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CASE REPORT

End stage thyroid ophthalmopathy presenting with bilateral exposure keratitis

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Abstract

The present case reports a 70-year-old female patient who presented with bilateral exophthalmos, lagophthalmus, and exposure keratitis. An aggressive topical treatment was commenced that included fortified vancomycin and ceftazidime. She was subsequently diagnosed with severe thyroid ophthalmopathy (TO) due to severe static and dynamic tremor that raised suspicion and abnormal thyroid function tests indicating Graves' Disease. She was diagnosed with bilateral exposure keratitis secondary to TO in which the clinical activity score was assessed as 5. As her TO was sight-threatening, she was administered intravenous pulse methylprednisolone, followed by bilateral balanced 2-wall (medial and lateral) decompression and lateral temporary tarsorrhaphy surgeries. As her exophthalmos and lagophthalmos improved postoperatively, both eyes' keratitis significantly regressed, and left scar tissue in the cornea. This extreme case should raise awareness for clinicians in the etiological investigation of exposure keratopathy to identify sight-threatening thyroid ophthalmopathy and promptly initiate appropriate treatment.

Keywords: Exposure keratitis; thyroid ophthalmopathy; thyroid orbitopathy.

Exposure keratopathy refers to drying of the cornea with subsequent epithelial breakdown due to a failure of eyelids to cover the globe, resulting in improper wetting of the ocular surface by tears.[1] Exposure keratopathy may lead to several severe complications such as bacterial ulcers that can cause opacity or corneal perforation and profound vision loss.[2] Therefore, it is very important that correct diagnosis is made and treatment is applied for the etiology. Decreased tear formation, reduced blink rate, incomplete eyelid closure, decreased corneal reflex, and altered vascular permeability predispose to exposure keratopathy.[3] Incomplete eyelid closure or lagophthalmos is a major risk factor for exposure keratopathy. Exposure keratopathy reportedly develops in 3.6–60% of intensive care unit patients.[4]

Bilateral exposure keratopathy associated with exophthalmos is a rare finding. Although this may occur due to bilateral retrobulbar tumors, hemorrhage, infection, and inflammation; thyroid ophthalmopathy (TO) can also be the underlying etiology. In fact, exposure keratopathy is observed in ~10% of TO patients.[5] Exophthalmos with eyelid retraction and chemosis in Graves' patients accelerates

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ocular surface exposure and corneal epithelial destruction. In critically ill patients, physiological stress can also activate TO and complicate ocular findings.[6]

The present case reports a patient who presented with bilateral exposure keratitis and was subsequently diagnosed with severe TO.

Case Report

A 70-year-old female patient was admitted to the emergency department with the complaints of pain and discharge in both eyes for a week (Fig. 1). She was living in a nursing home and had extremely poor cooperation to communicate and perform eye exams. She had a history of bilateral red eyes for the last 1 month, as learned from her nurse. Her medical history included Parkinson's disease, bipolar disease, and hypertension. During the initial eye exam, we noticed that she had significant static tremor in addition to dynamic tremor that was attributed to her Parkinson's disease. Her bilateral visual acuities were between 1.1 logMAR and hand movements. Biomicroscopic examination revealed bilateral severe mucopurulent discharge, extensive corneal infiltration and edema with inferior corneal ulceration (Fig. 2). Anterior chamber examination was unclear due to severe tremor of the patient. Intraocular pressures were 28 mmHg on the right and 25 mmHg on the left eye, by Tonopen. Fundus examination could not be evaluated with indirect ophthalmoscopy and was observed normally by ocular ultrasonography. The patient was hospitalized and corneal scrapings and cultures were obtained. An aggressive topical treatment was commenced that included hourly fortified vancomycin 50 mg/ml and fortified ceftazidime 50 mg/ml, cycloplegine drop 3×1, brimonidine drop 2×1, brinzolamide and timolol combination drop 2×1, and hourly artificial tear eye drops.

