

STERILE ENDOPHTHALMITIS FOLLOWING CATARACT SURGERY IN THE LEFT EYE: A RARE CASE REPORT OF TOXIC ANTERIOR SEGMENT SYNDROME (TASS)

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ABSTRAK

Toxic anterior segment syndrome (TASS) merupakan suatu kondisi komplikasi pasca tindakan pembedahan mata. TASS bersifat steril dan dapat terjadi akibat dari zat toksik non infeksius dengan berbagai etiologi. Seorang laki-laki berusia 55 tahun yang terdiagnosa dengan oculi sinistra toxic anterior segment syndrome, oculi dextra astigmatisme miopia kompositif dan oculi dextra et sinistra presbiopia dengan pseudofakia yang terjadi pasca tindakan operasi katarak dengan teknik fakoemulsi dan pemberian tetes mata ciprofloxacin. Antibiotik ciprofloxacin dapat menyebabkan toksisitas pada mata karena dapat mengendap pada kornea mata. Pengendapan tersebut memiliki kaitan erat dengan PH pada lapisan air mata.

ABSTRACT

Sterile Endophthalmitis Following Cataract Surgery in the Left Eye: A Rare Case Report of Toxic Anterior Segment Syndrome (TASS). Toxic anterior segment syndrome (TASS) is a complicated condition following eye surgery. TASS is sterile and can occur due to non-infectious toxic substances with various etiologies. A 55-year-old man diagnosed with oculi sinistra toxic anterior segment syndrome, oculi dextra astigmatism composite myopia and oculi dextra et sinistra presbyopia with pseudophakia that occurred after cataract surgery with phacoemulsion technique and administration of ciprofloxacin eye drops. Ciprofloxacin, an antibiotic, can cause ocular toxicity by depositing on the cornea surface. The precipitation is closely related to the PH of the tear film

INTRODUCTION

Cataract is an eye disorder that is mostly caused by the process of increasing age and is the number one cause of blindness in the world, with a total of 15.2 million cases, according to *Global Burden of Disease* (GBD) in 2020.^{1,2} The large number of cases of blindness due to cataracts in the world makes cataract surgery the most frequently performed procedure in the world.² Cataract surgery has existed since the 5th century BC with the technique "couching" at the time. This technique is performed to deal with mature cataracts by moving the cloudy lens out of the axis of vision using a needle without removing it from the eye.³ However, this ancient procedure has long been abandoned because the side effects after the procedure provide unsatisfactory results.

Various studies and innovations in cataract surgery have been carried out to increase the success of treatment and obtain satisfactory results after the procedure. These types of cataract surgery include extracapsular cataract extraction (ECCE), intracapsular cataract extraction (ICCE), and phacoemulsion, which are modern cataract extraction procedures combined with intra-ocular lens (IOL) cooking.³ Even though cataract surgery has been modified to keep pace with developments and has a high success rate with low complications, this procedure still allows intraoperative and post-operative complications to occur, such as tearing of the posterior capsule of the lens, *iris floppy syndrome*, hyphema, pseudophakic glaucoma, endophthalmitis up to *toxic anterior segment syndrome* (TASS).^{4,5}

In 1992, the term *toxic anterior segment syndrome* (TASS) was first introduced by Monson et al.⁶ Post-operative endophthalmitis and post-operative uveitis are other names for TASS. This condition is an uncommon complication after eye surgery, with an incidence rate of 0.22% based on a retrospective study conducted by Sengupta et al.⁸ The prevalence and reports of TASS cases in Indonesia are still limited. However, in Bogor's hospitals and *family medical centers*, the TASS incidence rate was 4.8% after cataract surgery. There was a TASS incidence rate of 0 after cataract surgery using various surgical techniques, including phacoemulsification.^{9,10} TASS is characterized by the occurrence of an inflammatory reaction in the anterior chamber of the eye without the involvement of sterile microorganisms as a result of non-infectious toxic substances with various etiologies.^{6,7} This event can occur within 12-48 hours after surgery with complaints such as red eyes, mild eye pain, and blurred vision. On further examination, severe corneal edema with a limbus to limbus pattern can be found, a relatively specific clinical finding in TASS. This TASS event must be differentiated from infectious endophthalmitis so that appropriate and fast treatment can be given.^{6,7} If the diagnosis has been confirmed, it can generally improve by administering high doses of steroid therapy, especially in cases of severe TASS with findings of fibrin formation.^{6,11} This case study describes a TASS case that occurred in a middle-aged man after cataract surgery using the phacoemulsion technique, systematically discussing the course of the disease and the condition after therapy for complaints.

