Nonabsorbable versus absorbable sutures in large, hang-back medial rectus muscle recessions

Ahmed Awadein, MD, Justin D. Marsh, MD, and David L. Guyton, MD

PURPOSE To investigate the value of nonabsorbable sutures in reducing the incidence of consecutive exotropia after large, "hang-back" medial rectus recessions.

METHODS The medical records of patients who underwent medial rectus recession of ≥6.5 mm in individuals ≤2 years of age, or ≥7.0 mm in those >2 years were retrospectively reviewed. Patients were divided into two groups based on suture material used: absorbable, polyglactin 910 sutures (44 patients); nonabsorbable, polyester sutures (50 patients). Preoperative measurements, ductions, strabismus surgery, and postoperative results were analyzed. Inadequate anchoring of the medial rectus muscle was suspected when consecutive exotropia developed 4-7 weeks after surgery after initial satisfactory alignment and was confirmed if during reoperation the medial rectus muscle appeared recessed >2 mm beyond the originally intended recession.

RESULTS Consecutive exotropia due to inadequate anchoring of the medial rectus muscle occurred in 11 of 66 muscles (17%) in the absorbable suture group. The muscle was found 6–10 mm posterior to the intended recession. Limited duction in the field of action of the involved medial rectus muscle occurred in 9 of the 11 muscles (82%). None of the eyes with nonabsorbable sutures showed inadequate anchoring. The incidence of consecutive exotropia was higher in the absorbable suture group (30%) than in the nonabsorbable suture group (6%) ($P < 0.005$).

CONCLUSIONS Using nonabsorbable suture for large, hang-back medial rectus recessions greatly reduces the incidence of consecutive exotropia that can occur when absorbable suture dissolves. (J AAPOS 2016;20:206-209)

Consecutive exotropia following medial rectus recession is a frustrating result for surgeon and patient. Although early overcorrection may result from too much surgery, a slipped muscle[1,2] or a stretched scar[3] should also be considered in such cases. Prior to 2003, we noted that occasional patients undergoing large medial rectus muscle recession on "hang-back" sutures developed consecutive exotropia 4-7 weeks after initial successful alignment in the first postoperative week. Because 6-0 polyglactin sutures lose their tensile strength in a predictable manner, retaining only 30% of their breaking strength at 21 days,[4] we hypothesized that if the muscle had not attached well to the sclera before that time, it would migrate backward when the suture broke. Clinically this caused a relatively rapid exoshift, noted intraoperatively as slippage of the true muscle fibers posteriorly.

Author affiliation: The Zanvyl Krieger Children's Eye Center at the Wilmer Institute, The Johns Hopkins University School of Medicine, Baltimore, Maryland

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Correspondence: Justin D. Marsh, MD, The Wilmer Institute 233, The Johns Hopkins Hospital, 600 North Wolfe Street, Baltimore, MD (email: jdmarsh@cmh.edu).

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It has been postulated that because of the shorter wrap-around effect of the inferior and medial rectus muscles as compared with the superior and lateral rectus muscles, the inferior and medial rectus muscles may be more likely to experience inadequate muscle adherence to the globe, particularly when using a hang-back technique.[5] This was further confirmed by Chatzistefanou and colleagues,[6] who found, on magnetic resonance imaging, that the inferior and medial rectus muscles have the shortest arc of contact with the globe. Using nonabsorbable sutures when performing strabismus surgery on the inferior rectus muscle can minimize this complication.[7]

Our intraoperative findings of inadequate muscle anchoring suggested that perhaps nonabsorbable sutures could be used for large medial rectus muscle recession in a similar manner as we used for inferior rectus muscle recessions. The present study aimed to investigate the possible advantages of using nonabsorbable sutures for large, hang-back recessions of the medial rectus muscle in reducing the risk of consecutive exotropia.

Subjects and Methods

The study protocol was approved by the Johns Hopkins Medicine Institutional Review Board. The study and data collection were compliant with the US Health Insurance Portability and Accountability Act of 1996. The medical records of patients

who had undergone medial rectus muscle recession surgery from 1980 through 2005 at the Wilmer Eye Institute were reviewed retrospectively. Patients who had undergone unilateral or bilateral medial rectus muscle recession of at least 6.5 mm for children ≤2 years of age or at least 7.0 mm for those >2 years of age, as measured from the original insertion site, were considered for inclusion. In patients who had undergone previous medial rectus muscle recession, the total amount of recession was considered to be equal to the sum of the original amount of recession, as determined intraoperatively, and the new amount of recession after adjustment. Patients were included in the study only if they had a minimum of 3 months' postoperative follow-up. At that time, most of any absorbable suture material was expected to be resorbed. Patients who had a history of prior scleral buckle surgery or slipped or lost muscles as well as those with thyroid eye disease, myasthenia gravis, Duane syndrome, cranial nerve palsies, or craniofacial anomalies were excluded. Variables analyzed included preoperative measurements, amount of strabismus surgery, and postoperative results.

