

STRABISMUS

Second Chances: Adjustable Sutures for Strabismus Corrections

BY MIRIAM KARMEL, CONTRIBUTING WRITER

From the start, this wasn't a straightforward case, said David G. Hunter, MD, PhD. His patient, a one-year-old boy with strabismus, had presented with a typical left superior oblique palsy, but he also had an unusually large left hypertropia (40 PD) and a severe head tilt. "I was pretty sure that in addition to the left inferior oblique procedure, he'd need a contralateral inferior rectus recession," Dr. Hunter said. "But how much?"

Fortunately, Dr. Hunter, who is chief of ophthalmology at Children's Hospital in Boston and associate professor of ophthalmology at Harvard, didn't need a definitive answer going into surgery. He was using adjustable sutures, which give strabismus surgeons the chance to refine binocular alignment postoperatively. In surgery

Dr. Hunter decided on a 3.5-mm recession, but an hour after surgery the patient had a significant residual left hypertropia. So Dr. Hunter completed the procedure with the child sedated in the recovery room by recessing the inferior rectus muscle 2 more mm, bringing the total recession to 5.5 mm.

Six months later, the patient had no measurable strabismus in any direction of gaze. "We wouldn't have achieved that result without the suture adjustment," said Dr. Hunter.

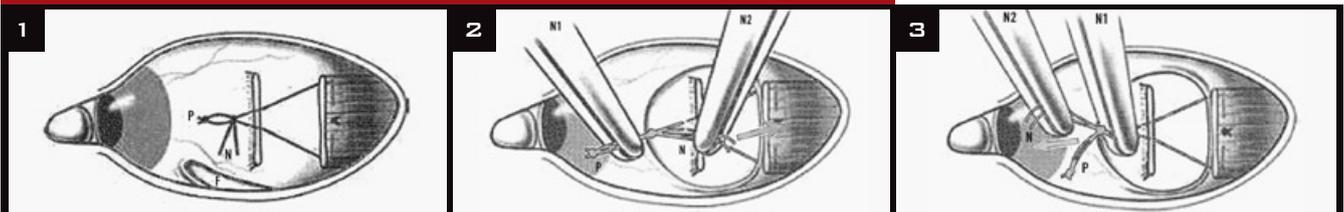
Not a New Notion

Adjustable sutures were popularized in the late 1970s by Arthur Jampolsky as a way of reducing the reoperation rate.¹ The concept is simple: Make a temporary knot, wait, and then, while the patient is still in the recovery room, assess the results. If necessary, adjust

the tension. "There are times when a patient comes out of surgery with a result that's clearly not what you wanted. And you can fix it," Dr. Hunter said.

But not a simple skill. If the concept is simple, the execution is anything but, which may explain why many strabismus surgeons have not embraced the technique. Even an advocate like David L. Guyton, MD, who uses them exclusively in both children and adults, cited the steep learning curve and resistance from anesthesiologists who balk at putting patients back to sleep. He estimated that no more than a fourth of strabismus surgeons use adjustable sutures, and fewer than that use them in young children. "It's not something for the occasional strabismus surgeon," said Dr. Guyton, who is professor of ophthalmology at Johns Hopkins University and director of the Krieger Children's Eye Center at the Wilmer Institute.

The Short Tag Noose Explained



(1) Short tag noose technique at the end of the initial surgical procedure showing the fornix incision (F). Trimmed pole sutures (P) and the trimmed noose (N) are buried under the conjunctiva. (2) Suture-adjustment technique: To tighten or decrease the recession, the pole sutures (P) are used to pull the muscle forward using a needle holder (N1) clamped in front of the noose (N), and the noose is slid posteriorly toward the sclera (arrow) using a second needle holder (N2).

(3) To loosen or increase the recession, the muscle is pulled forward and then the pole sutures (P) are stabilized by clamping behind the noose (N) using a needle holder (N1). The noose is grasped with the second needle holder (N2) and is moved away from the muscle (arrow).

All images courtesy of Dr. Hunter and reprinted with legends from last December's Archives of Ophthalmology (Nihalani, B. R. et al. Arch Ophthalmol 2009;127:1584-1590).

A Different Opinion

Times were different when Dr. Jampolsky introduced adjustable sutures, said David A. Plager, MD. Back then, the typical strabismus case involved a three-day hospital stay. Today, the time from arrival to the time the patient goes home typically takes less than three hours, he said, adding that even

if adjustable suture techniques resulted in a measurable decrease in the reoperation rate, the savings is much less today than it was 30 years ago.

