

Canaliculotomy as A Canalicular Obstruction Management Approach: a Case Series

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Abstract

Lacrimal drainage obstruction is a common disorder of lacrimal system. This obstruction could affect lacrimal punctum, canaliculi, lacrimal sac, and lacrimal duct. The etiology could be congenital or acquired, such as triggered by infection or other conditions. This case series illustrates the procedure of canaliculotomy to reduce the epiphora symptom caused by lacrimal drainage obstruction, specifically in punctum and canaliculi. The aim of this case series was to report the management of punctal and canaliculi obstruction with canaliculotomy procedure. Case 1, an eighty-two years old woman with chronic canaliculitis on the right eye due to *Actynomyces sp.* infection, underwent canaliculotomy and curettage of canalicular area of the right eye. Case 2, a sixty-years old man with chronic canaliculitis with canalicular fistula on the left eye underwent canaliculotomy with silicone tube procedure on the left eye. Case 3, a sixty-seven years old man with recurrent punctal obstruction due to punctal stenosis of the left eye, previous punctoplasty, underwent canaliculotomy with silicone tube. Identification of the patient's symptoms is very important in determining the diagnosis and management plan for the patient. Canaliculotomy procedure with antimicrobial and steroid medication after procedure leads to a good result in reducing symptoms caused by lacrimal drainage obstruction due to various etiology.

Keywords: Canalicular obstruction, canaliculotomy, punctoplasty

Introduction

Obstruction of the lacrimal drainage system is one of the most common lacrimal system disorders, with an incidence of 16.3% of all oculoplasty disorders. This disorder is a condition when there is an obliteration occurs at any level of the lacrimal pathway system such as puncta, canaliculi, lacrimal sac, or nasolacrimal duct. The incidence of canalicular obstruction is 16 to 25% in patients with obstructive epiphora. Canalicular obstruction can occur within the upper, lower, or common canaliculus. The most common site of canalicular obstruction is the common canaliculus with a 51.4% prevalence. Various etiologies can cause obstruction, which is divided into congenital and acquired. Acquired obstruction can be due to numerous causes including infection, inflammation, trauma, iatrogenic, neoplasm, as well as glaucoma, and dry eye medications.^{1,2}

Epiphora is the common chief complaint of patients with canalicular obstruction. Associated symptoms may vary depending on the cause of the obstruction. In canaliculitis and punctal stenosis, symptoms can begin with a history of inflammation of the eyelids. Pharmacological treatment of canalicular obstruction due to infection can resolve the infection but the risk of recurrence is high. Surgical management remains the definitive treatment of canalicular obstruction. Canaliculotomy provides direct access to obstruction and carries a successful outcome with few complications.¹⁻³ The purpose of this case report is to explain canaliculotomy as a treatment for canalicular obstruction with different causes, especially canaliculitis and punctal stenosis.

Cases

Case 1

An 82-year-old woman came to the Reconstruction, Oculoplasty, and Oncology (ROO) polyclinic with the complaint of purulent secretions on the right eyelid 3 months before. The watery right eye has been presented for more

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Figure 1 Anterior Segment Evaluation Pre-operatively Showed Epiphora with Purulent Secretion

than 1 year. There was minimal pain and the eye felt a little lumpy. The vision of the right eye felt a little more blurry than usual since 3 months before the presentation. There was no swelling or redness of the right eyelid. The patient has had a history of recurring and intermittent right eye redness for the last 3 months. There was no history of eye trauma. The patient underwent right and left eye cataract surgery about 15 years ago. History of hypertension, diabetes mellitus, and other systemic diseases was denied.

The physical examination revealed vital signs within normal limits. As for the ophthalmological examination, the visual acuity of the right eye was 0.4 pinhole 0.5, the left eye was 0.63 pinhole 0.8. Intraocular pressure with Non-Contact Tonometry (NCT) was 17 mmHg in the right eye and 14 in the left eye. The movement of both eyes was good in all directions. The anterior segment of the right eye exhibited that there was dermatochalasis in the superior palpebral accompanied by purulent secretion without edema or hyperemia and other examination within normal limits except the presence of an

intraocular lens. An anterior segment of the left eye exhibited that there was dermatochalasis in superior palpebral hyperemia and other examination within normal limits except for the presence of an intraocular lens.

