The Use of Nonabsorbable Suture Ligatures for Glaucoma Drainage Devices

Edney R. Moura Filho, MD; Arthur J. Sit, SM, MD

Nonvalved glaucoma drainage devices are typically ligated to prevent early postoperative hypotony. However, visualization of these sutures can be difficult owing to posterior placement and thick Tenon capsules that can develop over the tube. As a result, tube ligations are typically performed using absorbable sutures, which can open at unpredictable times, or rip cords that need to be removed from the eye. We present a technique and small consecutive case series for the use of nonabsorbable tube ligatures with postoperative suture lysis. This technique has the advantages of providing predictable control of postoperative intraocular pressure (because the ligature can be lysed at any time) and eliminating the need to pull a tube rip cord. There may also be a potential for thinner blebs and lower long-term intraocular pressure if the ligatures are left in place for longer periods.


Hill et al9 had previously described a technique to perform suture lysis of a GDD tube ligature. However, even with their technique, location of the suture can sometimes be difficult to ascertain owing to a thick Tenon capsule, posterior placement, and subconjunctival blood. As a result, absorbable sutures are typically used as a ligature, with attempts at suture lysis reserved for cases in which early intraocular pressure (IOP) control is inadequate with adjuvant IOP-lowering procedures (such as tube fenestration or orphan trabeculectomy) or the tube has not opened spontaneously. In some cases, it may also be beneficial to delay suture lysis to allow reduction in inflammation or if secondary IOP-lowering procedures are maintaining IOP adequately and hypotony could result with an open tube. However, delay of tube opening is not possible with the use of absorbable suture ligatures. We present a successful small consecutive case series of placement of nonabsorbable suture ligatures in nonvalved GDD and subsequent suture lysis using the Blumenthal suture lysis lens (Volk Optical Inc, Mentor, Ohio) in patients with at least 3 months of follow-up.
A fornix- or limbal-based conjunctival incision may be performed with this technique. An 8-0 nylon suture ligature is placed approximately 1 to 2 mm anterior to the plate of the GDD (Figure, A). After the drainage tube is ligated, water-tight occlusion by the ligature is assured with injection of balanced saline solution into the tube with a 30-gauge cannula. The drainage tube is placed into the anterior chamber through a short scleral tunnel. A scleral, corneal, or pericardial graft is placed on the tube and sutured such that it does not cover the ligature.

Suture lysis of the tube ligature can be performed at any time postoperatively, ranging from 29 to 44 days in our series. With the use of the Blumenthal lens, the ligature is easily identified and suture lysis is performed using an argon or other continuous wave laser with a 50-µm spot size, 0.1-second duration, and power of approximately 400 to 600 mW (Figure, B).

**REPORT OF CASES**

A 15-year-old girl received a Baerveldt 350 implant (Advanced Medical Optics Inc) in her left eye for advanced secondary open-angle glaucoma (nevus flammeus). Her preoperative IOP was 28 mm Hg with a prostaglandin, an α-agonist, a carbonic anhydrase inhibitor, and a β-blocker eye drop. On postoperative day 43, the IOP was 29 mm Hg with maximum topical therapy, and the tube was still closed with no bleb over the plate. Argon laser suture lysis was performed on the tube ligature without complications. Five days after the laser lysis, the IOP was 14 mm Hg, with a shallow but formed anterior chamber. Shallow choroidal effusions temporally and inferiorly were observed; they resolved spontaneously with a routine course of topical prednisolone acetate 1% drops 4 times a day before the next visit 7 days later. After 7 months from the surgery, the IOP was controlled at 20 mm Hg using only brimonidine 0.15% twice a day (Table).

A 68-year-old woman received a Baerveldt 350 implant in her right eye for advanced secondary open-angle glaucoma. She had a history of herpes zoster virus infection and 2 penetrating keratoplasties in the affected eye. Her preoperative IOP was 22 mm Hg with maximum topical therapy. On postoperative day 29, her IOP was 22 mm Hg, even with maximum topical therapy. On postoperative day 43, the IOP was 38 mm Hg with maximum topical therapy, and the tube was still closed with no bleb over the plate. Argon laser suture lysis was performed on the tube ligature without complications. Five days after the laser lysis, the IOP was 13 mm Hg, with a shallow but formed anterior chamber. Shallow choroidal effusions temporally and inferiorly were observed; they resolved spontaneously with a routine course of topical prednisolone acetate 1% drops 4 times a day before the next visit 7 days later. After 7 months from the surgery, the IOP was controlled at 20 mm Hg using only brimonidine 0.15% twice a day (Table).

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Diagnosis</th>
<th>Postoperative Time Until Suture Lysis, d</th>
<th>Baseline</th>
<th>Immediately Before Lysis</th>
<th>Immediately After Lysis</th>
<th>Long-term Follow-up</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sec OAG</td>
<td>43</td>
<td>28</td>
<td>28</td>
<td>14</td>
<td>20</td>
<td>Choroidal effusions</td>
</tr>
<tr>
<td>2</td>
<td>Sec OAG</td>
<td>29</td>
<td>24</td>
<td>22</td>
<td>3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>POAG</td>
<td>36</td>
<td>21</td>
<td>21</td>
<td>2</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>POAG</td>
<td>43</td>
<td>25</td>
<td>38</td>
<td>7</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CACG</td>
<td>44</td>
<td>22</td>
<td>22</td>
<td>13</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sec OAG</td>
<td>40</td>
<td>22</td>
<td>35</td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CACG, chronic angle closure glaucoma; IOP, intraocular pressure; POAG, primary open-angle glaucoma; Sec OAG, secondary open-angle glaucoma.

