoperatively. Eleven patients required a second procedure: 9 with recurrent esotropia and 2 with consecutive exotropia. Average time to second procedure was 27.4 months. In group 2 patients (n=157), average deviation improved from 29.6 PD preoperatively to 1.1 PD postoperatively. Twenty-one patients required a second procedure: 20 with recurrent esotropia and 1 with consecutive exotropia. Average time to second procedure was 22.7 months.

**Conclusion:** The hang-back technique represents a safe, effective alternative to conventional medial rectus recession.


INTRODUCTION

Medial rectus recession is a well-established procedure for the treatment of esotropia. Since the advent of adjustable sutures, the hang-back technique has become more popular. Advantages cited for this technique include ease to perform because of better surgical exposure with the potential for reduced risk of scleral perforation and retinal damage, and shorter surgical and anesthesia time. Capo et al reported results of medial rectus hang-back recession in which 0.5 mm was added to the desired amount of recession to account for the distance between the scleral tunnels. They reported a 16% overcorrection rate compared to the conventional recession procedure. This is in contrast to the 40% undercorrection rate reported by Rajavi et al, who did not make this addition.
This article reports our long-term results for hang-back medial rectus muscle recession using measurements identical to those previously established for our conventional recession procedures.

**Materials and Methods**

**Patient Population**

Medical records were reviewed for 341 consecutive patients who underwent unilateral or bilateral medial rectus muscle recession using the hang-back technique performed by one of the authors (LBN) at Wills Eye Hospital between July 1995 and June 2000. Patients who met the following criteria were included in the study: 1) preoperative esotropia of at least 12 prism diopeters (PD), 2) no previous muscle surgery on operative muscle(s), 3) full ductions and versions preoperatively, and 4) postoperative follow-up ≥6 months. Patients with developmental delay and neurological disorders were excluded.

Deviations were measured using either Krimsky's method in young children and patients with dense amblyopia, or the prism and cover test. The amount of recession performed was based on the size of the esotropic deviation as measured at near fixation (Table 1), as suggested by the results of O'Hara and Calhoun, and their discussion by Guyton.14

**Surgical Technique**

The muscle and tendon were exposed using a cul-de-sac approach as described by Parks or a limbal conjunctival incision.1 The muscle was isolated, and a double-armed 6-0 polyglactin suture was woven through the muscle using previously described techniques.14 The muscle was disinserted by cutting it flush with the sclera. Angled scleral tunnels were formed beneath the center of the original medial rectus insertion site. The tunnels were 1.5 to 2.0 mm in length and converged to form a “V” with the apex toward the cornea. The entry sites were approximately 4 mm apart, and the exit sites were 0.5 to 1 mm apart. The loose muscle was pulled up snugly against the insertion.

The distal caliper tip was held against the anterior aspect of the insertion while the proximal tip was used to measure the taut suture arms. A locking needle holder was placed around the sutures immediately below the proximal tip of the caliper, and four overhand knots were tied and trimmed. The needle holder was then removed, and the muscle was allowed to fall back from the original insertion while the eye was rotated in the opposite direction. Finally, the caliper was used to confirm the desired amount of recession. In each patient, the desired amount of recession was correct. The conjunctiva was repositioned and closed with 6-0 plain suture in an interrupted fashion.

Postoperative measurements were obtained at all follow-up examinations. For the purpose of this study, a successful result was considered to be alignment within 10 PD of orthophoria while the patient wore the necessary correction (including bifocals) at the most recent follow-up visit. Surgical outcomes were analyzed for all patients included in the study.

**Results**

Of the 341 consecutive patients who underwent unilateral or bilateral hang-back medial rectus recession, 189 patients met the inclusion criteria for the study and comprised the study population. Of these, 87 (46%) were females and 102 (54%) were males. One hundred three (54.5%) patients underwent unilateral surgery, and 86 (45.5%) patients underwent bilateral surgery. Patients were divided into two groups based on their age at onset of esotropia. Thirty-two (16.9%) patients <1 year comprised group 1 and 157 (83.1%) patients ≥1 year comprised group 2.

Of the 152 patients who were excluded from the study, 82 (53.9%) were excluded because of inadequate follow-up (ie, <6 months); 25 (16.4%) were excluded for Duane's retraction syndrome or other types of paretic deviations; 18 (11.8%) were exclus-
ed for coexisting neurological disorders such as cerebral palsy, pervasive developmental delay, traumatic brain injury, or nystagmus; 20 (13.2%) were excluded because of simultaneous resection of the lateral rectus on the same eye; and 7 (4.6%) were excluded because of previous surgery on the involved muscle(s). Of the 82 patients excluded for inadequate follow-up, 31 (37.8%) had at least 2 postoperative examinations; all 31 patients were within 10 PD of orthophoria at their last examination.

**Group 1**

Fourteen (43.8%) patients were females and 18 (56.2%) were males. Average age was 17.7 months at the time of first examination (range: 4-63 months, SD 14.7). Average preoperative esotropia was 48.3 PD (range: 25-75 PD, SD 16). Twelve (37.5%) patients had documented amblyopia. The average amount of recession was 5.9 mm/muscle (range: 5.7 mm/muscle, SD 0.7). Twenty-nine (90.6%) patients underwent bilateral surgery and the remaining 3 (9.4%) underwent unilateral surgery. Average postoperative deviation on the first postoperative examination was 1.1 PD (range: 0-10 PD, SD 3.0). Average follow-up was 36.2 months (range: 9-91 months, SD 21.2). Final measurements for patients who did not require further surgery averaged 1.1 PD (range: 0-10 PD, SD 2.4) (Table 2).