The thing that distinguishes between TASS and endophthalmitis is the rapid onset of TASS (12-48 hours after surgery). In contrast, endophthalmitis has an onset of about 6 weeks; TASS has a mild pain level while endophthalmitis does not, and in TASS, no organisms are obtained by gram staining or culture, while in endophthalmitis, it is the opposite.¹⁶

CASE ILLUSTRATION

a. Pre-surgical history

Mr. J, A 55-year-old middle-aged man who works as a farmer, arrived at the eye clinic with the main complaint of blurred vision in the left eye approximately 15 hours ago, accompanied by additional complaints of glare when exposed to sunlight and intermittent pain. The patient is known to have had complaints in the form of blurred vision and shadows in both eyes since 1 year ago, and the patient did not initially feel this complaint to be disturbing. However, these complaints were felt to be increasingly aggravating and interfering with the patient's activities as time went on. Blurred vision, such as foggy or smoky, and complaints worsen during the day, especially when there is

sunlight when working in the fields, and it feels very dazzling. Complaints feel lighter at night. Patients also find it challenging to read far and near.

This caused the patient to be diagnosed with cataracts in both eyes. The patient is also known to have a history of diseases such as a history of type 2 diabetes mellitus since 3 years ago and, is controlled by taking the anti-hyperglycemic drug metformin 500 mg three times a day and a history of hypertension since 2 years ago and is not controlled. Meanwhile, on family history, it was found that he did not have a history of similar diseases.

b. Surgical details

So, in March 2024, the patient underwent right eye cataract surgery using the phacoemulsion technique. After the procedure, complaints of fog and glare in the right eye had disappeared, but the vision still felt blurry and shadowy when looking far away. In May 2024, the patient is planned to undergo cataract surgery on the left eye using the same technique and operator.

c. Treatment after right and left eye cataract surgery

After surgery, the patient received glasses and used them as recommended, which function as post-operative eye protection and received eye drops containing dexamethasone 1 mg, neomycin sulfate 3.5 mg, and polymyxin b sulfate 10,000 SI, which was used 6 drops per day in the right eye, antibiotic eye drops ciprofloxacin HCL 3 mg used 6 drops per day, acetazolamide given orally consumed once a day in the morning to prevent the occurrence secondary glaucoma after cataract surgery. Apart from the above drugs, the patient also takes several other drugs, such as potassium l-aspartate once a day orally at a dose of 300 mg and the drug candesartan 16 mg once a day orally, which is consumed in the morning.

d. Post-surgical left eye observation

15 hours after cataract surgery on the left eye, the patient complained that the vision in the right eye was increasingly blurry and progressive. The patient also complained of mild pain that seemed to come and go in the left eye. Apart from that, patients also complain of discomfort and glare when exposed to sunlight. The patient stated that this was the first time he had complained and had never experienced something similar in his right eye.

On physical examination, the patient's vital signs were found to be within normal limits, with details: the patient's blood pressure was systolic 119 mmHg and diastolic 87 mmHG, pulse rate 85 times per minute, adequate content with a regular rhythm, breathing frequency 20 times per minute, regular rhythm with abdominothoracic type of breathing, The patient's body temperature was found to be 36.5thC. On examination of the eye system, it was found that the right eye, after 3 months of surgery, had a vision of 6/12 with a sphere of – 0.25 and a cylinder of – 0.50 with an axis of 105the and the addition of +3.00 diopter lenses so that the visual acuity after correction becomes 6/6 with two reading errors on the Snellen Chart. The patient's intraocular pressure (IOP) was checked using non-contact tonometry or *air puff*, and the result was 15mmHg. On slit-lamp examination and extra oculi funduscopy, no abnormalities were found; Intra Ocular Lens (IOL) +, the optic nerve was round, clear boundaries, reddish-yellow, *Cup-to-Disc Ratio* (CDR) 0.3, arterial/venous ratio (AVR) 2/3, retina within normal limits, positive macular reflex. Meanwhile, on

