Management of Orbital Cellulitis with Periorbital Abscess and Rhinosinusitis in Older Patient with Type 2 Diabetes Mellitus: A Case Series

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Short Report

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Abstract

Background

In this observational case series, we describe two cases of orbital cellulitis with periorbital abscess and rhinosinusitis in patients with type 2 diabetes mellitus. Orbital cellulitis is an ocular emergency because it's not only sight- but also life-threatening if not properly treated.

Case Report

Two female patients presented to our hospital with progressive swelling and pain in the right eye. Ophthalmological examination of both patients showed diffuse inflammatory signs from the upper eyelid to the lower eyelid with pus production. A multidisciplinary approach including ENT, dermato-venereology, internist-endocrinologist, dentistry, and plastic reconstructive surgery departments was accomplished to achieve proper management. Both patients were diagnosed with orbital cellulitis, periorbital abscess, rhinosinusitis, diabetes mellitus, and dental problem. In the first case, initial empiric antibiotic therapy was given for two days, but there was no clinical improvement. Functional Endoscopic Sinus Surgery and debridement were performed on the 4th day of hospitalization. There was a significant improvement after the surgery and a new regimen of antibiotics (piperacillin-sulbactam 4x4.5 g intravenously and clindamycin 3x600 mg orally). The pus culture showed Klebsiella pneumonia and Enterobacter cloacae which were sensitive to piperacillin-sulbactam. In the second case, improvement was significant with given antibiotics medication (ampicillin-sulbactam 4x1.5 gram, and metronidazole 3x500 mg intravenously). The pus culture revealed no growth of bacteria, but gram-positive cocci were positive in the gram staining examination.

Conclusion

Multidisciplinary team plays a critical role in managing orbital cellulitis with periorbital abscess, rhinosinusitis, and type 2 diabetes mellitus to achieve a better prognosis and visual outcome.

Background

Orbital cellulitis is an inflammation of the soft tissues behind the orbital septum[1]. It can be caused by bacteria, fungi, viruses, or protozoa. The majority of cases occur as a secondary extension of acute or chronic bacterial sinusitis[2]. Orbital cellulitis is an ocular emergency because it's not only sight- but also life-threatening if not properly treated. Medical history and physical examination must be carefully asked for early detection. Radiological evaluation should be done in all cases[3]. Delays in treatment may result in serious complications such as blindness, cavernous sinus thrombosis, meningitis, sepsis, or even death[3].

This report presents two rare cases of orbital cellulitis in older patients who had type 2 diabetes mellitus. Both patients were also diagnosed with rhinosinusitis and dental problem. Older patients with type 2 diabetes mellitus usually have a compromised immune system, making both of our patients more susceptible to infection and vascular complications. A multidisciplinary approach is required to achieve the proper management and better prognosis for these patients.

Case Reports

Case 1

A 67-year-old female presented to our hospital with progressive swelling and pain of the right eye for 2 weeks. Initially, the swelling was small as an acne vulgaris lesion at the middle edge of the nose. The patient went to a clinic and an oral unknown drug was administered. But, during the last week before admission, she felt that the swelling was getting worse so that she couldn't open her right eye. She had a history of dental and maxillary pain 5 years ago, but she only used over-the-counter drugs to relieve the pain. The history of sinusitis was unknown. She reported no history of trauma, ocular disease, ocular surgery, hypertension, or diabetes.

Ophthalmological examination of the right eye showed diffuse upper eyelid swelling and redness extended to the lower eyelid area with active pus production and skin crusts (shown in Fig. 1.A). The right eyeball could not be assessed due to the tight closure of the eyelid. On the left eye, examination showed normal condition with visual acuity 6/9 with immature cataract, and other parts were within normal limit. Based on clinical condition, the patient was diagnosed having severe orbital cellulitis with skin complication of the right eye.

Pus specimens from the skin lesion and blood culture were collected for microbiological tests include direct examination, cultures and antimicrobial sensitive-resistance tests. The Gram stain revealed Gram negative rods. The blood test results showed increase of inflammation with leukocytosis (21.8 $x10^3/\mu L$), high CRP (300 mg/L), and also found hyperglycemia (392 mg/dL) with high HbA1c level (11.1%). Orbital CT-Scan with contrast demonstrated pre- and post-septal cellulitis of the right orbit that attached to the eye globe and extended to the right ethmoid, frontal and maxillary sinuses, and also extended to the soft tissue around the nasal region (shown in Fig. 1.B). Right maxillary sinusitis was a prominent finding in both CT-Scan and paranasal sinuses X-Ray. The bilateral nasolacrimal ducts also showed moderate signs of infection or inflammation.