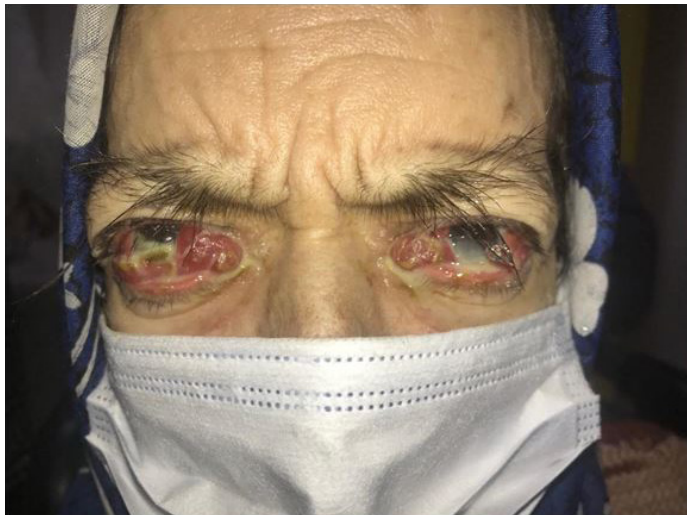

Fig. 1. Severe chemosis, conjunctival hyperemia, secretion, inferior corneal infiltrate, and lagophthalmus image in the patient's initial inspection.

No bacteria and leukocytes were observed in direct microscopic examination of corneal scraping specimens, immediately; and no microorganism growth could be detected in the cultures, in the following weeks. For the etiological investigation of severe tremor, she was consulted to Neurology Department for her Parkinson's disease and to Psychiatry Department for possible drug toxicities. Her initial hemogram, biochemistry and thyroid function tests revealed normal findings, except TSH: <0.015, T3: 3.06, T4: 2.48, and Trab: 20. Subsequent thyroid ultrasonography revealed multiple nodules compatible with autoimmune thyroiditis. Tyromazole 2×1 was added to the patient who

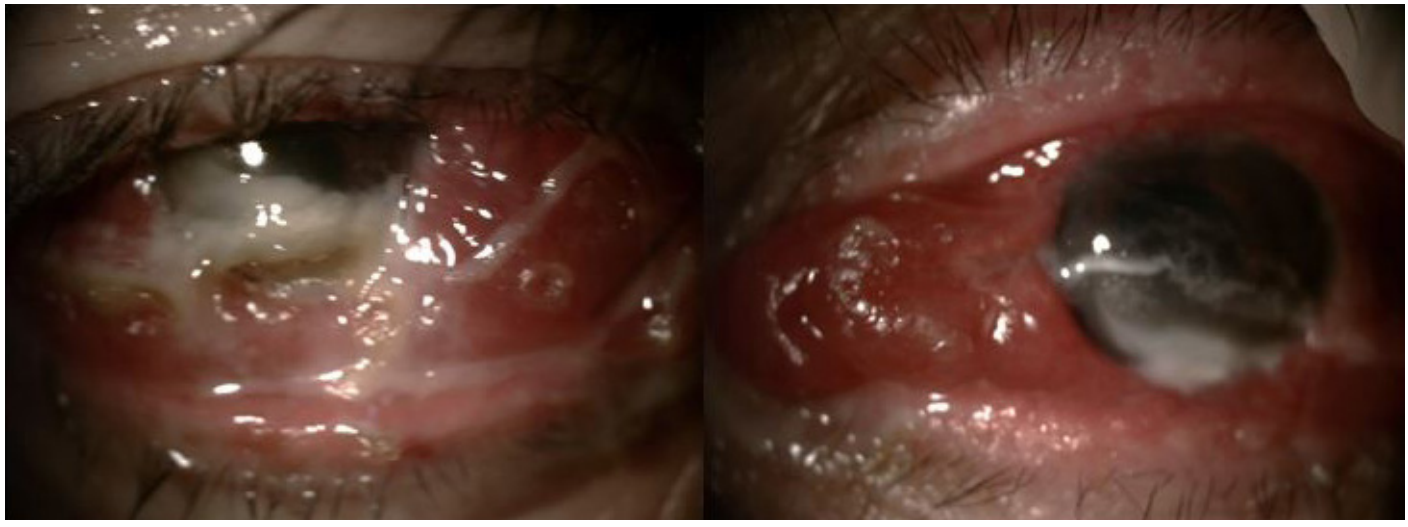

Fig. 2. In the slit-lamp examination of the patient, bilateral cornea edema, inferior corneal infiltration (in the right eye is more widespread), secretion, severe chemosis, and hyperemia images (left image is right eye and right image is left eye).