examination of the patient's left eye after 15 hours of surgery, the vision was 6/30 with 2 reading errors in the eye. *Snellen chart*. After that, the patient was given a pinhole, but there was no visual improvement. When checking the IOP using the same tool, it was found to be 17 mmHg. On slit-lamp examination and fundoscopy of the left oculi, edema was found on the left eyelid *upper and lower conjunctival injection*, diffuse corneal edema from limbus to limbus, keratic precipitates (+) on the endothel cornea, visible *flare* (+) in the anterior chamber, fibrin (+) in the pupil, Pupil appears mid-dilated, IOL (+), optic nerve is round, with firm boundaries, reddish-yellow, CDR 0.3, AVR 2/ 3, the retina is within normal limits and the macular reflex is positive.

After the examination had been carried out systematically and entirely from the history to system examination, this patient was diagnosed with oculi sinistra toxic anterior segment syndrome, oculi dextra astigmatism myopia composite, and oculi dextra et sinistra presbyopia + pseudophakia, and this patient was differentially diagnosed with infectious endophthalmitis.

e. Treatment after the patient was diagnosed with oculi sinistra toxic anterior segment syndrome

Based on the diagnosis that has been made, the clinician stopped administering ciprofloxacin HCL 3mg drops and provided additional therapy in the form of dexamethasone tablets at a dose of 0.5mg taken orally, three times a day after meals and 1% tropicamide eye drops 2 drops per day in the eyes. Apart from that, patients are given education regarding the disease they are suffering from, the treatment plan, and the prognosis of their disease; patients are also encouraged to come back to the polyclinic regularly every week to get an evaluation of the treatment given and are advised to consume foods that have a high vitamin A content.

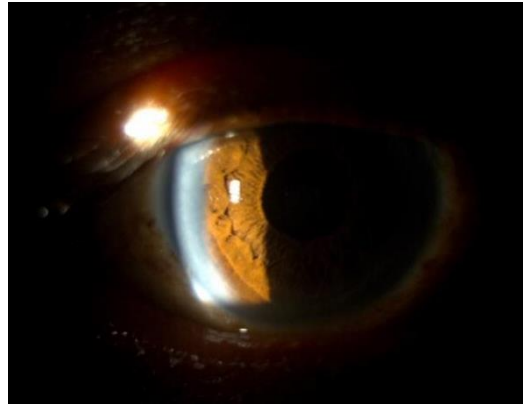
f. Treatment result 1 week after the patient was diagnosed with oculi sinistra toxic anterior segment syndrome

One week after treatment, the patient comes back to the clinic according to the clinician's recommendations, and the patient's complaints and clinical condition are evaluated. Based on the patient's confession, it was found that left eye complaints, such as blurred vision, had improved a lot compared to 1 week ago, but he still needed to squint if he wanted to see far away. Patients also feel that when exposed to sunlight and in a bright place, the patient's eyes no longer feel glare or pain, and it is easier to see long distances.

