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**Title: Nasolacrimal Lavage as a Treatment for Ocular Surface Toxic Soup Syndrome**

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## **Author Questionnaire**

- 1. Microscopy:** Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **No**
  
- 2. Software:** Does the part of your protocol being filmed include step-by-step descriptions of software usage? **No**
  
- 3. Filming location:** Will the filming need to take place in multiple locations? **No**

### **Current Protocol Length**

Number of Steps: 7

Number of Shots: 21

# Introduction

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***Videographer: Obtain headshots for all authors available at the filming location.***

- 1.1. **Kaleb Abbott:** We are investigating whether dilation and irrigation—a standard diagnostic procedure—can be used therapeutically in patients with ocular surface toxic soup syndrome, a condition we coined.
  - 1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.3.1*

What advantage does your protocol offer compared to other techniques?

- 1.2. **Kaleb Abbott:** Nasolacrimal lavage offers a safe, cost-effective, and efficacious procedure to alleviate symptoms of ocular discomfort such as itchiness, burning, and foreign body sensation.
  - 1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.6.1*

What new scientific questions have your results paved the way for?

- 1.3. **Kaleb Abbott:** Our research questions why nasolacrimal lavage and punctal occlusion—despite being opposite procedures—both relieve discomfort. We hypothesize both reduce backflow of noxious inflammatory mediators from the lacrimal sac onto the ocular surface.
  - 1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 3.2.1*

***Videographer: Obtain headshots for all authors available at the filming location.***

**Testimonial Questions (OPTIONAL):**

*Videographer: Please ensure that all testimonial shots are captured in a wide-angle format, while also maintaining sufficient headspace, given that the final videos will be rendered in a 1:1 aspect ratio.*

How do you think publishing with JoVE will enhance the visibility and impact of your research?

- 1.4. **Kaleb Abbott**: As a clinician, there's a big difference between reading about a procedure and seeing it done. Watching it in action makes it easier to understand and gives you confidence to perform it in the clinic.
  - 1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 3.2.1*

**Ethics Title Card**

This research has been approved by the Colorado Multiple Institutional Review Board

# Protocol

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## 2. Nasolacrimal Lavage Procedure

**Demonstrators:** Kaleb Abbott, Stephanie Martich

- 2.1. To begin, wash hands thoroughly and don clean gloves [1]. Verify that all required instruments are available in the sterile field [2]. Then, have the patient sit back and relax, ensuring the back of their head is supported by the headrest [3]. Attach a 3-milliliter syringe filled with saline to the lacrimal cannula [4].
  - 2.1.1. WIDE: Talent donning gloves standing beside the sink.
  - 2.1.2. Talent checking the sterile field to confirm all listed instruments are present.
  - 2.1.3. Talent assisting the patient to take the position on the operating chair.
  - 2.1.4. Talent connecting the 3 milliliter syringe filled with saline to the lacrimal cannula.
- 2.2. Instill one drop of topical anesthetic such as proparacaine into the intended eye or eyes [1]. Wait for 30 to 60 seconds to allow the anesthetic to take effect while monitoring the patient for comfort [2].
  - 2.2.1. Talent instilling one drop of topical anesthetic into the patient's eye.
  - 2.2.2. Talent observing the patient while waiting for anesthetic effect.
- 2.3. After instilling a drop of topical anesthetic, select the smallest punctal dilator if the punctum is too small to proceed with cannulation [1] and gently insert it vertically 1 to 2 millimeters into the lower punctum [2]. Rotate the dilator 90 degrees so that the tip points toward the nose [3]. Gradually increase the size of the dilator until it comfortably accommodates the lacrimal cannula, ensuring the punctum is dilated without causing trauma [4].
  - 2.3.1. Talent picking up the smallest punctal dilator.
  - 2.3.2. Talent inserting the dilator vertically into the lower punctum.
  - 2.3.3. Talent rotating the dilator 90 degrees to orient toward the nose.
  - 2.3.4. Talent gradually increasing dilator size to achieve appropriate punctum dilation.
- 2.4. Now, gently insert the lacrimal cannula into the lower punctum and advance it into the vertical canaliculus [1]. Rotate the cannula horizontally with the blunt tip facing toward the nose [2]. Gently advance the cannula 3 to 6 millimeters into the canaliculus,

ensuring smooth, resistance-free movement [3].

2.4.1. Talent inserting the lacrimal cannula into the lower punctum.

2.4.2. Talent rotating the cannula horizontally toward the nose.

2.4.3. Talent advancing the cannula into the canaliculus without resistance.

2.5. Slowly inject 2 to 3 milliliters of saline solution through the cannula into the lacrimal duct system, applying gentle pressure to avoid discomfort or trauma [1-TXT]. Then, remove the cannula from the punctum [2].

2.5.1. Talent slowly injecting saline solution through the cannula into the duct system.

**TXT: Observe for resistance or reflux during irrigation**

2.5.2. Talent gently removing the cannula from the punctum.

2.6. After irrigation, observe for displaced mucus or improvement in ocular discomfort symptoms [1]. If the patient detects irrigated fluid in the back of the throat with the head tilted back or in the nose with the head tilted forward, confirm lacrimal system patency [2-TXT].