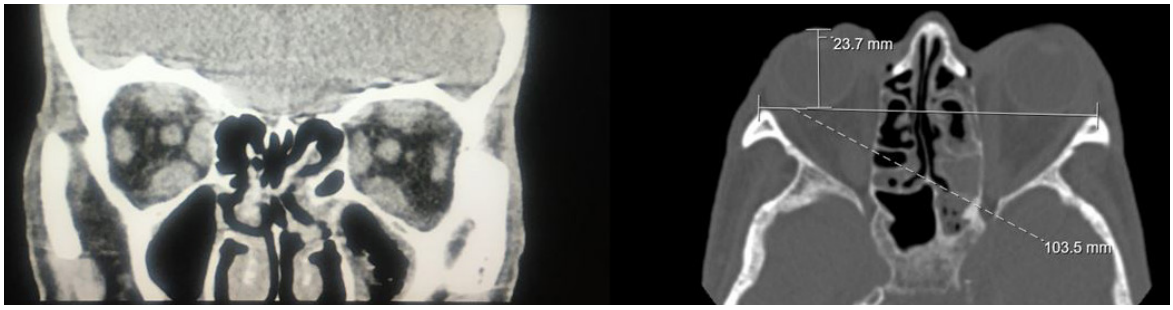

Fig. 3. Left image; significant hypertrophy image in bilateral inferior and medial rectus muscles with orbital CT. Right image; bilateral exophthalmometry measurement that 23.7 mm by CT.

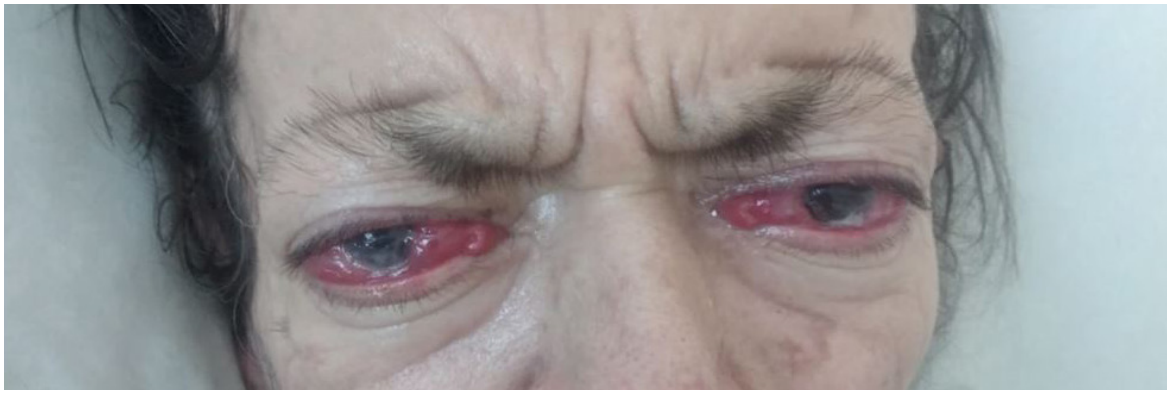

Fig. 4. Improvement in exophthalmos, lagophthalmia, chemosis, and hyperemia after intravenous administration of 750 mg and 500 mg pulse methylprednisolone with 3-day intervals.

Fig. 5. In the slit-lamp examination of the patient, regression of keratitis and improvement in the corneal epithelium with scar tissue postoperatively.

was diagnosed with Graves' Disease by the Endocrinology Department.