Based on laboratories and imaging investigations, the patient was diagnosed with orbital cellulitis of the right eye with periorbital abscess and rhinosinusitis due to suspected bacterial infection. The patient was hospitalized and was started with ampicillin-sulbactam (4x1.5g) intravenously and chloramphenicol eye ointment three times daily. To manage other comorbidities we consulted other specialties for advice, including ENT, dermato-venereology, endocrinology, dentistry, and plastic reconstructive surgery. The

patient was also diagnosed with type 2 diabetes mellitus, immature cataract of the left eye, periodontitis, and dental gangrene.

Initial empirical systemic antibiotic therapies were given including ampicillin-sulbactam 4x1.5 g IV, and chloramphenicol topical eye ointment. Systemic analgetic was also given to relieve the pain. Other supported treatment include lesion wound care, nasal wash, and fluticasone furoate spray twice daily. Microbiological test from the base of skin ulceration was also performed. From endocrinology, the patient was diagnosed with type 2 diabetes mellitus based on increased HbA1C result, and started to give insulin therapy for glycemic control.

Two days after the initial treatment, there was no clinical improvement seen from the lesions. After discussion with the dermato-venereology department, we decided to change systemic antibiotic to of piperacillin-tazobactam 4x4.5 g intravenously and clindamycin 3x600 mg oral. The blood glucose was also not controlled with the insulin therapy and we reconsulted to the endocrinology department.

On the 4th day of hospitalization, the eyelid swelling and redness were decreasing and the eyeball movement improved and showed mild restriction in all cardinal gaze direction. The visual acuity of the right eye was 0.16. From eye examination with slit lamp, seen marked conjunctival and ciliary injection, but no sign of corneal defect or ulceration, lens opacities was found on the right eye (shown in Fig. 1.C.D.E) Funduscopic examination showed enlargement of cup-to-disk ratio (0.6–0.7). The intraocular pressure was within normal limits, so this could be possible of suspected normal-tension glaucoma or a normal variance. Further examination should be examined for reassure of glaucoma management.

Functional Endoscopic Sinus Surgery (FESS) and debridement were performed by ENT and joined with plastic surgeon departments. Three days post-surgery, a significant improvement was seen with new regimen of antibiotics (shown in Fig. 2.A). The laboratory test showed decreasing in the leukocyte count (8.3 x10^3/μL), the blood glucose was also well-controlled (< 200 mg/dL). The pus culture result showed *Klebsiella pneumonia* and *Enterobacter cloacae* which were sensitive to piperacillin-tazobactam yet resistant to ampicillin-sulbactam. Five days after the surgery, it was seen improvement on clinical presentation (shown in Fig. 2.B).

The patient was discharged on the 4th day after FESS surgery. The infection and inflammation of the right eye were properly managed by the combination of multidisciplinary team, a suitable regimen of antibiotics, adequate control of blood glucose level, surgical treatment, and appropriate wound care management. On the last eye examination, the inflammation on the right eye were reduced quite significantly and the best corrected visual acuity had improved from decimal 0.16 to 0.4. Intraocular pressure and eyeball movement were within normal limits.

Oral antibiotics were still given to control the infection. We recommended the combination of levofloxacin 1x500 mg for 7 days and clindamycin 3x600 mg for 3 days. Chloramphenicol eye ointment, insulin

injection, and other supportive drugs were also given to achieve optimal healing. On follow up, clinical improvement was seen on the 10th day after surgery (shown in Fig. 2.C).

Case 2

A 59-year-old female came to our emergency room presenting with swollen painful eyelid of her right eye three days before admission without complaining of blurry vision or watery eye. There was no history of trauma. She compressed her right eye with warm water, came to the nearest clinic, and was given levofloxacin 1x500mg, omeprazole 2x20mg, and paracetamol 3x500mg orally. On the next day, the pain and swollen of the right eye worsened, and there was pus coming out from the wound near the corner of the eye. She denied any history of sinusitis or toothache before. However, she had a history of the same complaints 12 years ago when she was working in Saudi Arabia. The ophthalmologist recommended surgery as a treatment, but she refused. She was regularly consuming 2 mg dexchlorpheniramine maleate and 0.5 mg dexamethasone 4–5 times a week in one year without prescription.

The ophthalmology examination of the right eye revealed a restriction of the ocular movement to the superior, superonasal, nasal, inferonasal, temporal, and superotemporal regions. The position of the right eye was hypertrophic. Visual acuity of the right eye was 6/30 and intraocular pressure was normal. There was a hyperemic, edematous mass at the inferior palpebra extended to maxillary, sized 8.5 x 9 cm. The palpation of the mass revealed warm, tenderness with soft consistency around the palpebra and hard consistency at the maxillary region. There was no undulation detected. There was a fistula seen at 8 mm from the medial canthus, but no discharge was coming out from the fistula. Slit-lamp examination on the right eye revealed conjunctival injection and chemosis at the inferior and temporal quadrants, mild discharge, erosion at inferomedial cornea sized 2x1.5 mm with positive fluorescein staining. Pupil was round with no relative afferent pupil defect, and posterior segment evaluation was within normal limit. Examinations of the left eye were within the normal limit. (shown in Fig. 3.A.B.C).