The patient then was diagnosed with chronic canaliculitis of the right eye and given combined eye drops of fluorometholone and neomycin 4 x 1 drop for the right eye. The patient underwent a canaliculotomy on the right eye. The canaliculotomy was performed by making an incision in the punctum area and curettage of the canaliculi canal. It was obtained a dacriolith measuring about 6x4x2 mm. The dacriolith sample was sent to the anatomic pathology laboratory. The patient was given doxycycline 2x100 mg orally, paracetamol 3x 500 mg orally, and combined eye drops of fluorometholone and neomycin 4x1 drop on the right eye as postoperative therapy. One day after the surgery the patient was discharged and scheduled for a follow-up one week later.

Postoperative follow-up showed there was no discharge, pain, swelling nor redness. Physical



Figure 2 Intraoperative Dacriolith Removal

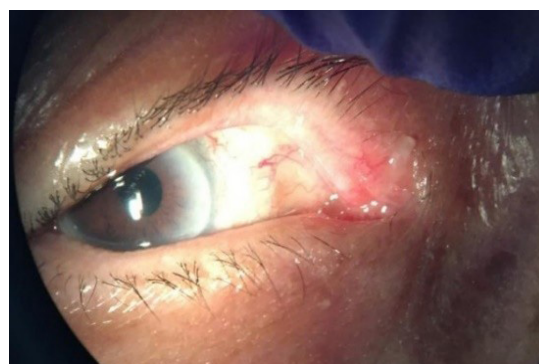


Figure 3 Anterior Segment Evaluation of the Right Eye Post Operatively

examination revealed vital signs within normal limits. As for the ophthalmological examination, the visual acuity of the right eye was 0.63 pinhole 0.8, left eye's visual acuity was 0.63 pinhole 0.8. Intraocular pressure with NCT in the right eye was 18 mmHg and in the left eye 17 mmHg. The movement of the right and left eyeballs was good in all directions. The anterior segment of the right eye exhibited dermatochalasis of the superior palpebra, and the presence of a scar. Other anterior segments of the left eye's examination are within normal limits except for the presence of an intraocular lens with no edema or hyperemia.

The results of the anatomical pathology examination from 3 pieces of tissue with the largest size 5x4x3 mm and the smallest measuring 3x2x2 mm, brownish-white in color, springy partly brittle revealed microscopically, the superior canalicular OD biopsy preparation consisted of edematous fibrocollagenous connective tissue stroma with massive inflammatory cells of lymphocytes, PMNs, and plasma cells. Among them also seen necrotic tissue and sulfur granule formation. No visible epithelium, signs of specific processes or malignant tumor cells. The conclusion of anatomical pathological examination was canaliculitis *et causa Actinomyces sp.*

The patient was diagnosed with post canaliculotomy OD due to chronic canaliculitis OD *et causa Actinomyces sp.* The patient was given artificial tears eye drops therapy 6x drop/day for both eyes. The patient was planned for follow-up 1 month later at the ROO polyclinic.

Case 2

A 60-year-old man came to the clinic with complaints of watery left eye with discharge and minimal pain since 3 years ago. There was no blurry vision in both eyes nor swelling, redness on the left eyelid. The patient has had a history of the recurrent and intermittent red left eye for the last 3 years and was given eye drops as the treatment, but the patient did not remember the name of the drug. History of trauma and surgery of the eye was denied. History of hypertension, diabetes mellitus, and other systemic diseases also was denied.

