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· Novel Technique ·

Repositioning of the complete prolapsed silicone tube with modified suture-probe and silk thread traction method

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HIGHLIGHTS

- Repositioning or removal when the bicanalicular silicone tube is completely prolapsed from medial canthus is a challenge.
- A novel method employing a modified suture-probe and silk thread traction technique to reposition the bicanalicular silicone tube that has completely prolapsed from the medial canthus is secure and effective.

Abstract: The whole lacrimal passage intubation is widely used in lacrimal surgery. However, one of the most typical complications is the prolapse of the silicone tube from the medial canthus. In case, the bicanalicular silicone tube after whole lacrimal duct intubation has completely prolapsed from the medial canthus before extubation, then cannot be found in the opening of the nasolacrimal duct, and it would be a challenge to reposition or removal. A novel approach to employ a modified suture-probe and silk thread traction technique has been developed, and it is not only safe and effective, but also cost-effective.

Keywords: suture-probe; silk thread traction; complete prolapsed silicone tube; reposition

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Full Text

INTRODUCTION

The whole lacrimal passage intubation is widely used in lacrimal surgery, including puncta, lacrimal canaliculi, nasolacrimal duct stenosis, inflammatory diseases and nasolacrimal duct obstruction.^[1-3] Two ends of the bicanalicular silicone tube reach the inferior nasal meatus through puncta, canaliculi, lacrimal sac and nasolacrimal duct, and the free ends of the silicone tube will be fixed by a knot.^[4] The role of the whole lacrimal passage intubation is to maintain the patency of newly formed channels, and prevent anastomotic scar formation and stenosis.^[5-6] However, the prolapse of the silicone tube from the medial canthus is one of the most common complications in the whole lacrimal passage intubation.^[2-3,7]

When the bicanalicular silicone tube is completely prolapsed from medial canthus, the distal part of the silicone tube and the knot enter into the nasolacrimal duct or is embedded in the lacrimal sac, and the silicone tube cannot be found in the inferior meatus and the opening of nasolacrimal duct.^[5] In this case, it would be a challenge to reposition or remove. A new method with modified suture-probe and silk thread traction is developed to reposition the bicanalicular silicone tube that has completely prolapsed from the medial canthus.

CASE HISTORY

From 2018 to 2023, 2 patients with complete prolapsed of bicanalicular silicone tube from medial canthus were treated using a suture-probe and silk thread traction method at our hospital. In Case 1, the patient experienced obstruction of the upper and lower lacrimal canaliculus in the right eye. Three months after undergoing an operation involving anastomosis of the upper and lower lacrimal canaliculus combined with silicone tube intubation of the entire lacrimal passage, the silicone tube completely prolapsed from the medial canthus. No silicone tube was observed in the inferior meatus or the nasolacrimal duct opening. Case 2 involved a patient with left eye lacrimal puncta atresia. Six months after undergoing lacrimal canaliculus and nasolacrimal duct laser plasty, along with silicone tube intubation of entire lacrimal passage, the silicone tube prolapsed completely from the medial canthus. In two cases, the bicanalicular silicone tube prolapsed completely from the medial canthus (Figure 1), and with examination, no silicone tube was found in the inferior meatus. The prolapse of the silicone tube occurred because both patients wiped the medial canthus, causing the tube to prolapse, after which they inadvertently pulled the tube out. Using the modified suture-probe

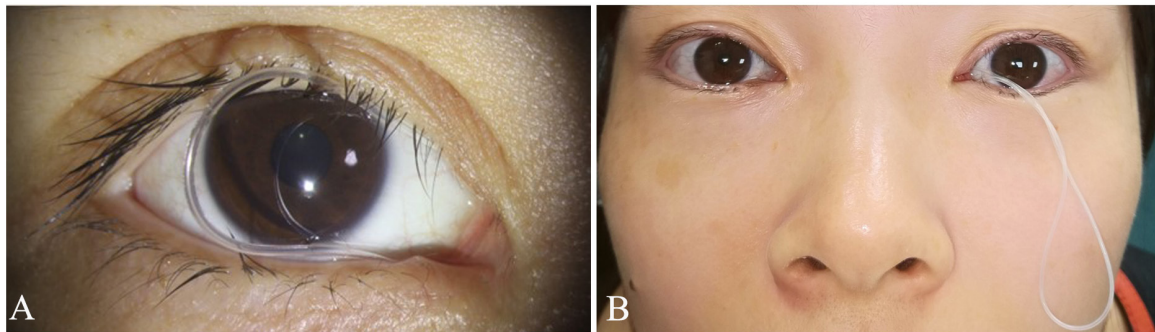


Figure 1 The prolapsed silicone tube

(A) Case 1, the right eye presents with a completely prolapsed silicone tube from the medial canthus. (B) Case 2, the left eye presents with a completely prolapsed silicone tube from the medial canthus.

and silk thread traction method, the silicone tubes were successfully repositioned in both cases, and a three-month follow-up was conducted. Throughout the follow-up period until the silicone tubes could be removed, the patients maintained good positioning of silicone tubes without requiring with new ones, and no complications associated with the modified suture-probe and silk thread traction method were encountered.

