CASE REPORT

Dacryocystosclerotherapy with doxycycline injection for chronic dacryocystitis: a case report

Kenneth KH Lai[1], *AFCOphth; Yuen Ting Kwok*[2], *FHKAM (Ophthalmology); Hunter KL Yuen*[2,3] *FRCSEd, FRCOph*
[1]*Department of Ophthalmology, Tung Wah Eastern Hospital, Hong Kong*
[2]*Hong Kong Eye Hospital, Hong Kong*
[3]*Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong, Hong Kong*

Correspondence and reprint requests:
Dr Hunter KL Yuen, Hong Kong Eye Hospital, 147K Argyle Street, Kowloon, Hong Kong. Email: yuenkl1@ha.org.hk

Abstract

We report a case of chronic dacryocystitis treated with dacryocystosclerotherapy with doxycycline injection in an 89-year-old woman. At the 12-month follow-up, the dacryocystitis was resolved, and there was a residual sac cavity with a trace amount of mucoid discharge without requiring further treatment.

Key words: Dacryocystitis; Doxycycline

Introduction

Dacryocystitis is inflammation of the lacrimal sac that typically occurs in patients with nasolacrimal duct obstruction (NLDO).[1] Prompt treatment is required as dacryocystitis can lead to life-threatening conditions such as orbital cellulitis, meningitis, and cavernous sinus thrombosis.[2] Dacryocystorhinostomy (DCR) is indicated in patients with dacryocystitis secondary to NLDO.[3]

Sclerotherapy is a non-surgical procedure that injects sclerosants into the lesions. Good outcomes have been reported for orbital lesions such as vascular or lymphatic malformation. Dacryocystosclerotherapy (DCST) is a less invasive alternative to DCR for primary acquired NLDO.[4] Sclerosants that have been reported in DCST include ethanolamine oleate, sodium tetradecyl sulphate, and bleomycin.[4,5] We report a case of chronic dacryocystitis secondary to NLDO treated with DCST with doxycycline injection.

Case presentation

In October 2020, an 89-year-old Chinese woman presented to Hong Kong Eye Hospital with a 1-month history of increasing right eye discharge and lower eyelid swelling. She has been regularly followed up at our clinic for right eye NLDO and advanced primary open-angle glaucoma. The patient had undergone transcatheter aortic valve replacement for severe aortic stenosis 6 years earlier. She was recently diagnosed with breast cancer and has been receiving hormonal therapy. Given multiple comorbidities and a high risk for anesthesia, the patient did not undergo surgical intervention for NLDO.

Physical examination revealed mucoid discharge regurgitated from both the upper and lower punctum of the right eye, with early signs of dacryocystitis including tenderness, swelling, and skin induration. There was no proptosis, and the ocular motility was normal in both eyes. The microbiological culture of the discharge yielded heavy growth of *Escherichia coli*, which was sensitive to amikacin, ceftazidime, trimethoprim-sulfamethoxazole, and meropenem. She underwent canalicular irrigation with benzylpenicillin (100 000 U/mL) and expression of lacrimal sac secretion. One week later, she was prescribed 1% amikacin eyedrop four times per day for 8 weeks.

Three months later, the right dacryocystitis persisted despite biweekly canalicular antibiotics irrigation. Given the patient's high risk for anesthesia, DCST was performed as

Figure. Doxycycline is injected slowly around the right swollen lacrimal sac.

an alternative to dacryocystectomy and DCR. Under local anesthesia, the patient underwent lacrimal sac tapping and doxycycline injection using a three-way stop-clock system with two 3 mL syringes and one 16-gauge butterfly needle. 10 mg of doxycycline was diluted in 10 mL of normal saline. Minimal content was yielded upon lacrimal sac tapping, and 2 mL of doxycycline was injected slowly around the right swollen lacrimal sac (**Figure**). The patient complained of tolerable pain during the perilesional injection. The patient was then prescribed 1 week of oral Augmentin. At the 6-week follow-up, the dacryocystitis improved gradually with mild mucoid discharge. Second DCST was performed without lacrimal sac tapping, and local anesthesia was not required. At the 12-month follow-up, the dacryocystitis was resolved, and there was a residual sac cavity with a trace amount of mucoid discharge without requiring further treatment.