Eleven (33.3%) patients required a second procedure to achieve adequate alignment: 9 (81.8%) had recurrent esotropia and 2 (18.2%) had consecutive exotropia. Average time to the second procedure was 27.4 months (range: 3-67 months, SD 26.5). Average deviation for patients requiring a second procedure was 22.5 PD (range: 18-30 PD, SD 2.4). Immediate postoperative measurements averaged 2.9 PD (range: 0-10, SD 3.4).

**Group 2**

Seventy-three (46.5%) patients were females and 84 (53.5%) patients were males. Average patient age was 131.2 months (range: 13-1004 months, SD 210.2) at the time of first examination. Average preoperative esotropia was 29.6 PD (range: 12-50 PD, SD 7.0). Forty-seven (29.9%) patients had documented amblyopia. The average amount of recession was 5.7 mm/muscle (range: 4.5-7.5 mm/muscle, SD 0.7). One hundred (63.7%) patients underwent unilateral surgery and 57 (36.3%) patients underwent bilateral surgery. Average postoperative deviation was 1.1 PD (range: 0-10 PD, SD 2.3). Average follow-up was 25.5 months (range: 6-74 months, SD 15.2). Final measurements averaged 1.9 PD (range: 0-25 PD, SD 4.3) (Table 2).

Twenty-one (13.4%) patients required a second procedure to achieve adequate alignment: 20 (95.2%) had recurrent esotropia and 1 (4.8%) had consecutive exotropia. Average time to the second procedure was 22.7 months (range: 4-73 months, SD 17.3). Average deviation for patients requiring a second procedure was 23.5 PD (range: 16-45 PD, SD 6.6). Immediate postoperative measurements averaged 2.0 (range: 0-16 PD, SD 4.0).

No complications such as slipped or lost muscle, induced vertical deviation, infection, or recognized scleral perforation occurred in either group.

**DISCUSSION**

Recession techniques for the correction of strabismus evolved from the myotomies first reported by Diefenbach in the 1830s. In the early 1920s, Jameson performed the first recessions, which involved suturing the muscles to the sclera with silk. Since then, the technique of conventional scleral sutures has undergone few modifications. Adjustable sutures, loop recessions, and hang-back recessions are among the alternatives to the conventional approach. Jampolsky often is credited with the popularization of adjustable sutures in the 1970s. Later, Repka and Guyton modified the adjustable suture procedure and developed the hang-back recession. Prior to that, Gobin described the loop recession or suspension in the 1960s. The loop recession differs from the adjustable and hang-back techniques in that scleral reattachment is posterior to the original insertion and the muscle is suspended from the posterior attachment site. Potter et al.

**TABLE 2**

<table>
<thead>
<tr>
<th>Patient Characteristics and Results by Group</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. patients</td>
<td>32</td>
<td>157</td>
</tr>
<tr>
<td>Average age at diagnosis (months)</td>
<td>17.7</td>
<td>131.2</td>
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<tr>
<td>Average preoperative deviation (PD)</td>
<td>48.3</td>
<td>29.6</td>
</tr>
<tr>
<td>Average mm/muscle of recession</td>
<td>5.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Average final measurement (PD)</td>
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<td>1.9</td>
</tr>
<tr>
<td>No. patients requiring reoperation</td>
<td>11</td>
<td>21</td>
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resurrected the loop recession and coined the term "hemihang-back." They suggested use of this technique for recessions >7 mm to avoid problems with anterior migration of the muscle, which had been reported in prior animal studies.1,2,3

We attribute our high exclusion rate to the stringent inclusion criteria. Requiring ≥6 months of follow-up accounted for the majority of exclusions from the study. Previous studies have limited follow-up to 6 weeks, but this may skew the data toward a more positive result. By 6 months postoperatively, there is little chance that a shift in deviation is related to the surgery. If we had required 6 weeks of follow-up, an additional 33 patients could have been included in the study population; of these, 32 patients had measurements ≤10 PD at 6 weeks.

This report summarizes our experience with hang-back recessions over an extended postoperative period. The overall success rate for this procedure at the initial postoperative examination was 100%. While unilateral cases represented 63.7% of the surgeries for acquired esotropia, 81% of the second procedures were performed on unilateral cases. Chi-square analysis showed this difference was not statistically significant (P=.28). This discrepancy was not seen in the congenital esotropia group, with unilateral cases representing 9.1% of initial procedures and 9.4% of the reoperations.

CONCLUSION

The hang-back technique represents a safe, effective alternative to conventional medial rectus recession. This technique provides better exposure, especially when a large recession is needed on a small eye or when operating with an inexperienced assistant who may be less skilled at providing good exposure for conventional surgery. With the hang-back recession, the surgeon works in the region of the pars plana, so a deep needle pass will not directly damage the retina. We found that without adding 0.5 mm to the desired amount of recession, as reported by Repka and Guyton,4 the incidence for both overcorrection and undercorrection was low.

REFERENCES