Dr. Plager, who is professor of ophthalmology and director of the pediatric ophthalmology and adult strabismus service at Indiana University in Indianapolis, stopped using

adjustable sutures when he realized he was adjusting almost nobody. When he did make adjustments, he said, he wondered if he was second-guessing himself. “I might have taken what would have been a good result, if I’d left it alone, and made it into something else.”

Cost is another drawback for Dr.

Tied Up in Knots

Strabismus surgeries, with or without adjustable sutures, adhere to the same principles, Dr. Hunter said. Here are some basic suture techniques as well as thoughts on the best situations for their application.

Bow-tie. The sutures are passed through scleral tunnels, then tied together in a single-loop bow tie like a shoe lace. At adjustment, the bow is untied, the muscle position adjusted and the bow retied. Once the desired alignment is achieved, the bow is cut and converted to a square knot.

Sliding noose. The sutures are passed through scleral tunnels and emerge less than 1 mm apart. A noose is created by tying a separate piece of suture around the scleral sutures. The ends are tied together to provide a “bucket handle” for manipulation of the noose during adjustment.

Dr. Guyton’s technique. In 1981, early in his career, Dr. Guyton learned the adjustable suture technique from a student of Dr. Jampolsky’s. “I liked it so much, I stayed with it,” he said. Over the years, he refined his technique and expanded his indications. His technique involves a small cul-de-sac conjunctival



incision and burying all suture materials to minimize discomfort and reduce scarring.

After making a cul-de-sac incision through the conjunctiva, Dr. Guyton isolates, secures and disinserts the muscle. The muscle is hung back from the original insertion. He then uses a variation on the sliding noose, preferably with a 6-0 Vicryl suture on an S-28 or S-29 needle. To minimize the amount of suture material left behind, Dr. Guyton developed a removable sliding noose, which consists of a clove hitch with two slip knots.¹

Some surgeons use one adjustable suture and put nonadjustable sutures on other muscles. But to maximize the options for achieving the best result, Dr. Guyton typically puts each muscle—except the inferior oblique—on an adjustable suture. “I like to fine-tune by adjusting small amounts on more than one muscle.”

Dr. Guyton is realistic about the notion of these sutures becoming common practice. “You can’t become skilled with adjustable sutures from looking at a book or a paper. It takes my fellows four or five months of operating with me, watching an experienced person do the operation, especially the adjustment, time and again. I won’t use an adjustable suture on the inferior oblique muscle. It’s hard to get to and when you disinsert the

muscle from the globe, the muscle is still attached to the tissue surrounding the inferior rectus muscle. The distal end is floppy. You can’t tell the initial effect with the inferior oblique muscle. To determine if a patient is a suitable candidate for adjustment while awake, I assess the response to drops. I often touch the sclera with a rolled-up tissue or Q-tip to double-check their reaction.”

Dr. Hunter’s technique. Dr. Hunter uses a modified sliding noose, called the “short tag noose.”² The suture is short and buried under the tissue. He trims the suture in the operating room, leaving just enough—4 or 5 mm—for any necessary adjustment. If he is satisfied with the adjustment, no further intervention is required; he doesn’t have to touch the eye again. “Even if you don’t tie the permanent knot, the sutures aren’t going to go anywhere,” he said. “The muscles won’t slip or slide. This frees you up to leave the patient alone.”



The adjustment can be made as many as seven days following surgery. “The traditional adjustable suture needs to be completed by the next morning after surgery,” Dr. Hunter said. “With the short tag noose method, we extend the time frame for the suture adjustment. When I adjust the suture several days post-surgery, the eye has had more time to heal, so the patient may feel the adjustment more. To ease the discomfort, I give a sub-Tenon’s xylocaine infusion. People new at using adjustable sutures will sometimes overuse them and reverse an overcorrection and end up with undercorrection. You don’t want every patient to go home with straight eyes. You need to be brave and let some patients go home with an over- or undercorrection, even though you have the power to adjust it. You have to sit on your hands and anticipate that as the eye heals, it will settle into the right position.”

Dr. Plager’s caveats: “If a surgeon feels more comfortable doing an adjustment later, it’s fine to go ahead and use adjustable sutures. But surgeons who choose not to use them aren’t depriving their patients of some fantastic thing because there’s never been any evidence from a randomized, controlled study that the results are better.”