The patient was diagnosed with bilateral exposure keratitis secondary to TO. As the cooperation of the patient was extremely poor, her pain status could not be assessed. Given the current general status and eye exam findings of the patient, the clinical activity score[7] of the patient was evaluated as 5 (i.e., bilateral chemosis, conjunctival hyperemia, eyelid edema, eyelid hyperemia, and caruncle hyperemia). Unfortunately, she who could not undergo magnetic resonance imaging due to her intense tremor and denial for a general anesthesia. However, orbital computed tomography (CT) revealed significant hypertrophy in bilateral inferior and medial rectus muscles and an exophthalmic measurement of 23.7 mm (Fig. 3). Patient's exophthalmos with severe upper eyelid retraction and decreased blink reflex were deemed as the causative factors for exposure keratitis. An application of 5 IU of botulinum toxin A was per-

formed to the bilateral levator muscles; however, the upper eyelid retraction was refractory. Since the TO was clinically active, she was administered intravenous 750 mg and 500 mg pulse methylprednisolone with 3-day intervals which lead to a dramatic improvement in her exophthalmos (Fig. 4). With the improvement of eyelids' closure function and regression of bacterial keratitis, fortified antibiotics were stopped and her topical treatment was continued as moxifloxacin drops 6×1, cyclosporine drops 2×1, loteprednol etabonate drops 2×1, artificial tears, as well as the previous antiglaucomatous treatment. However, her TO was still sight-threatening after 10 days and, thus, we performed bilateral deep lateral wall decompression with fat removal, followed by medial wall decompression (i.e., a balanced 2-wall decompression) with ethmoidectomy. Dysthyroid optic neuropathy was not observed in the CT and proptosis reduced significantly after orbital decompression surgery. Therefore, bilateral lateral temporary tarsorrhaphy and lower lid medial frost saturation were also performed for exposure keratopathy. As her exophthalmos and lagophthalmos improved postoperatively, her keratitis also significantly regressed, and left a scar tissue in the cornea (Fig. 5). Her visual acuities did not seem to improve, possibly due to pale optic discs seen after decompression surgery and her uncooperation to the exams. Unfortunately, on her 1st month of discharge from the ophthalmology clinic, the patient passed away due to septic shock as a result of perforated cholecystitis.

Discussion

Our patient presented with bilateral lagophthalmos and exophtalmus, which are major risk factors for exposure keratopathy. She underwent a thorough and complete examination to investigate possible etiologies for exposure keratopathy; and finally was diagnosed with Graves' disease. Her severe static tremor observed in her physical examination and thyroid dysfunction in laboratory tests indicating thyrotoxicosis led to correct diagnosis. A complete clinical response could be seen after appropriate intravenous pulse steroid therapy and orbital decompression surgery for her severe TO.

The etiologies of lagophthalmos can be broadly classified into two categories.[8] The first category of is palpebral pathology-related causes. Abnormal eyelid closure can be a result of previous surgery, a traumatic injury or idiopathic.[9] Our patient had no previous history of surgery or trauma. The second category is proptosis-related causes such as physiological abnormalities, intraorbital tumors, or endocrine-related conditions including dysthyroid optic neuropathy/thyroid eye disease. A detailed anamnesis was not obtained from the nursing home for our patient. Due to her extremely poor cooperation and examination due to severe tremor was suboptimal. Her tremor had always been attributed to the Parkinson's disease, even in her regular check-ups at the nursing home. Her radiological imaging revealed no pathologies other than exophthalmos and hypertrophic rectus muscles. TO was then considered as the preliminary diagnosis.

Many systemic diseases, especially neurological conditions, have also been implicated as causative or linked to exposure keratopathy. Facial nerve paralysis has been known to cause lagophthalmos with exposure keratopathy as a subsequent consequence. Since facial nerve innervates the facial muscles, it affects facial symmetry and eyelid closure and is integral in the prevention of paralytic lagophthalmos.[10] Another important cranial nerve is the trigeminal nerve, which supplies sensory input to the cornea. Trigeminal nerve lesions can lead to neurotrophic keratitis that inhibits the blinking reflex, which is vital for protecting the cornea from external stimuli and normal tear film production.[11] Furthermore in exposure keratopathy, potential etiologies such as sleep apnea with consequent sequelae, or floppy eyelid syndrome were also reported in the literature.[12]

Identifying the underlying cause of the condition remains a priority, and doing so facilitates the development of a correct treatment plan. Our patient was admitted with bilateral exposure keratitis and diagnosed as Graves' disease after etiological investigation. In fact, she or her nursing facility had no prior knowledge that her thyroid function tests were abnormal. Having identified a correct diagnosis, response to the treatment was obtained easily.