Discussion

Dacryocystitis is inflammation of the lacrimal sac; its symptoms include reddening, swelling, and severe tenderness overlying the nasolacrimal sac. Without prompt treatment, patients can develop orbital cellulitis, cavernous sinus thrombosis, and endophthalmitis (in those with intraocular surgery). Systemic antibiotic is the first-line treatment for acute dacryocystitis. Refractory cases require lacrimal sac massage, lacrimal irrigation, and surgery.[6] DCR is indicated in patients with dacryocystitis secondary to NLDO by connecting the lacrimal sac to the nasal cavity. Both external and endoscopic approaches to DCR have a high success rate.[3] Nonetheless, patients with multiple comorbidities may not be able to tolerate surgical intervention owing to the high risk for anesthesia. Our patient with a high risk for anesthesia opted to avoid surgical intervention. We, therefore, performed DCST with doxycycline injection as the less invasive alternative to DCR or dacryocystectomy.

Sclerotherapy is the first-line treatment in most vascular and lymphatic malformation lesions, particularly for non-distensible lesions with low blood flow and thus with increased reaction time for sclerosants.[7] The common pathway of sclerosants is to irritate and destroy the endothelial surfaces, which leads to vascular thrombosis and intimal fibrosis.[8] A good balance between efficacy and toxicity of the sclerosants is critical; sclerosants may cause tissue injuries if extravasation occurs, particularly in slow-flow lesions.[9] Ethanolamine oleate is the most potent sclerosant, but histological analysis of its structure effect was not available.[4] Both sodium tetradecyl sulphate and bleomycin are safe and effective in DCST and are able to preserve the histopathological data for subsequent analysis.[5]

DCST was first reported in 2001 in nine patients with primary NLDO or previous incomplete dacryocystectomy using ethanolamine oleate.[4] Three of the nine patients had a recurrence of dacryocystitis, and two of them underwent a second DCST with good outcomes. In 10 patients with primary NLDO treated with sodium tetradecyl sulphate or bleomycin, two patients treated with bleomycin required additional DCST, whereas one patient treated with sodium tetradecyl sulphate had persistent moderate inflammation and required low-dose oral steroid.[5] All 10 patients underwent dacryocystectomy 4 weeks after DCST; histopathological analysis suggested that sodium tetradecyl sulphate was a better sclerosing agent than bleomycin, with a more prominent effect on the sac wall vessels and intra-sac wall hemorrhages.

Our patient underwent repeat DCST at the 6-week follow-up and achieved good outcomes at the 12-month follow-up. Minimal content was yielded from the lacrimal sac tapping, and the sclerosant was injected perilesionally. The exact mechanism of sclerosing action of doxycycline is unclear, and both the inhibition of matrix metalloproteinase and suppression of vascular endothelial growth factors may cause collagen and fibrin deposition and result in dense adhesion and fibrosis.[7,10] We postulate that the perilesional injection may diffuse doxycycline into the lacrimal sac cavity and result in inflammation with secondary fibrosis and adhesions, which leads to shrinkage of the lacrimal sac. Interstitial sclerotherapy has been reported to be effective in treating vascular malformation lesions.[11,12] Further investigation of the histological changes and the sclerosing mechanism is warranted.

Doxycycline is effective in treating lymphatic malformation, but its role in treating dacryocystitis as a sclerosant is unknown. To the best of our knowledge, our patient is the first reported case of DCST with doxycycline injection. Doxycycline has an additional antimicrobial effect for lesions caused by infections. Doxycycline is an antibiotic in the tetracycline group that inhibits bacterial protein synthesis by binding to the 30S ribosome subunit.[13] Sodium tetradecyl sulphate and ethanolamine oleate can cause skin hyperpigmentation and necrosis.[7,13] Doxycycline has minimal local and systemic complications.[14] Although bleomycin is routinely prepared by trained pharmacists, its availability may be limited in hospitals without an oncology department. Whereas doxycycline is easily prepared and

widely available in many ophthalmic centers of Hong Kong.[14] DCST with doxycycline injection is a less invasive alternative to surgical intervention in patients at high risk for anesthesia.

Contributors

All authors designed the study, acquired the data, analyzed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Data availability

All data generated or analyzed during the present study are available from the corresponding author on reasonable request.

Ethics approval

The patient was treated in accordance with the tenets of the Declaration of Helsinki. The patient provided written informed consent for all treatments and procedures and for publication.

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