Physical examination revealed vital signs within normal limits. On ophthalmological examination, the visual acuity of the right eye was 1.0, and the visual acuity of the left eye was 1.0. Intraocular pressure with NCT in the right

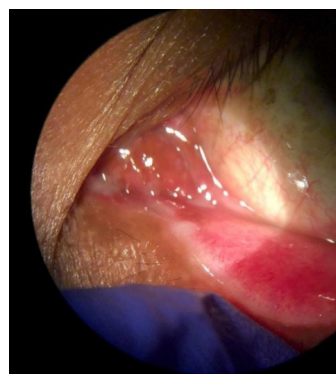


Figure 4 Pre-operative Anterior Segment Examination of the Left Eye

eye was 15 mmHg, in the left eye 11 mmHg. Movement of the right and left eyeballs in all directions. Right eye anterior segment palpebral superior canalicular punctum (+), inferior canalicular punctum (+), bulbar conjunctiva relatively calm, clear cornea, anterior chamber of Van Herrick grade III, flare/cell -/-, pupil round, light reflex +/+, iris synechiae (-), lens clear. Left eye anterior segment palpebral superior canalicular punctum (+), inferior canalicular punctum (+), inferior canalicular fistula (+), bulbar conjunctiva calm, clear cornea, Van Herrick grade III anterior chamber, flare/cells -/-, round pupil, light reflex +/+, iris synechiae (-) and clear lens.

The patient was diagnosed with canaliculitis and canaliculi fistula of the left eye and given eye drops combination of fluorometholone and neomycin 4 x 1 drops for the left eye. The patient underwent canaliculotomy and silicone tube placement on the left eye under sedation and local anesthetic. Canaliculotomy was performed by making an incision in the punctum area and curettage of the canalicular canal, followed by insertion of a silicone tube of the left eye. The patient was given doxycycline 2x100 mg orally, paracetamol 3x500 mg orally, eye drops a combination of fluorometholone and neomycin 4x1 drops on the right eye as postoperative therapy.

The patient followed up on the 10th-day postoperative day to ROO polyclinic. There was still a little discharge but no pain, swelling nor redness. Physical examination revealed vital signs within normal limits. Ophthalmological examination exhibited that the visual acuity of the right eye was 1.0 and the left eye was 1.0. Intraocular pressure with NCT was 18 in the right eye and 17 mmHg in the left eye. The movement of both eyeballs was good in

all directions. Anterior segment examination of the right eye within normal limit. The left eye anterior segment's examination exhibited superior and inferior canalicular punctum with silicone tube placement of the left eye and the rest examination within normal limit.

The patient was diagnosed with post canaliculotomy of the left eye with silicone tube placement due to canaliculitis, and canaliculi fistula of the left eye. The patient was given artificial eye drops 6x1 drops of right and left eyes and the was planned for follow-up 1 month later.

Case 3

A 67-year-old man presented to Reconstruction, Oculoplastic and Oncology clinic with the complaint of watery eyes for 2 years. The complaint was not accompanied by pain or redness in both eyes. Blurred vision was presented in both eyes one year after the chief complaint presentation. The patient had a history of secondary glaucoma of both eyes and was treated with timolol maleate eyedrop, artificial tears, and bandage contact lenses three years before presentation. He underwent cataract surgery of the right eye five years before the presentation and retinal surgery of the left eye three years before the presentation. There was no history of hypertension, diabetes mellitus, other systemic diseases, and allergy.

Physical examination revealed vital signs were ordinary. Ophthalmological examination showed visual acuity of the right eye was CFFC and the left eye was 0.1 with no difference after pinhole examination. Intraocular pressure was normal by palpation on both eyes. Anterior segment examination of the right eye revealed normal superior and inferior puncta, ciliary injection on bulbar conjunctiva, corneal edema with bullae, corneal neovascularization, and normal anterior chamber with anterior chamber intraocular

lens. Anterior segment examination of the left eye revealed only superior punctum presented with no inferior punctum, fibrovascular tissue on bulbar conjunctiva, pterygium head on the cornea, normal anterior chamber, and cloudy lens.

