Discussion

Surgical excision and observation of periorbital dermoid cysts have both been previously demonstrated as treatment options.[4] Currently, there are no evidence-based guidelines for management. Typically, the cysts are removed for cosmetic reasons or fear of rupture. Although our study is limited by its retrospective nature, the data provide potential evaluation targets when assessing orbital dermoids, including age at presentation and dermoid size, to reduce the likelihood of spontaneous rupture. In our study cohort, the mean cyst size was significantly larger for those with evidence of prior rupture than for those without evidence of prior rupture. Additionally, the mean age at the time of presentation was significantly older for patients with evidence of prior rupture than for those without evidence of prior rupture, and there were increased odds of finding spontaneous rupture on pathological review in patients who underwent surgical removal later in life. These data suggest that spontaneous rupture is more likely to occur with a larger dermoid that has been present for a longer period of time compared to a smaller dermoid that has been present for a shorter period of time. Therefore, larger size and older patient age are factors to consider when deciding whether to remove a dermoid to avoid the chance of spontaneous rupture.

Only 1 of our 16 patients with signs of cyst rupture reported pain. This may be because our patient population was largely nonverbal; in another study, up to 18% of patients reported painful dermoids.[5] However, pain may not be the most sensitive indicator of acute rupture. Sherman and colleagues[6] presented histological evidence of prior rupture in 6 patients, all of whom were asymptomatic. Our data demonstrated no significant difference between those patients who reported pain and those who did not with respect to signs of prior cyst rupture, but the only patient who did report pain had signs of cyst rupture on the pathology report.

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Securing extraocular muscles in strabismus surgery: effect of cautery on suture strength

Carolina Adams, MD, and Steven E. Brooks, MD

An experimental study was performed to evaluate quantitatively the effect of cautery on the tensile strength of sutures commonly used in strabismus surgery. This in vitro study was conducted in a controlled fashion using 6-0 polyglactin 910 suture, two different forms of cautery, and a precision digital force gauge. The results suggest that thermal electrocautery with a wire tip can substantially weaken or break 6-0 polyglactin threads only if direct contact is made, but bipolar cautery at typical ophthalmic surgical settings does not.

Strabismus surgery requires a strategy to secure extraocular muscles to sclera until adequate scarring develops. An unstable attachment may result in a lost or slipped muscle. Potential points of failure include a breakdown in the suture, rupture of the scleral fibers, inadequate muscle imbrication, and breakage or loosening of the surgical knot. Previous studies have addressed the maximum forces generated by human rectus extraocular muscles[1] as well as the time course of healing between a reattached muscle and the sclera.[2-6] Recent studies have also evaluated the tensile characteristics of the sclera,[7] the technique used to imbricate the muscle,[8,9] the surgical knot,[9] and various aspects of the suture itself.[10] The current study was performed to objectively address the effect of cautery on suture strength.

Methods

Ten threads of 18-inch, double-armed, 6-0 coated polyglactin 910 suture (Vicryl, Ethicon Inc, Sommerville, NJ) were divided into 3.5-inch lengths. For each suture, the suture segments were randomly distributed into five groups, such that each experimental group received one segment from each of the 10 individual threads. Group 1 served as a "no cautery" control. In group 2 a low-temperature ophthalmic wire electrocautery (Cardinal

Author affiliations: Department of Ophthalmology, Columbia University Medical Center, New York, New York

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Correspondence: Steven E. Brooks, MD, Edward S. Harkness Eye Institute, 635 West 165th St., New York, NY 10032 (email: seb2204@cumc.columbia.edu).

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Health, Waukegan, IL) was used to quickly (ie, less than 1 second) touch the center of the thread with the heated tip to mimic its use in actual surgery. In group 3 the low-temperature electrocautery was applied approximately 0.5 mm away from the thread, such that no direct contact occured. In group 4 the center of each thread was firmly grasped with fine-tip bipolar forceps (Codman and Shurtieff, Raynham, MA) and subjected to 1 second of bipolar current, at a setting of 10 on a Synergy Malis Bipolar Unit (Codman and Shurtieff, Raynham, MA), the power level typically employed in strabismus surgery in our operating room. In group 5 the center of the threads was subjected to 2 seconds of bipolar current at a setting of 10. In each group the threads were briefly (eg, 5-10 minutes) submerged in a small volume of balanced salt solution. For the bipolar groups the threads were placed on a paper towel saturated with balanced salt solution to mimic interstitial fluid and facilitate the electrical current.