SURGICAL TECHNIQUE

In modified suture-probe and silk thread traction method, a 7-8 gauge stainless steel lacrimal suture-probe with a side opening at one end is used (Figure 2). The surgical procedures are performed as follows (Figure 3, Figure 4). 1. Patients assume the supine position. After topical anesthesia with proxymetacaine, a cotton pad soaked in a 0.01% epinephrine lidocaine solution was placed in the lower nasal meatus to constrict the nasal mucosa. 2. The upper silicone tube is gently pulled from the upper punctum towards the temporal side. At this time, the knot should have reached the widest part of the dacryocyst, facilitating the subsequent probe insertion. 3. The 5-0 suture is lubricated with recombinant bovine fibroblast growth factor eye gel. One end of the suture is wrapped around the prolapsed tube twice (Figure 3 B). The two ends of the suture are then passed through the suture-probe together (Figure

4 B). It is important to ensure that the ends of the suture are not excessively long or short relative to one end of the probe with the side hole, as this may complicate the retrieval of the suture from the probe and nasal cavity. After lubricating the suture-probe with recombinant bovine fibroblast growth factor eye gel, the suture-probe, along with a 5-0 suture, is inserted into the upper canaliculi, lacrimal sac, nasolacrimal duct and inferior meatus through the upper punctum (Figure 4 C). 4. The suture at the medial canthus is fixed, after which the broken ends of the suture are carefully drawn out from the suture-probe using a nasal cavity hook. Subsequently, the suture thread is pulled out from the suture-probe, and the probe is withdrawn through the upper punctum (Figure 4 E). 5. The suture is loosened, and the proximal end of the silicone tube at the medial canthus is firmly secured, the suture is then pulled from the nasal cavity, causing it to slide towards the distal end of the silicone tube and form a knot (Figure 3 C). 6. Continuing to pull the suture from the nasal cavity, the distal end and the knot of the silicone tube are drawn out to the inferior meatus (Figure 4 F-G). Then, the prolapsed completely bicanalicular silicone tube of the whole lacrimal passage from the medial canthus was successfully repositioned (Figure 3 D, Figure 4 H-I). 7. Local application of antibiotic eye drops is administered, and the inferior meatus is filled with a mixture of tobramycin and triamcinolone acetonide.

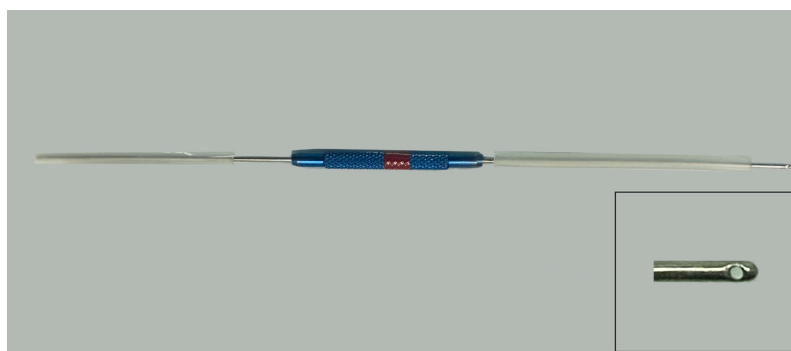


Figure 2 7-8 gauge stainless steel lacrimal suture-probe with side opening at one end