The patient has been diagnosed with punctum stenosis of inferior palpebra OS + pterygium grade II OS + Pseudophakic bullous keratopathy OD + Pseudophakia OD. Anel test was performed on the left eye with the result of stenosis of the inferior punctum. Punctoplasty was planned for the inferior palpebra of the left eye under local anesthesia. Post-operative medications were amoxicillin 500 mg three times a day, mefenamic acid 500 mg three times a day, fluorometholone and neomycine sulfate eye drop four times a day for the left eye, hydrocortisone and chloramphenicol eye ointment application three times a day for the left eye.

A post-operative follow-up examination showed that watery eyes were still presented. Visual acuity was hand movement on the right eye and 0.1 on the left eye. Ophthalmological examination revealed similar results from the first presentation except for both inferior and superior punctum of the left eye presented. The patient was treated with artificial tears six times a day for both eyes and instructed to come to the clinic in two to three weeks for watery eyes observation.

A follow-up examination revealed watery eyes both eyes were still presented and accompanied by an itchy sensation. Visual acuity was hand movement on the right eye and 0.1 on the left eye. Anterior segment examination of the right eye was similar to the previous follow-up. Anterior segment examination of the left eye showed inferior punctum was not intact with the superior punctum still presented. The patient was diagnosed with post punctoplasty inferior punctal stenosis OS + pterygium grade II OS + Pseudophakic bullous keratopathy OD + Pseudophakia OD. The patient was planned to



Figure 5 Pre-operative Anterior Segment Evaluation

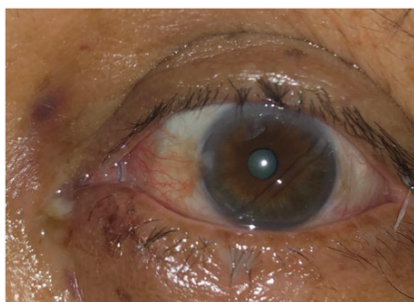


Figure 6 Post-operative Anterior Segment Evaluation of the Left Eye

undergo canaliculotomy with silicone tube OS in general anesthesia. The steps of the procedure were started with dilatation of inferior puncta OS then followed by canaliculotomy and silicone tube insertion OS. Post-operative treatments were amoxicillin 500 mg three times a day, paracetamol 500 mg three times a day, fluorometholone, and neomycine sulfate eyedrop four times a day for the left eye.

Post-operative day one examination showed both inferior and superior puncta of the left eye were intact. The patient was diagnosed with post canaliculotomy OS due to inferior punctal stenosis OS. The patient was discharged and treated with amoxicillin 500 mg three times a day, paracetamol 500 mg three times a day, fluorometholone, and neomycine sulfate eyedrop four times a day for the left eye. The patient was instructed to come for a follow-up one week later.

Discussion

Based on anatomy and physiology, the lacrimal system was divided into secretion and excretion. The structure of the lacrimal system was started from superior and inferior punctum of the medial portion of the eyelid. Both punctum with 0.3 mm diameter will form canals of superior and inferior canaliculi and merge to become common canaliculi. The common canaliculi will end in a tear sac called a lacrimal sac. The flow of tears in the lacrimal sac will stream down to the lacrimal duct until the inferior meatus of the nasopharyngeal space. Disruption of physiological flow of tear excretion may have resulted from infection, inflammation, trauma, iatrogenic, neoplasm, glaucoma medication, and dry eye treatment that caused the mechanical obstruction.^{1,4,5}

The main complaint of patients with lacrimal

duct obstruction is watery eyes, which is presented in three patients of this case series. Clinical manifestation of lacrimal duct obstruction varied based on its etiologies. Pouting punctum accompanied with erythema and eyelid edema and punctal mucopurulent secret on medial canthus palpation were pathognomonic signs of canaliculitis. The clinical signs of this condition were often misdiagnosed as conjunctivitis, hordeolum, mucocele, dacryocystitis, blepharitis, or meibum gland cysts. The first and second patients of this case series were presented with mucopurulent secretion from the punctum.³⁻⁵