The laboratory results confirmed high leukocytes (14.780/uL), high blood glucose level (573mg/dL), and high CRP level (51.4 mg/L). The orbital CT-scan identified diffuse edema of the soft tissue in the superior and inferior palpebra to right maxilla with right ethmoid and maxillary sinusitis and bilateral mastoiditis (shown in Fig. 3.D). The diagnoses were orbital cellulitis, conjunctivitis and corneal erosions of the right eye.

This patient was also consulted to Otorhinolaryngology/ENT department. She was diagnosed with acute unilateral rhinosinusitis and treated conservatively with nasal spray and irrigation. The internal medicine department was also assessed and treated this patient as type 2 diabetes mellitus. Cavities filling and dental scaling was also performed by dentistry department.

We treated the patient with levofloxacin eye drop 6 times daily, artificial tears hourly, chloramphenicol eye ointment 3 times of the right eye, ampicillin-sulbactam 4x1.5 g, and metronidazole 3x500 mg intravenously, mefenamic acid 3x500 mg orally. On the next day, the redness of the right eye was still prominent, with a minimal yellowish discharge coming out from the fistula. Pus was taken for

microbiological direct examination and culture. Gram-positive cocci were revealed on direct examination. Furthermore, corneal erosion enlarged to size 3.5x1.8 mm, thus levofloxacin eye drop was given hourly and other previous medications were continued.

On the third day, the pain and redness of the right eye were gradually reduced and the patient felt easier to open her eye. Visual acuity of the right eye was improved to 6/15 and the ocular movement was also improving. The hyperemic mass on her right eye and cheek was significantly reduced and the wound gradually closed and improved over time (shown in Fig. 4.A). Corneal erosion was also improving until fluorescein staining was negative. However, the pus culture showed no growth of microorganisms. We tapered levofloxacin eye drop to 6 times daily and other medications were continued. The incision and drainage of the right eye were postponed until the 5th day of antibiotic administration to evaluate clinical response with medications.

On the 5th day of observation, the general condition was improved significantly. The consistency of the hyperemic, edematous diffuse mass on the inferior palpebra became softer, yet spontaneous yellowish discharge was still positive (shown in Fig. 4.B). The blood glucose levels were also reduced significantly (mostly < 200 mg/dL). Careful and tight monitoring were continued until the 7th day and clinical result responded well to the treatment (shown in Fig. 4.C). She was discharged after 7 days in the hospital, and we gave levofloxacin eye drop 6 times daily, artificial tears hourly, chloramphenicol eye ointment, ampicillin-sulbactam 3x375 mg, metronidazole 3x500 mg, and ranitidine 2x150 mg orally. We also reminded the patient to visit our clinic one week later.

On one week follow up, our patient visited our clinic without any complaint. The ocular movement was adequate to all quadrants, best-corrected visual acuity was 6/6 on both eyes, and intraocular pressure was within normal limit. Hyperemic and edematous on the inferior palpebra to the maxillary region was minimal without any pus nor blood. The anterior and posterior segment of the eye was within the normal limit. She was given artificial tears 3 hourly, and chloramphenicol eye ointment 2 times a day on the right eye and asked to revisit in one month. Two months after hospitalization, the patient was satisfied with her appearance as proven by complete resolution of the orbital cellulitis (shown in Fig. 4.D).

Discussion

Orbital cellulitis is a rare disease that can affect all age groups, but predominantly in the children-age group. The incidence in children is 1.6 per 100.000 compared to adults 0.1 per 100.000[4]. The most frequent predisposing factor is an infection that spread from paranasal sinuses[2, 5, 6]. These case reports also revealed that rhinosinusitis was the cause of this orbital cellulitis. *Staphylococcus aureus* and *Streptococcus sp.* are the most common causative organism[5, 6], but pathogens in adults may be more variable. *Klebsiella pneumonia* is a gram-negative bacterium and an important cause of respiratory tract infection in Asian countries[7].

A cross-sectional study of patients with orbital cellulitis as a complication of acute sinusitis in India revealed that the most commonly isolated bacterial species were *Staphylococcus aureus* (40%) and

Streptococcus sp. (20%) and fungal species *Aspergillus sp.* (26%)[6]. In our first case, the pus culture showed *Klebsiella pneumonia* and *Enterobacter cloaca* as the etiologies of the orbital cellulitis. Meanwhile, in the second case, gram-positive cocci were found, but unfortunately no growth of bacteria was seen from the culture test.