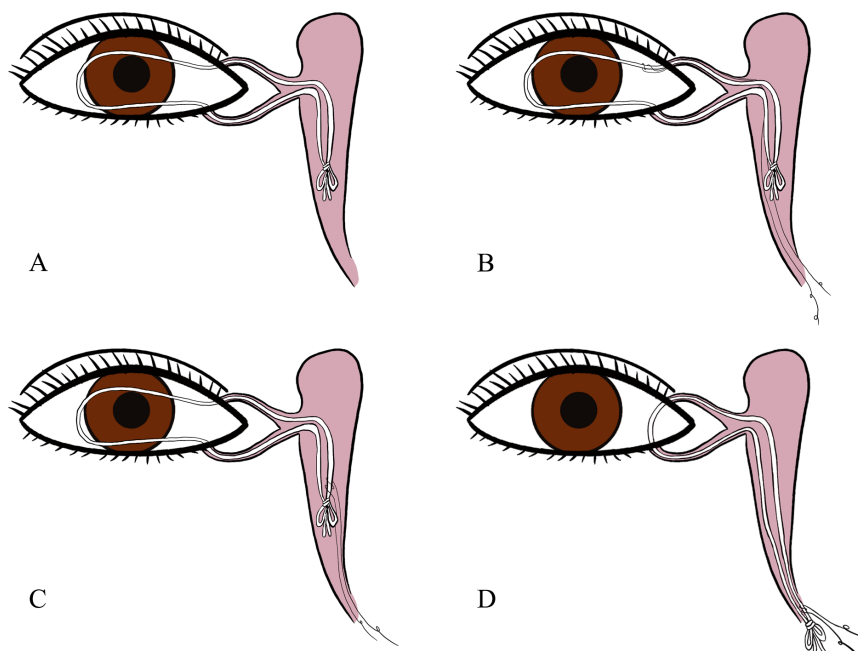


Figure 3 A simple diagram of using a 5-0 suture to reposition a complete prolapsed bicanalicular silicone tube after whole lacrimal duct intubation

(A) Completely prolapsed silicone tube from medial canthus, the distal part of the silicone tube and the knot goes deep into the nasolacrimal duct or is embedded in the lacrimal sac. No silicone tube was found in the inferior meatus and the opening of the nasolacrimal duct. (B) After wrapping the prolapsed silicone tube two times with a 5-0 suture, the suture was inserted into the inferior meatus from the superior lacrimal point with a suture probe. (C) The silicone tube at the medial canthus was fixed, and then the suture was pulled from the nasal cavity so that it slipped to the distal end and the knot of the silicone tube. (D) Continue to pull the suture so that the distal end and the knot of the silicone tube are pulled out to the inferior meatus. Then, the prolapsed completely bicanalicular silicone tube of the whole lacrimal passage from the medial canthus was successfully repositioned.

DISCUSSION

The complete prolapse of the bicanalicular silicone tube from the whole lacrimal passage, originating from the medial canthus, was successfully repositioned with no complications, using the modified suture-probe and silk thread traction method in this study. The results unequivocally showed that the effectiveness and safety of the modified approach in treating complete dislocations of the bicanalicular silicone tube from the medial canthus. From 2018 to 2023, our hospital encountered only two such cases, indicating the rarity of this condition. This finding contrasts with previous research.^[4] To prevent such complete prolapses during whole lacrimal passage

intubation surgery, a unique double tube knot technique for the silicone tube was introduced in our hospital. This knot is deliberately designed to be too large to fit through the nasolacrimal duct opening, thus preventing accidental dislocation. Additionally, after the operation, our nursing team will educate patients carefully, emphasizing silicone tube care measure, such as keeping eyes closed during face washing, avoiding vigorous eye rubbing, and refraining from forceful nose blowing.^[8] These measures, combined with our surgical techniques, contribute to the low incidence of complete prolapses in our hospital.

The dislocation of the bicanalicular silicone tube after whole lacrimal duct intubation can vary from partial to complete, depending on the extent of the