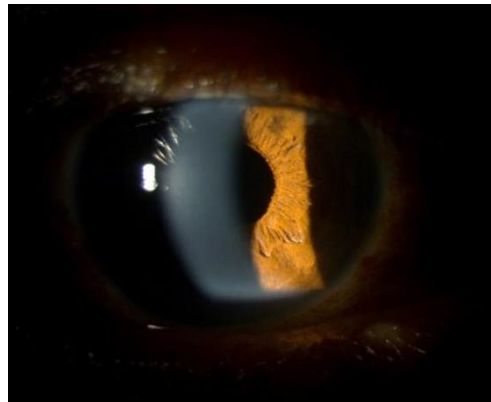
Other complaints, such as headaches, dizziness, nausea, vomiting, fever, red eyes, and itchy eyes, were denied by the patient. On physical examination, the patient's vital signs were within normal limits, the patient's systolic blood pressure was 120 mmHg and diastolic 80 mmHg, the pulse rate was 80 times per minute with a regular rhythm and was sufficiently filled, the respiratory rate in one minute was found to be 20 times per minute, and the temperature was within normal limits. at 36.5°C. On examination of the eye system, the visual acuity in the right eye was 6/7.5, with one reading error in the eye *Snellen chart*. Spherical -0.25, cylindrical -0.5 with axis 95the and additional diopters +3.00, after correcting the patient's vision to 6/6. The IOP was found to be 15 mmHg on the slit lamp examined. There were no abnormalities in the right eye.

Meanwhile, in the left eye, the vision was at 6/30, with 2 reading errors *in the Snellen chart*. Pinhole inspection (+), giving Spheris -1.50, and adding diopters +3.00. After correction, the patient's vision decreased to 6/6. On examination, the IOP was found to be 17 mmHg, on slit-lamp and fundoscopy examination, palpebral edema was found only inferiorly and minimally, corneal,

conjunctival injection (-) did not show edema, keratic precipitates were still visible, but had decreased compared to one week ago, fibrin in the pupils had absence, flare (-) in the anterior chamber, IOL (+).

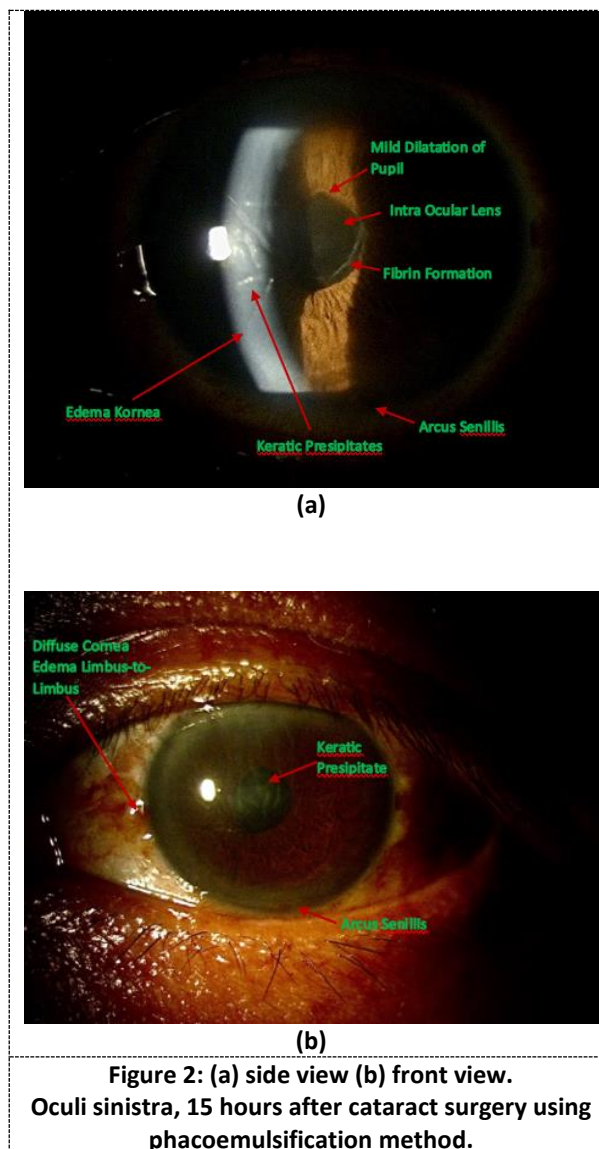


(a)