Tensile testing of the sutures was conducted immediately after treatment in the following manner. One end of the suture was clamped to a precision digitial force gauge (DFS2-010; Chattilon-Ametek Inc, Largo, FL); the other end, to a stationary platform, as previously described.[10] A distracting force was then applied to slowly increase the tension in the suture until rupture occurred. Tensile stress was continuously recorded at a rate of 10 Hz and uploaded in real time to a computer using propietary software (Nexygen, Chatillon Inc.) supplied by the manufacturer. The tension at the break point was automatically determined based on the sudden drop in tension occuring at the time of thread rupture (Figure 1).

Differences in mean rupture values between each group (n = 10 per group) and the control were compared using a *t* test (two-tailed).

Results and Discussion

Because rectus extraocular muscle contraction in humans is known to produce forces of up to 100 g, it is reasonable to seek at least 100 g of support from every component of the attachment until healing occurs. Previous studies have shown that a knotted 6-0 polyglactin 910 suture and 2 mm scleral tunnels of 10%-20% depth provide tensile strengths in excess of 300 g[7,10] and are therefore unlikely to be sources of failure leading to a slipped or lost muscle. Prior studies have also shown that muscle imbrication should be performed >1 mm from the cut edge and greater than 1 mm from the lateral edge of the muscle to ensure adequate tensile strength.[8] Cautery, however, is another factor that could affect suture strength and stability.

Although hemostasis during strabismus surgery can sometimes be accomplished by applying direct pressure to the tissues, the use of cautery is often necessary. If it is applied after the imbricating suture has been placed in the muscle, it is possible that the suture may be negatively affected. The data in this study reveal that even brief direct contact with a low-temperature thermal electrocautery can dramatically weaken a 6-0 coated polyglactin 910 suture to levels that would compromise muscle stability (Figure 2). It was also observed that more prolonged contact between the wire tip and the thread resulted in immediate and complete rupture of the thread (data not shown) at the point of contact.

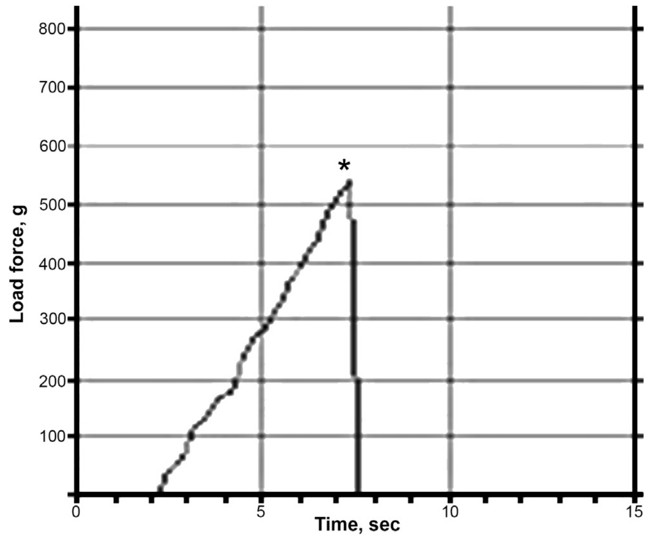

FIG 1. Representative experimental tracing showing the increase in tensile stress applied to a suture and resulting in suture rupture. In the example shown, the stress was steadily increased over a period of 5.5 seconds, with rupture occurring at 556 g. The asterisk indicates the point of suture rupture.