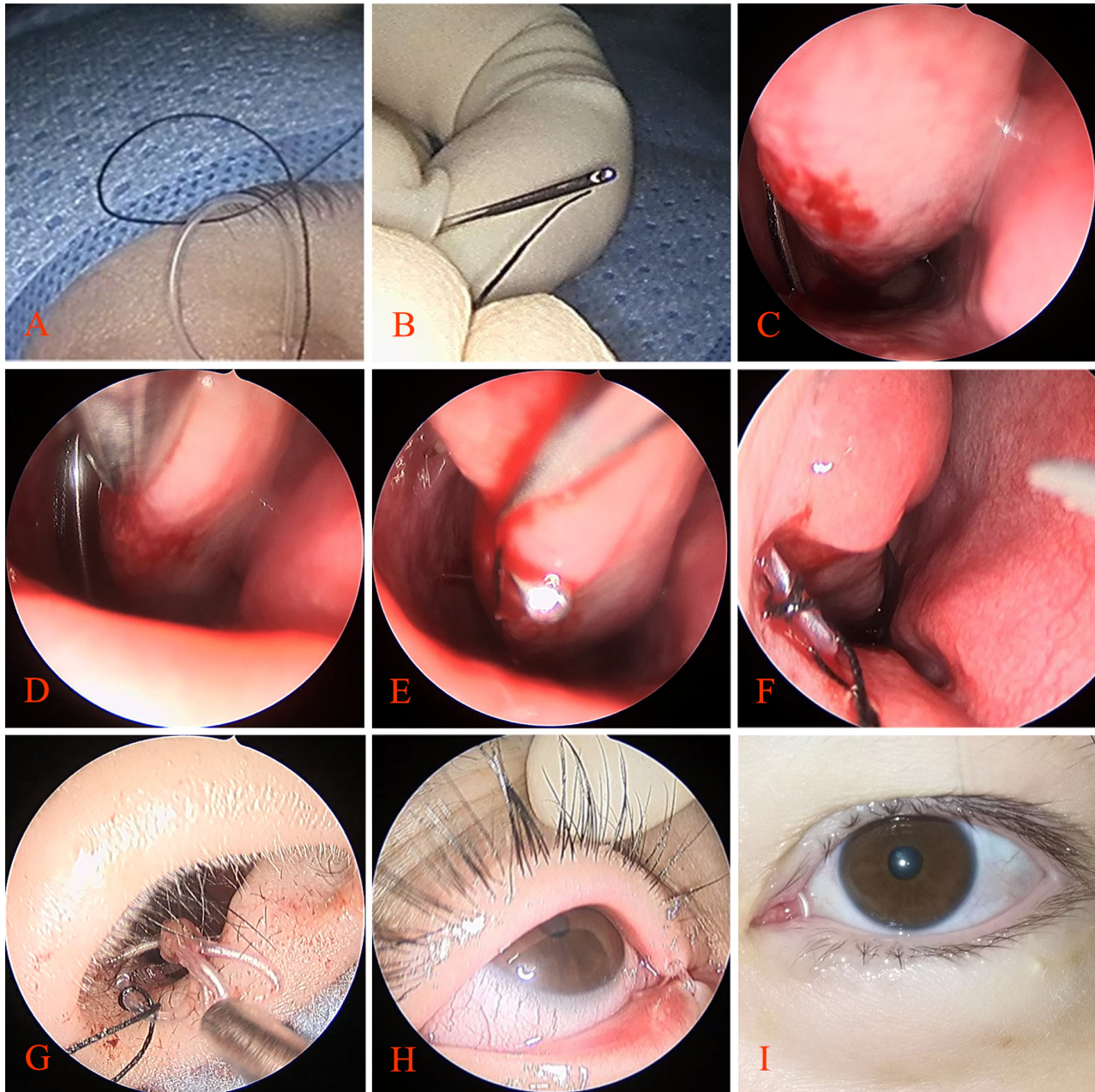


Figure 4 The surgical procedures

(A) Patients take the supine position. After topical anesthesia with proxymetacaine, the 0.01% epinephrine lidocaine solution cotton pad was filled in the lower nasal meatus to contract the nasal mucosa. Pull the upper silicone tube from the upper punctum in the medial canthus to the temporal side until it can not be pulled, and pull the lower silicone tube from the lower punctum to the temporal side. At this time, the knot has entered the widest part of the dacryocyst. These facilitate the entry of subsequent probe. Lubricate the 5-0 suture with recombinant bovine fibroblast growth factor eye gel. One end of the suture is wound around the prolapsed tube two times. (B) The two ends of the suture are passed through the suture-probe together. (C) After the suture-probe is lubricated with recombinant bovine fibroblast growth factor eye gel, the suture-probe with a 5-0 suture is inserted into the upper canaliculi, lacrimal sac, nasolacrimal duct and inferior meatus from the upper punctum. (D) No silicone tube was found in the opening of the nasolacrimal duct. (E) The suture at the medial canthus is fixed, then the broken ends of the suture are hooked out from the suture-probe by using a hook in the nasal cavity, the suture thread is pulled out from the suture-probe, and the probe exited from the upper punctum. (F) Pull the suture from the nasal cavity so that the distal part of the silicone tube is pulled out. (G) The knot of the silicone tube is pulled out. (H-I) The silicone tubes in Case 1 and Case 2 were successfully repositioned.

displacement.^[4] In cases of partial dislocation, where only a small portion of the silicone tube comes out from the inner canthus, the distal end of the tube and knot remain visible in the nasal cavity, the tube can be easily repositioned by pulling the distal end down with forceps under the nose or gently pushing it back in place using forceps around the inner canthus. The management of complete dislocation of the silicone tube, where the tube knot becomes lodged in the nasolacrimal duct or dacryocyst with no visible portion in the nasal cavity, poses a significant challenge in terms of repositioning.^[4]

Fortunately, the incidence of such complete prolapse of silicone tube is relatively rare. Byun Z et al.^[9] reported 11 cases of complete prolapse of bicanalicular silicone tube from medial canthus in 2 years, and Chu Z et al.^[4] reported 12 cases in 5 years. The protrusion of the silicone tube from the medial canthus can readily lead to corneal trauma and conjunctivitis.^[4] Therefore, it is imperative to promptly reposition or remove the prolapsed silicone tube to prevent any further complications.