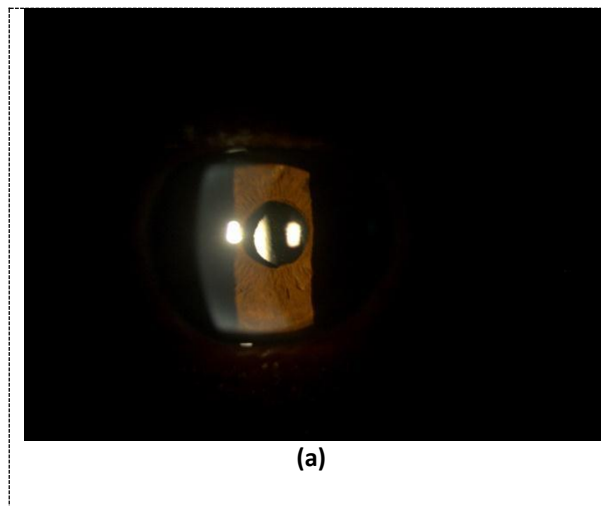
(b)

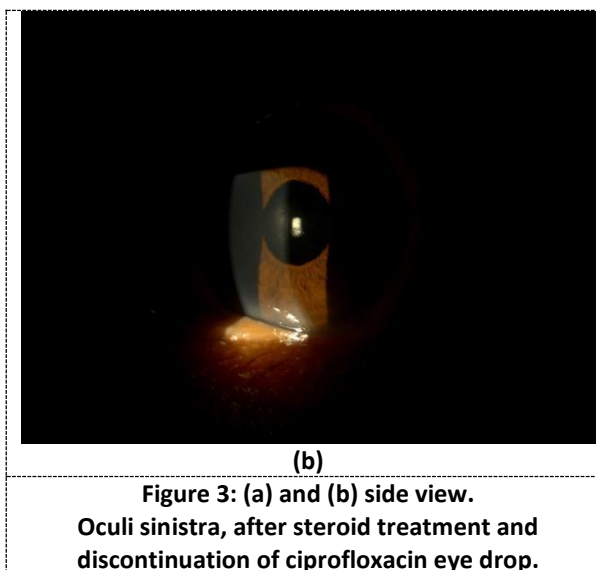
Figure 1: (a) front view (b) side view, Oculi dextra, 3 months after cataract surgery using phacoemulsification method



After the examination had been carried out systematically and entirely from the history to system examination, this patient was diagnosed with oculi sinistra toxic anterior segment syndrome, oculi dextra astigmatism myopia composite, and oculi dextra et sinistra presbyopia + pseudophakia, and this patient was differentially diagnosed with infectious endophthalmitis. Based on the diagnosis that has been made, the clinician stopped administering ciprofloxacin HCL 3mg eye drop and provided additional therapy in the form of dexamethasone tablets with a dose of 0.5mg taken orally, three times a day after meals, and 1% tropicamide eye drop, 2 drops per day in the left eye. Apart from that, patients are given education regarding the disease they are suffering from, the treatment plan, and the prognosis of their disease; patients are also encouraged to come back to the polyclinic regularly every week to get an evaluation of the treatment given and are advised to consume foods that have a high vitamin A content.

One week after treatment, the patient returns to the clinic according to the clinician's recommendations, and the patient's complaints and clinical condition are evaluated. Based on the patient's confession, it was found that left eye complaints, such as blurred vision, had improved a lot compared to 1 week ago, but he still needed to squint if he wanted to see far away. Patients also feel that when exposed to sunlight and in a bright place, the patient's eyes no longer feel glare or pain, and it is easier to see long distances. Other complaints, such as headaches, dizziness, nausea, vomiting, fever, red eyes, and itchy eyes, were denied by the patient. On physical examination, the patient's vital signs were within normal limits, the patient's systolic blood pressure was 120 mmHg and diastolic 80 mmHg, the pulse rate was 80 times per minute with a regular rhythm and was sufficiently filled, the respiratory rate in one minute was found to be 20 times per minute, and the temperature was within normal limits. at 36.5°C. On examination of the eye system, the visual acuity in the right eye was 6/7.5, with one reading error in the eye *Snellen chart*. Spherical -0.25, cylindrical -0.5 with axis 95the and additional diopters +3.00, after correcting the patient's vision to 6/6. The IOP was found to be 15 mmHg on examination, and on slit-lamp examination, no abnormalities were found in the right eye. Meanwhile, in the left eye, the vision was at 6/30, with 2 reading errors in the *Snellen chart*. Pinhole inspection (+), giving Spheris -1.50, and adding diopters +3.00. After correction, the patient's vision improved to 6/6. On examination, the IOP was found to be 17 mmHg; on slit-lamp and funduscopy examination, palpebral edema was found only inferiorly and minimally, corneal conjunctival injection (-) did not show edema, keratic precipitates were still visible, but had decreased compared to one week ago, fibrin in the anterior chamber had absence, flare (-) in the anterior chamber, IOL (+).