*Long-term follow-up ranged from 5 to 13 months.
therapy. Laser suture lysis was performed at that time. Immediately after suture lysis, IOP was 3 mm Hg, with a formed anterior chamber. One week after the suture lysis, the IOP was 27 mm Hg. Thirteen months after surgery, the IOP was 10 mm Hg with a fixed combination of timolol 0.5% and dorzolamide 2%.

An 80-year-old woman received a Baerveldt 350 implant in the right eye for advanced primary open-angle glaucoma. She had a history of a failed phacotrabeculectomy in the same eye. Her preoperative IOP was 21 mm Hg with a fixed combination of timolol 0.5% and dorzolamide 2%. On postoperative day 36, her IOP was 29 mm Hg and the suture was removed. Ten months after surgery, her IOP was 9 mm Hg with an elevated bleb over the plate with a fixed combination of timolol 0.5% and dorzolamide 2%.

A 54-year-old man received a Baerveldt 350 implant in his right eye for advanced primary open-angle glaucoma. He had a history of a failed trabeculectomy in the affected eye. Preoperative IOP was 25 mm Hg with brimonidine 0.15%, a fixed combination of timolol 0.5% and dorzolamide 2%, and travoprost 0.004%. On postoperative day 43, his IOP was 38 mm Hg with travoprost and the suture was removed. Immediately after suture lysis, his IOP was 7 mm Hg, with a deep and quiet anterior chamber. His IOP was 21 mm Hg with no medication 13 months after surgery.

A 68-year-old woman underwent replacement of a Baerveldt implant in the left eye owing to severe diplopia from a high, anterior bleb, which required strabismus surgery. She had a history of chronic angle closure glaucoma and her IOP was 22 mm Hg before surgery with timolol 0.5%, brimonidine 0.2%, and bimatoprost 0.03%. On postoperative day 44, the IOP was 22 mm Hg with maximum topical therapy and the suture was removed. Immediately after suture lysis, IOP was 13 mm Hg and the patient had a formed and quiet anterior chamber. Her IOP was 12 mm Hg with no medication 11 months after surgery.

A 44-year-old man received a Baerveldt 350 implant in his right eye for a traumatic glaucoma. The IOP was 22 mm Hg with brimonidine 0.15%, a fixed combination of timolol 0.5% and dorzolamide 2%, bimatoprost 0.03%, and 500 mg of oral acetazolamide twice a day. On postoperative day 40, the IOP was 34 mm Hg with maximum topical therapy, and the suture was released. Right after suture lysis, IOP was 6 mm Hg, with a formed and quiet anterior chamber. The IOP was 10 mm Hg with no medication 5 months after surgery.

**COMMENT**

Laser suture lysis is commonly performed after trabeculectomy to treat the flow of aqueous humor through the sclerostomy. Commonly used suture lysis lenses, such as the Hoskins lens or the Ritch lens (both from Ocular Instruments Inc, Bellevue, Washington), are designed to provide visualization of the scleral flap sutures and provide eyelid elevation for better exposure. However, visualization of suture sutures in GDD surgery is very difficult with these lenses owing to their posterior placement, thick overlying Tenon capsules, and fibrosis. Khouri et al had previously described the advantages of the Blumenthal suture lysis lens for use with trabeculectomies. The Blumenthal lens differs from other suture lysis lenses in that the tip is smaller and rounded, allowing greater and more localized compression of tissues. This design also allows magnification of images of 2 to 3 times. These factors allow improved visualization of sutures beneath thick conjunctival and Tenon layers and are particularly helpful for posteriorly placed sutures. In our series of patients, we found that the Blumenthal lens was highly effective for suture lysis in GDD even through a thickened, fibrotic Tenon capsule. The predictable ability to locate and lyse tube ligatures allows nonabsorbable suture ligatures to be used as a routine part of GDD surgery.

Laser suture lysis of nonabsorbable suture ligatures provides several advantages over other methods of tube ligature in GDD surgery. First, it allows predictable postoperative control of the IOP, unlike absorbable sutures that dissolve at variable rates in different patients. Postoperative medications can thus be adjusted according to a defined schedule. Second, the procedure is noninvasive and is performed in the office. The chance of creating a wound leak is extremely low and long-term hypotony is unlikely once the plate of the GDD has been encapsulated. Third, for patients who are able to tolerate elevated IOP for a few extra weeks, the suture lysis may be delayed beyond the typical 3- to 4-week period associated with absorbable tube ligatures. This has the advantage of providing an option of leaving the tube closed if there is a risk of hypotony due to other factors. This may also have the advantage of producing thinner blebs with lower long-term IOP. However, our case series was small and not designed to compare long-term IOP control using our technique vs other suture ligatures. Further research is required to explore the long-term clinical advantages of this technique.

Submitted for Publication: June 11, 2009; final revision received July 24, 2009; accepted August 19, 2009.

Correspondence: Arthur J. Sit, MD, Department of Ophthalmology, Mayo Clinic, 200 First St SW, Rochester, MN 55902 (sit.arthur@mayo.edu).

Financial Disclosure: None reported.

Funding/Support: This study was supported by the Mayo Foundation for Medical Education and Research and an unrestricted departmental grant from Research to Prevent Blindness.

**REFERENCES**


---

**Ophthalmological Ephemera**

In 1795, Dr Isaac Thompson concocted an eye water of zinc sulfate, saffron, camphor, and rose water. It was sold as late as 1939. This is 1 of a series of 32 medical trade cards advertising the product from 1875 through 1895.

![Eye Water Advertisement](https://jamanetwork.com/)

*Courtesy of: Daniel M. Albert, MD, MS*