There are several ways to take out the silicone tube. Yeh H et al.^[10] removed the tube through the skin dacryocystorhinostomy,^[10] but this method can enlarge the wound, leave behind visible skin scar, and increase the cost. Additionally, they also discussed the technique of removing the tube through the transnasal endoscopic dacryocystorhinostomy, but this method can also result in additional trauma and expenses. Patel BC et al.^[11] reported clipping the silicone tubes and gently pulling the knot out of the lacrimal puncta for tube removal. However, we found that forcibly pulling the prolapsed silicone tube from the lacrimal puncta can easily lead to tears in the lacrimal passage and residual lacrimal duct.

There are various approaches to repositioning

a completely prolapsed silicone tube. Byun Z et al.^[9] reported a method in which they obliquely cut the prolapsed tube with scissors, creating a small semicircular hole. A probe is then inserted into this hole, entered into the inferior nasal meatus, and the silicone tube is clamped with pliers. Subsequently, the probe is withdrawn from the puncta. However, this method is only applicable for hollow silicone tubes. He J et al.^[5] reported a different method in which the probe with memory wire passed through the lacrimal puncta and into the inferior nasal meatus. The suture is threaded through the head of the memory wire. After removing the probe from the puncta, the suture is cut and looped around the silicone tube. The two ends of the suture were then knotted. Finally, by pulling the suture from the nasal cavity, the prolapsed tube can be repositioned. Chu Z et al.^[4] introduced another method utilizing a suture-probe. They cut the suture, wrapped one end around the silicone tube, and tied it to the other end of the thread to create a suture knot. Pulling the suture from the nasal cavity resets the prolapsed tube. Additionally, they also suggested attaching 30 mm sutures to the distal end of the silicone tube as a preventive measure against re-prolapse. However,^[10] the suture knot formed by the two ends of the sutures poses a risk of loosening as it is withdrawn from the nasal cavity. Additionally, the sutures reserved in the inferior meatus may cause irritation and promote the deposition of secretions.

In this study, patients who experienced complete dislocation of the bicanalicular silicone tube from medial canthus following whole lacrimal duct intubation were treated with modified suture-probe and silk thread traction method. This innovative method addresses the limitations associated with previous surgical methods. It is not only simple and safe, but also cost-effective,

effectively preventing surgical failures or the need for silicone tube replacement due to premature removal of the prolapsed tube. The modified suture-probe and silk thread traction method introduced in this study offers a novel and effective solution for managing the complete prolapse of the bicanalicular silicone tube from the medial canthus after intubation of the entire lacrimal passage. Furthermore, the choice of suture is discretionary. While 5-0 black silk thread is thick and lacks smoothness, resulting in greater friction against the lacrimal duct mucosa, it exhibits a lesser cutting force. Conversely, the 6-0 prolene suture is thinner and smoother, minimizing friction with the lacrimal duct mucosa but possessing a higher cutting force. The safety of employing various suture types for repositioning the completely prolapsed silicone tube remains to be thoroughly investigated within the context of suture-probe and silk thread traction method. Given the infrequent occurrence of silicone tube prolapse and the limited sample size in this study, additional research is warranted to establish the safety of this method and identify potential intraoperative complications.

Correction notice

None

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Author Contributions

(I) Conception and design: Xuanwei Liang and Rongxin Chen

(II) Administrative support: None

(III) Provision of study materials or patients: Xuanwei Liang

(IV) Collection and assembly of data: Jing Li

(V) Data analysis and interpretation: Jing Li and Xuanwei Liang

(VI) Manuscript writing: Jing Li

(VII) Final approval of manuscript: All authors

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Conflict of Interests

None of the authors has any conflicts of interest to disclose. All authors have declared in the completed the ICMJE uniform disclosure form.

Patient consent for publication

None

Ethical Statement

This study was approved by the Institutional Review Board of the Zhongshan Ophthalmic Center, Sun Yat-sen University, China (No.2021KYPJ100) and adhered to the tenets of the Helsinki Declaration.

Informed consent was obtained from all subjects.

Provenance and Peer Review

This article was a standard submission to our journal. The article has undergone peer review with our anonymous review system.

Data Sharing Statement

None

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