DISCUSSION

TASS cases only had an incidence rate of 0.22% in a retrospective study conducted by Sengupta et al., with a sample size of 26,480 cataract operations; this makes TASS an infrequent event.⁸ In this patient, the diagnosis was confirmed as TASS after cataract surgery clinically with systematic examination. In the anamnesis, there were complaints 15 hours after surgery with decreased vision, mild pain in the eyes that seemed to come and go, redness, and photophobia. Apart from that, on examination of the patient's left eye after 15 hours of surgery, the vision was 6/30 with two reading errors in the eye—*Snellen chart*.

There is no improvement in vision with pinhole administration. When examining the IOP using tonometry, it was found to be 17 mmHg. On slitlamp examination and fundoscopy of the left oculi, edema was found on the left eyelid *upper and lower* conjunctival injection, diffuse corneal edema from limbus to limbus, keratic precipitates (+) on the endothel cornea, visible *flare* (+) in the anterior chamber, fibrin (+) in the anterior chamber, the pupil appears mid-dilated, the IOL is (+), and there is no visible involvement in the posterior chamber.^{6,11,12} This is in accordance with the literature study conducted by Hernandez, et al., who said that the diagnosis of TASS is sufficient to be diagnosed with clinical conditions and does not depend on negative results from microbiological culture, besides that TASS generally occurs in post-operative patients within 12- 48 hours accompanied by complaints of blurred vision since the first day after surgery to varying degrees, and complaints of mild pain and discomfort in the eyes can be found, but this is rare.¹¹

Most patients with TASS do not feel pain. This can be differentiated from infectious endophthalmitis; most patients will experience pain that is moderate and tends to be severe, and the complaints experienced generally occur within a period of 3 to 7 days, accompanied by complaints of a drastic reduction in visual acuity that occurs at the same time. Apart from that, this case can be differentiated from infectious endophthalmitis based on physical and slit-lamp examination of the patient's eyes, which revealed inflammation in the anterior chamber of the oculi without involvement of the posterior chamber of the oculi which was visible from the results of the examination in the form of superior and inferior palpebral edema, conjunctival injection, corneal

edema.^{6,11,12} diffuse from limbus to limbus, keratic precipitates on the endothel cornea, visible flare, and fibrin in the anterior chamber. This is a severe case characterized by findings of fibrin in the anterior chamber, keratic precipitates on the endothel cornea, and flares (+).^{6,11,12} The diagnosis of TASS was strengthened by successfully administering dexamethasone 0.5 mg three times a day for 1 week and eliminating suspicion of a substance causing eye toxicity, namely ciprofloxacin HCL 3 mg eye drop.^{6,11,12}

TASS is caused by toxic agents that enter the eye during surgery, including inadequate cleaning of surgical instruments, contamination of surgical instruments, adverse drug reactions, preservatives such as benzalkonium chloride, liquid disinfectants, and IOLs contaminated with bacterial endotoxins and lipopolysaccharide.^{7,15} Toxic or inflammatory conditions in the anterior segment will cause cell and extracellular damage. The corneal endothelium is the part that suffers the most damage due to its inability to regenerate and replace dead cells. Toxic agents that enter during eye surgery damage the endothelial junctions and disrupt the pumping system, resulting in corneal edema. A toxic agent that can cause eye toxicity is ciprofloxacin eye drops.^{7,15}