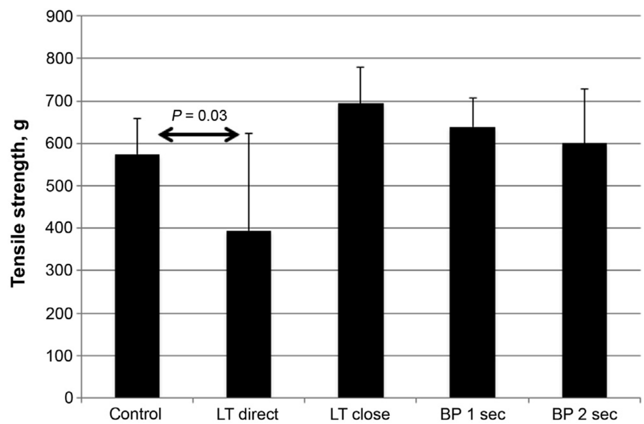

FIG 2. Control sutures were untreated (n = 10). LT direct sutures (group 2 [n = 10]) were directly contacted, briefly, by low-temperature cautery. LT close sutures (group 3 [n = 10]) had low-temperature cautery applied 0.5 mm away from the thread, but without any direct contact. BP 1 sec sutures (group 4 [n = 10]) had bipolar cautery applied to the center of the thread for 1 second. BP 2 sec sutures (group 5 [n = 10]) had bipolar cautery applied to the center of the thread for 2 seconds. Error bars indicate one standard deviation.

In contrast, the use of ophthalmic low-temperature electrocautery close to but not in direct contact with the suture did not lead to weakening. Nor was weakening observed with the use of bipolar cautery applied directly to the suture for as long as 2 seconds. The lack of damage to the thread by the bipolar current was unexpected. One possible explanation is that the polyglactin 910 threads, which are coated with calcium stearate and polyglactin 370 to improve performance and reduce the rate of in vivo absorption, may not conduct electrical current well. The chemical composition of polyglactin 910 suture (a copolymer comprised of 90% glycolide and 10% L-lactide), coupled with its intrinsic lack of water and ion content compared to biological tissue, may render it relatively invulnerable to the coagulative effects of standard bipolar electrocautery. It is important to note, however, that inordinately high bipolar levels were not tested in the current study, nor was the effect of blood or adjacent biological tissue, all of which might alter the physical properties of the suture in vivo with respect to bipolar cautery.

The data from this study suggest that cautery may be safely used in strabismus surgery, but the use of thermal electrocautery requires extreme care to avoid direct contact with the suture. On the other hand, bipolar cautery used at typical ophthalmic surgical settings does not appear to substantially weaken coated 910 polyglactin suture. Taken together, these data suggest that bipolar cautery may be preferable to thermal electrocautery in strabismus surgery.

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A new application of modified Nishida muscle transposition procedure for medial rectus muscle transection following endoscopic sinus surgery without tenotomy or splitting muscles

Miao Kong, MD,[a] Li Jun Zhang, MD,[a] Shuan Dai, FRANZCO,[b] and Jun Hong Li, MD[a]

The modified Nishida muscle transposition procedure, in which the one-third of the vertical rectus muscle bellies are sutured onto the sclera in the infero- and superotemporal quadrants without either tenotomy of the vertical rectus muscles or splitting of the vertical rectus muscle is an effective treatment for abducens nerve palsy. We report 2 cases of large-angle exotropia caused by medial rectus transection following the endoscopic sinus surgery treated using the modified Nishida procedure to transpose both vertical rectus muscles nasally, combined with lateral rectus muscle recession.

Patients with medial rectus transection, a severe but relatively rare complication of endoscopic sinus surgery (ESS), often present with large-angle exotropia and adduction deficits. Surgical management of the condition is challenging and often requires two or more procedures, especially in cases where the residual muscle stump cannot be recovered.[1] Full- or half-tendon vertical rectus transposition (VRT), such as the Hummelsheim procedure, is a viable treatment option in these cases; however, these procedures are technically complex and risk potential anterior segment ischemia, because they require operating on more than two rectus muscles. Additionally, the transposed muscles are split, and the anterior ciliary arteries in the transposed muscles may be compromised during the surgery. Vertical deviation is also a possible complication.

Muraki and colleauges[2] previously reported a case series that used a modified Nishida muscle transposition

Author affiliations: [a]Shanxi Province Eye Hospital, Shanxi Medical University, China; [b]Queensland Children's Hospital, Brisbane, Queensland, Australia

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Correspondence: Dr. Jun Hong Li, MD, Department of Strabismus and Pediatric Ophthalmology, Shanxi Province Eye Hospital, Shanxi Medical University, No.100 Fudong Street, Taiyuan 030002, China (email: lijh21c@yahoo.com).

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