Punctal stenosis can be evaluated by macroscopic and slit lamp examination. Diagnosis of punctal stenosis can be made with other diagnostic tests such as tear meniscus height and dye disappearance test. Anel's test of punctal stenosis will reveal difficulty in punctum dilator insertion and probing. Three patients of this case series showed punctal stenosis based on anel test.^{4,6,7}

Canaliculitis is commonly found in middle age and elderly patients, although some literature also mentions its occurrence in children. This case series showed canaliculitis cases in female and male patients with variable ages from 60 to 82 years old. Recent studies revealed that canaliculitis is more common in females. This is suspected due to hormonal changes during menopause that result in lower quality of tear production and decrease infection prevention. Research by Kaliki et al.⁵ showed that the female gender is a risk factor for canaliculitis.^{2,8}

The most common cause of primary canaliculitis is canaliculith obstruction. Canaliculith is composed of lipopolysaccharide aggregate, sulfur, and calcium that become more condensed as the tear viscosity increased due to hormonal and age. Secondary canaliculitis is associated with oral 5-fluorouracil consumption in breast cancer treatment, iatrogenic due to punctal plug, and other causes that may obstruct canaliculi such as eyelashes.^{3,6,9}

The etiologic agent of canaliculitis is dominated by Actinomyces gram-positive bacteria which is an anaerobe that difficult to be isolate and identified. Other bacteria, fungal and viral may cause canaliculitis. Another study explained that *Staphylococcus* is one of the most common causes of canaliculitis. The growth rate of Actinomyces is reported to range from 25–54%. Several canaliculitis case reports found *Arcanobacterium* (*Corynebacterium*) haemolyticum grew on culture media. The first patient of this case series had a pathological

anatomy examination that revealed the etiologic agent of her canaliculitis was *Actynomyces sp.*^{5,6,10}

Clinically, punctal stenosis is associated with topical and systemic medication. Long-term usage of an anti-glaucoma agent such as latanoprost and timolol maleate may form conjunctival fibrosis. This condition is contributed to the pathomechanism of punctal stenosis. Other topical agents that have a similar effect are chloramphenicol, tobramycin, dexamethasone, and mitomycin. The third had a history of glaucoma treatment with a topical anti glaucoma agent.^{7,11,12}

Conservative treatments of canaliculitis are warm compress, digital massage, and topical and oral antibiotics. A high recurrence rate of canaliculitis despite medical treatment is reported. This is due to canaliculi dacryolith obstructing tear drainage and preventing drug penetration. Surgical management remains the definitive treatment of canalicular obstruction due to canaliculitis. Widely accepted management of canaliculitis is canaliculotomy with canaliculi curettage. The goal of this procedure is to remove the dacryolith that obstructs the canaliculi. Canaliculotomy is also the treatment of choice for punctal stenosis when there is no improvement after punctal dilation and punctoplasty. Punctal dilation has a temporary effect while punctoplasty has a high risk of recurrence. To prevent a recurrence, Nandini et al use punctal plugs to inhibit post-operative tissue adherence. Silicone tube insertion is common after the canaliculotomy procedure. The third patient had recurrent punctal stenosis after punctoplasty, therefore the choice of management for this patient was canaliculotomy with silicone tube insertion.^{8,11,12}

To reduce the recurrence risk of post-operative canaliculitis, topical and systemic antibiotics are recommended post-operatively. The first and second patients underwent canaliculotomy and curettage. Post-operative treatment was combined fluorometholone and neomycin eyedrop four times a day on the right eye and oral doxycycline 100 mg two times a day for one week. The third patient was treated with oral Amoxicillin 500 mg three times a day and combined fluorometholone and neomycin eyedrop four times a day on the left eye.¹¹⁻¹³

Identification of possible etiologies and risk factors are important to correctly diagnose various nasolacrimal duct obstructions. Canaliculotomy is the preferred management of canalicular obstruction due to infection such as canaliculitis or anatomical anomalies

such as punctal stenosis. This procedure had a lower recurrence rate compared to medical management alone. Topical antibiotic and steroid combination with systemic antibiotics are recommended post-operatively to diminish the etiologic agents and prevent post-operative complication.^{4,8,13}

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