Ciprofloxacin is a fluoroquinolone antibiotic that is used to treat various infections, including eye infections. The use of ciprofloxacin is often associated with various side effects, ranging from mild to severe. These side effects are not limited to gastrointestinal (GI), neuropsychiatric disorders, tendinitis, and tendon rupture. Eye complications due to ciprofloxacin are rarely reported, but several complications can still occur, such as retinal rupture, blurred vision, diplopia, decreased vision, and photophobia. Studies show 10% of cases of ocular toxicity caused by ciprofloxacin have been reported.¹³

The ciprofloxacin agent can deposit in the cornea of the eye. Ciprofloxacin is susceptible to deposits in the cornea, especially in patients with dry eyes. During cataract surgery, the eyes are prone to dryness, which can cause ciprofloxacin to deposit in the cornea. In addition, PH plays an important role in drug solubility. Ciprofloxacin eye drops are known to cause physicochemical changes in the tear film, mainly through a decrease in tear PH to 4.7 after use. This decrease was caused by the acidic PH of the ciprofloxacin formulation (PH 4.5), where the solubility of fluoroquinolone was less than optimal at a higher PH (alkaline).¹⁴ Changes in the PH of the tear film can trigger antibiotic precipitation, ultimately leading to the formation of deposits on the cornea. Using benzalkonium chloride (BKC) as a preservative in ciprofloxacin formulations also exacerbates local eye side effects. With a BKC concentration of 0.02%, which is higher than gatifloxacin, this compound has been shown to cause various adverse effects, including damage to the cornea and conjunctiva, decreased basal tear secretion, impaired corneal wetting, inhibition of cell motility, and impaired surface healing processes. The presence of BKC is also known to exacerbate the cytotoxic toxicity of fluoroquinolones, thereby increasing the risk of local complications in patients.¹⁴ other antibiotics such as moxifloxacin, vancomycin, and cefuroxime besides ciprofloxacin have been reported in several studies to cause TASS, especially cefuroxime.^{12,13,14} Precipitates/deposits on the cornea occur more often in the interpalpebral area because it is the area of tear film meniscus formation with maximum drug accumulation in this area.¹⁴ According to Sara Johny, the mechanism of TASS is not fully known, but it usually occurs due to the patient's hypersensitivity to ciprofloxacin.¹³

This case report presents a 55-year-old man diagnosed with oculi sinistra toxic anterior segment syndrome, oculi dextra astigmatism compositive myopia, and oculi dextra et sinistra

presbyopia + pseudophakia that occurred after cataract surgery with phacoemulsion technique and baguinoir 0.3%. After the clinician stopped the administration of baguinoir 0.3% and provided additional therapy in the form of dexamethasone tablets at a dose of 0.5 mg taken orally, three times a day after meals, and mydriatil 1% mini dose eye drops with 1% tropicamide content of 2 drops per day in the left eye, there was a significant improvement in complaints after 1 week of treatment based on patient recognition. In this case, it is evident that after administration of ciprofloxacin eye drops, there is a risk of increasing the incidence of TASS. This case emphasizes the role of ciprofloxacin in TASS and the importance of monitoring drug-induced ocular toxicity.

CONCLUSION

This case report reports the case of a 55-year-old man who was diagnosed with oculi sinistra toxic anterior segment syndrome, oculi dextra astigmatism myopia composite, and oculi dextra et sinistra presbyopia + pseudophakia, which occurred after cataract surgery using the phacoemulsion technique and administration of ciprofloxacin eye drop. After the clinician stops administering ciprofloxacin eye drops and provides additional therapy in the form of dexamethasone tablets with a dose of 0.5 mg taken orally, three times a day after meals, and eye drops containing 1% tropicamide, two drops per day. There was a significant improvement in complaints in the left eye after 1 week of treatment based on the patient's confession. In this case, it is evident that after administration of ciprofloxacin eye drops, there is a risk of increasing the incidence of TASS. It is important to know the association of ciprofloxacin with TASS and the importance of monitoring drug-induced ocular toxicity.

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