1 Sharma, M. et al. *J AAPOS* 2006;10:93.

2 Nihalani, B. R. et al. *Arch Ophthalmol* 2009;127:1584–1590.

Plager. “Not so much in dollars as in time,” he said, noting the impact on family, patient, recovery room staff and physician. And he added that re-adjustment often entails a second round of anesthesia, especially in children, which is a real dollar cost.

That muscle needs to calm down.

A final drawback for Dr. Plager is that adjustments are generally made within 24 hours, and often on the day of surgery, when the eye is still settling. In the immediate aftermath of surgery, “the eye may be turned in or out a little bit. It’s not where it’s going to be six weeks later,” he said. “The way patients look one day after surgery does not tell you how they’ll look six weeks after surgery.”

Adjustable Rebuttal

While acknowledging the disadvantages, including the extra time for adjustment, Dr. Guyton said adjustable sutures are in the patient’s best interest. “Doctors should move beyond the knee-jerk reaction that the sutures are not necessary and take too much time,” he said, because from a patient’s point of view they’re worth doing. “I am no longer comfortable subjecting a patient to the uncertainty of nonadjustable sutures.”

No hard data? Still, without any randomized, controlled studies to support one technique over the other, the decision to use adjustable sutures appears to be a matter of personal preference. There’s “no evidence anywhere, zero, that doing adjustable sutures decreases the reoperation rate,” Dr. Plager said. “With only anecdotal benefit, the cost in terms of time, discomfort and money may not be worth it for the majority of patients.”

Dr. Hunter agreed, to a point. “There is no high-level evidence that the outcomes are better, but at least two retrospective studies have shown statistically significant improvement in success rates or reoperation rates when adjustable sutures are used.”^{2,3} And as his pediatric patient with severe hyperopia demonstrated, “There are some cases where adjustable sutures are invaluable because you otherwise don’t

know how much surgery to do,” Dr. Hunter said. “It gives you confidence to make some decision about where to put the muscle.”

Dr. Plager won’t dispute that. “It is a completely viable technique and has a place for people facile with it and who feel good about using it.”

Dr. Guyton is one of those people. “There’s a higher percentage of success in my hands versus the traditional technique,” he said, in part because he feels less stress. “You always know you have that second chance.”

Surgery on Kids

Children pose a special challenge, since many must be put back to sleep in the recovery room for suture adjustment. “Nurses and anesthesiologists can be squeamish putting the child under in the recovery room rather than the OR,” said Dr. Hunter, who established a protocol at Children’s Hospital Boston that satisfies all groups and supports the ophthalmologist’s practice of adjusting sutures postoperatively in the PACU.

For the most routine pediatric cases, he uses nonadjustable sutures because of the extra time and trouble of anesthesia and because children are a little harder to assess in the immediate postop period. “It can take 15 minutes to get them to open their eyes and look at you,” he said. “So I tend to reserve adjustable sutures for children with complex strabismus or for children who have had a couple of operations already.”

Dr. Guyton moved to adjustable sutures in children in 1993, when it became easy to put children back to sleep with propofol. “No more gas. No more operating room,” he said. Today, he uses adjustable sutures in all children, with the cooperation of his staff.

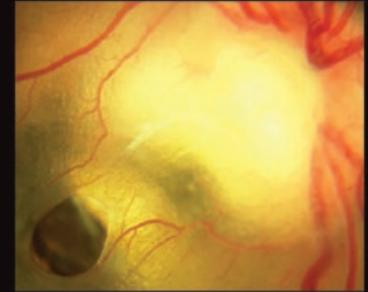
1 Jampolsky, A. *Am J Ophthalmol* 1979;88:406–418.

2 Awadein, A. et al. *J AAPOS* 2008;12:585–590.

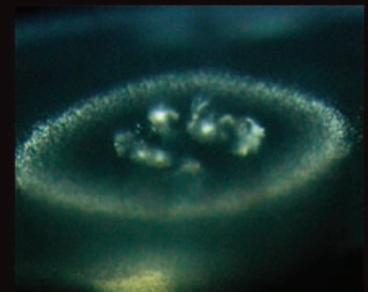
3 Tripathi, A. et al. *Eye* 2003;17:739–742.

None of the physicians interviewed report related financial interests.

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