Dysthyroid optic neuropathy or corneal breakdown due to severe exposure are both sight-threatening complications of TO. Depending on the severity of the exophthalmos, cases of corneal exposure keratopathy could be treated with aggressive topical lubrication, moisture chamber, botulinum toxin, levator recession surgery, tarsorrhaphy, or even orbital decompression in very severe cases of exophthalmos which impede lid closing. Intravenous methylprednisolone should be administered prior surgery if the disease is still active.[7] Although our patient's optic nerve cannot be evaluated initially, she had an obvious sight-threatening TO. Clinical improvement could be achieved in addition to topical antibiotic treatment for exposure keratitis, after first intravenous steroids, then orbital decompression and tarsorrhaphy surgeries.

Conclusion

Exposure keratopathy with bilateral lagophthalmos of exophthalmos origin is rare and requires prompt diagnosis and treatment. This extreme case should raise awareness for clinicians in the etiological investigation of exposure keratopathy to identify sight-threatening TO and promptly initiate appropriate treatment.

Informed Consent: Written informed consent was obtained from the patients for the publication of the case report and the accompanying images.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: C.A.U.; Design: C.A.U.; Supervision: A.Y.; Resource: A.Y.; Materials: A.Y.; Data Collection and/or Processing: B.A.Y.; Analysis and/or Interpretation: C.A.U.; Literature Search: B.A.Y., C.A.U.; Writing: B.A.Y.; Critical Reviews: A.Y.

Conflict of Interest: None declared.

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References

1. Demirel S, Cumurcu T, Firat P, Aydogan MS, Doganay S. Effective management of exposure keratopathy developed in intensive care units: The impact of an evidence based eye care education programme. Intensive Crit Care Nurs 2014;30:38–44.
2. Hodgson NM, Rajaii F. Current understanding of the progression and management of thyroid associated orbitopathy: A systematic review. Ophthalmol Ther 2020;9:21–33.
3. Kuruvilla S, Peter J, David S, Premkumar PS, Ramakrishna K, Thomas L, et al. Incidence and risk factor evaluation of exposure keratopathy in critically ill patients:A cohort study. J Crit Care 2015;30:400–4.
4. Grixti A, Sadri M, Edgar J, Datta AV. Common ocular surface disorders in patients in intensive care units. Ocul Surf 2012;10:26–42.
5. Gupta R, Thomas R, Almukhtar F, Kiran A. Visual morbidity in thyroid eye disease in Asian Indian patients. Indian J Ophthalmol 2020;68:1622–7.
6. Mizokami T, Li AW, El-Kaissi S, Wall JR. Stress and thyroid autoimmunity. Thyroid 2004;14:1047–55.
7. Barrio-Barrio J, Sabater AL, Bonet-Farriol E, Velazquez-Villoria A, Galofre JC. Graves' ophthalmopathy: VISA versus EUGOGO classification, assessment, and management. J Ophthalmol 2015;2015:249125.
8. Latkany RL, Lock B, Speaker M. Nocturnal lagophthalmos: An overview and classification. Ocul Surf 2006;4:44–53.
9. Alhoutan K, Alarfaj K. Exposure keratopathy: An ıdiopathic lagophthalmos case report. Cureus 2021;13:e18945.
10. Sohrab M, Abugo U, Grant M, Merbs S. Management of the eye in facial paralysis. Facial Plast Surg 2015;31:140–4.
11. Sacchetti M, Lambiase A. Diagnosis and management of neurotrophic keratitis. Clin Ophthalmol 2014;8:571–9.
12. West SD, Turnbull C. Eye disorders associated with obstructive sleep apnoea. Curr Opin Pulm Med 2016;22:595–601.