2.6.1. Talent pointing to the area showing no displaced mucus.

2.6.2. Talent conversing with the patient. **TXT: Apply topical anesthetic if the patient experiences pain during irrigation**

2.7. Finally, remove the excess discharge or mucus from the eye using a clean tissue [1]. Monitor the patient for signs of discomfort, redness, or significant discharge [2]. Provide post-procedure instructions including the use of cold compresses and preservative-free artificial tears if needed [3].

2.7.1. Talent cleaning the patient's eye with a tissue.

2.7.2. Talent examining the patient's eye.

2.7.3. Talent handing over an instruction sheet to the patient.

# Results

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## 3. Results

3.1. Four patients underwent nasolacrimal lavage without confounding treatment changes [1].

3.9.1 LAB MEDIA: Table 1

3.2. All the patients reported good improvement in itchiness post-treatment [1] and duration of symptom relief ranged between 3 weeks to 7 months [2].

3.2.1. LAB MEDIA: Table 1 *Video editor: Highlight the column “result”*

3.2.2. LAB MEDIA: Table 1 *Video editor: Highlight the column “duration of symptom relief”*

**Pronunciation Guide:****1. Nasolacrimal**

- **Pronunciation Link:** Merriam-Webster Medical: *nasolacrimal* (pronunciation key) [YouTube+4YouTube+4Encyclopedia Britannica+4YouTube+11Merriam-Webster+11Dictionary.com+11](#)
  - **IPA (American):** /næ-soʊ-'lækrə-məl/
  - **Phonetic Spelling:** NA-soh-LAK-ruh-muhl
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**2. Ocular**

- **Pronunciation Link:** Merriam-Webster: *ocular* [Merriam-Webster+5Merriam-Webster+5HowToPronounce+5WordReference+8Merriam-Webster+8Merriam-Webster+8](#)
  - **IPA (American):** /'ækjələr/
  - **Phonetic Spelling:** OCK-yuh-ler
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**3. Proparacaine**

- **Pronunciation Link:** Merriam-Webster Medical: *proparacaine* [Merriam-Webster+15YouTube+15YouTube+15HowToPronounce+2Merriam-Webster+2JAMA Network+15Merriam-Webster+15Pediatrics+15](#)
  - **IPA (American):** /proʊ-prə-rə-'keɪn/
  - **Phonetic Spelling:** proh-pruh-ruh-KAYN
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**4. Canaliculus**

- **Pronunciation Link:** Merriam-Webster: *canaliculus* [YouTube+15Merriam-Webster+15YouTube+15](#)
  - **IPA (American):** /,kænə'likjələs/
  - **Phonetic Spelling:** ka-nuh-LICK-yuh-luhs
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**5. Dilator**

- **Pronunciation Link:** Merriam-Webster Medical: *dilator* [Wiktionary+15YouTube+15YouTube+15YouTube+7Cambridge Dictionary+7YouTube+7Plant4Harvest.com+15Merriam-Webster+15Merriam-Webster+15](#)
  - **IPA (American):** /'daɪlətər/
  - **Phonetic Spelling:** DYE-lay-ter
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**6. Cannula**

- **Pronunciation Link:** Merriam-Webster: *cannula* [Merriam-Webster+8Merriam-Webster+8Merriam-Webster+8](#)
  - **IPA (American):** /'kænjələ/
  - **Phonetic Spelling:** KAN-yuh-luh
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**7. Anesthetic**



- **Pronunciation Link:** Merriam-Webster: *anesthetic* [WordReferenceYouTube+8Merriam-Webster+8Merriam-Webster+8](#)
  - **IPA (American):** /ˌænəsˈθetɪk/
  - **Phonetic Spelling:** an-uh-STHET-ik
- 

#### 8. Irrigation

- **Pronunciation Link:** Britannica Dictionary audio: *irrigation* [Merriam-Webster+3Merriam-Webster+3Merriam-Webster+3Review of Optometry+12Encyclopedia Britannica+12Merriam-Webster+12](#)
  - **IPA (American):** /ˌɪrəˈɡeɪʃən/
  - **Phonetic Spelling:** ih-ri-GAY-shun
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#### 9. Nasolacrimal Duct

- **Pronunciation Link:** Merriam-Webster Medical: *nasolacrimal duct* [Cambridge Dictionary+15Encyclopedia Britannica+15YouTube+15YouTube+9Merriam-Webster+9Merriam-Webster+9Merriam-Webster+15Merriam-Webster+15Merriam-Webster+15](#)
  - **IPA (American):** /nə-sou-ˈləkrə-məl dʌkt/
  - **Phonetic Spelling:** NA-soh-LAK-ruh-muhl DUKT
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#### 10. Lacrimal (from lachrymal anatomy)

- **Pronunciation Link:** Implied via nasolacrimal; common root *lacrimal* shares... [Merriam-Webster+12Merriam-Webster+12HowToPronounce+12pronounceonline.com](#)
- **IPA (American):** /ˈləkrɪməl/
- **Phonetic Spelling:** LAK-ruh-muhl