The angle of deviation was measured either with the prism and alternating cover test or with the Krimsky prism reflex method, depending on patient age. The pre- and postoperative angles of deviation were calculated for each subject as the mean of the distance and near angles if measured by prism and alternating cover test or simply by the Krimsky measurement if measured only at near. Prior to surgery, patients with hyperopic refraction of more than +2.00 D were prescribed the full cycloplegic correction. Additionally, patients with amblyopia were treated or were continued on treatment after the surgery.

The surgeries were performed by one surgeon (DLG) using a radial cul-de-sac conjunctival/Tenon's incision. The muscle was secured with a double-armed 6-0 suture using a central knot, then a locking bite toward each corner, and disinserted. The muscle was totally dissected from Tenon's tissue, and the tissues now known as the pulley tissues were divided far backward to allow a large recession. The muscle was reattached to the sclera using the hang-back technique, and in the vast majority of cases at all ages an adjustable 6-0 polyglactin noose was placed around the muscle sutures. Traction sutures were also placed for retraction of the conjunctiva during adjustment. Adjustment aimed to orthotropia was performed on the same day of surgery, at least one hour after the conclusion of the case, once the patient was cooperative. After satisfactory alignment, the muscle sutures were tied in three throws over the noose and then trimmed. The amount of adjustment made was recorded in millimeters and used to calculate the final surgical dosage.

Patients were divided into two groups, according to the type of suture material that was used during surgery: (1) absorbable 6-0 polyglactin 910 suture (Vicryl, Ethicon, Somerville, NJ) or (2) nonabsorbable 6-0 polyester fiber suture (either Mersilene [Ethicon, Somerville, NJ] or Surgidac [Covidien, Dublin, Ireland]). Patients prior to 2003 underwent surgery using polyglactin 910 suture and were placed in the absorbable suture group. Due to subsequent concern for inadequate muscle adherence, patients from 2003 and later underwent surgery using nonabsorbable suture.

For each group, horizontal alignment and ductions of patients before and after surgery were analyzed. Underaction was graded on a scale of 0 to −4, with 0 representing full duction and −4 representing no movement into the tested field of gaze. Success was defined as alignment within 8^{Δ} of orthotropia at the end of 3 months. The incidences of undercorrection and overcorrection were calculated in both groups. Statistical analyses of differences between the two groups were performed with a *t* test.

The records of patients who had an overcorrection were reviewed for signs of inadequate anchoring of the medial rectus muscle. This condition was suspected when consecutive exotropia developed 4-7 weeks after surgery after initial satisfactory horizontal alignment in the immediate postoperative period (1 day to 1 week). All of these patients underwent reoperations approximately 3-5 months after the initial surgery. All reoperations were performed using adjustable absorbable sutures in a hang-back manner when the medial rectus muscle was advanced to within 4 mm of the original insertion. In cases where the medial rectus was to remain recessed beyond 4 mm of the original insertion, a nonabsorbable suture was employed with an adjustable "hemi-hang-back" technique.

The diagnosis of inadequate muscle anchoring was confirmed only if during reoperation the muscle fibers appeared recessed >2 mm beyond the originally intended point of recession, either because of an intervening segment of pseudotendon—a stretched scar—between the posteriorly displaced muscle fibers and the scleral attachment site, or because of slippage of muscle fibers posteriorly within its sheath, leaving an empty sheath attached to the sclera where the muscle was surgically suspended. All measurements were made from the original muscle insertion.

Of note, in some early cases performed with nonabsorbable sutures, it was found that the permanent knot at the original insertion site eroded through the conjunctiva and irritated the surrounding tissue. To prevent this complication in subsequent cases, the muscle was sutured to the sclera 4 mm behind the original insertion, and the muscle was then allowed to hang farther back (a "hemi-hang-back" technique). For example, in cases requiring a 12 mm recession, the muscle was sutured to the sclera 4 mm behind the insertion and then allowed to hang back for another 8 mm, giving a total recession of 12 mm. This ensured that the knot was far enough posterior to the insertion to be well covered by Tenon's tissue and conjunctiva, minimizing the risk of later exposure.

Results

A total of 66 muscles of 44 patients in the absorbable suture group and 67 muscles of 50 patients in the nonabsorbable suture group were included. The mean age at surgery in the former group was 28.5 years, with a standard deviation of 26.9 years (range, 1-82 years); in the latter, 35.2 ± 23.8 years (range, 1-86 years). The age difference between the groups was not statistically significant ($P = 0.2$).

Preoperative measurements and amount of recession in both groups are reported in Table 1. The mean amount of total recession in the absorbable suture group was 7.2 ± 0.77 mm with a range from 6.5 to 11 mm. In group B, the mean amount of total recession was 8.8 ± 2.5 mm