Diabetes mellitus may be a crucial risk factor of *Klebsiella pneumonia* orbital cellulitis. The study conducted in Taiwan also revealed that 3 out of 6 orbital cellulitis patients had underlying diabetes mellitus. The two patients without previously recognized diabetes were found to have high HbA1c levels during their hospital stay[7], the same as these patients in our case reports. *Klebsiella pneumonia* can cause severe invasive diseases because it develops capsules composed of polysaccharides that inhibit phagocytosis of the host. It has been reported that insufficient glycemic control may stimulate capsular polysaccharide biosynthesis, further impairing the phagocytosis against virulent capsular serotypes K1 and K2 in patients with type 2 diabetes[8, 9].

Orbital cellulitis is a sight- and life-threatening condition. Proper examination, investigation, and initial treatment should be done properly to achieve a better prognosis. An examination with CT scan is an important tool in the diagnostic of orbital cellulitis. Moreover, a CT scan may also influence the course of therapeutic action, determine abscess size and location, localise the involved sinuses, and whether or not surgical intervention is needed[10]. The adult population has predominant involvement of ethmoid sinuses (36.67%), followed by maxillary sinus (10%), maxilloethmoidal (10%), fronto ethmoidal (10%), and pan-sinusitis (6.67%)[6]. The ethmoid air cells are thin-walled cavities that lie between the medial orbital wall and the lateral wall of the nose. Sinusitis in the ethmoids is the most common cause of orbital cellulitis and complication to medial orbital subperiosteal abscess when the inflammation or infection spreads into the orbit[2]. In both of our cases, the orbital CT-scans also identified right ethmoid and maxillary sinusitis. These reports confirmed that orbital cellulitis often occurs as a consequence of a sinus infection that urgent radiological investigation of the sinuses is a mandatory[1–3].

Specimen of eye discharge or pus should be sent for microbiological evaluation to identify the causative agent and ensure antibiotic coverage. Blood culture is also needed in the case with suspicion of sepsis or systemic toxicity. Regarding the complications of orbital cellulitis that can lead to blindness and death, empirical intravenous antibiotics should be started immediately. Urgent drainage or surgical debridement has been suggested if the patients fail to respond to medical treatment, have an extensive abscess, worsening visual function, anaerobic bacterial infection suspicion, or elderly patient with completely opacified sinuses[11].

Aggressive antibiotic treatments and surgery can be considered to achieve optimal prognosis[6]. Antibiotic regimens are usually empiric and intended to cover the most common pathogens because reliable culture results are sometimes difficult to obtain, for instance in our second case. The duration of antibiotic therapy ranges from a total of at least 1 to 4 weeks, or until all clinical signs have resolved[5]. The topical antibiotics recommendations for orbital cellulitis are chloramphenicol eye ointment at bedtime and ciprofloxacin eye drops every 4–6 hours[12, 13]. For the systemic antibiotics empirical

treatment, other studies recommended ceftriaxone IV (1 g BD), metronidazole IV (500 mg TID) for anaerobes coverage, and vancomycin IV (500 mg every 6 hours) for MRSA (Methicillin-resistant Staphylococcus aureus) coverage[6, 12, 13]. Other antibiotic choices are ampicillin-sulbactam IV (3 g every 6 hours), levofloxacin IV (500 mg BD), and piperacillin-tazobactam IV (4.5 g every 6 hours) for cephalosporin-resistant bacteria[12]. Most of the recommended antibiotics given in the other studies were also used in both of our cases.

Conclusion

An appropriate multidisciplinary team collaboration plays a critical role in the management of orbital cellulitis with periorbital abscess, rhinosinusitis, and type 2 diabetes mellitus. Daily monitoring of the patient's clinical improvement, antibiotic evaluation, good glycemic control, and time to do the surgical intervention should be done comprehensively to achieve a better prognosis and visual outcome.

Abbreviations

ENT: Ear Nose Throat; CRP: C-Reactive Protein; CT-Scan: Computerized Tomography Scan; IV: Intravenous; FESS: Functional Endoscopic Sinus Surgery

Declarations

Ethics approval and consent to participate

Written informed consents were obtained from patients for participate of this case series.

Consent for publication

Written informed consents were obtained from patients and family for publication of this case series and any accompanying images.

Availability of data and material

Not applicable

Competing interests

The authors declare that they have no competing interest

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Authors' contributions

All authors contributed to the study and data curations. Conceptualization, methodology, investigation, resources, supervision, writing-review and editing were permofed by Made Susiyanti. The first draft of the manuscript and visualization was written by Michael Hartono. All authors commented on previous versions of the manuscript. All authors review, editing, and approved the final manuscript.

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Not applicable

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Figures

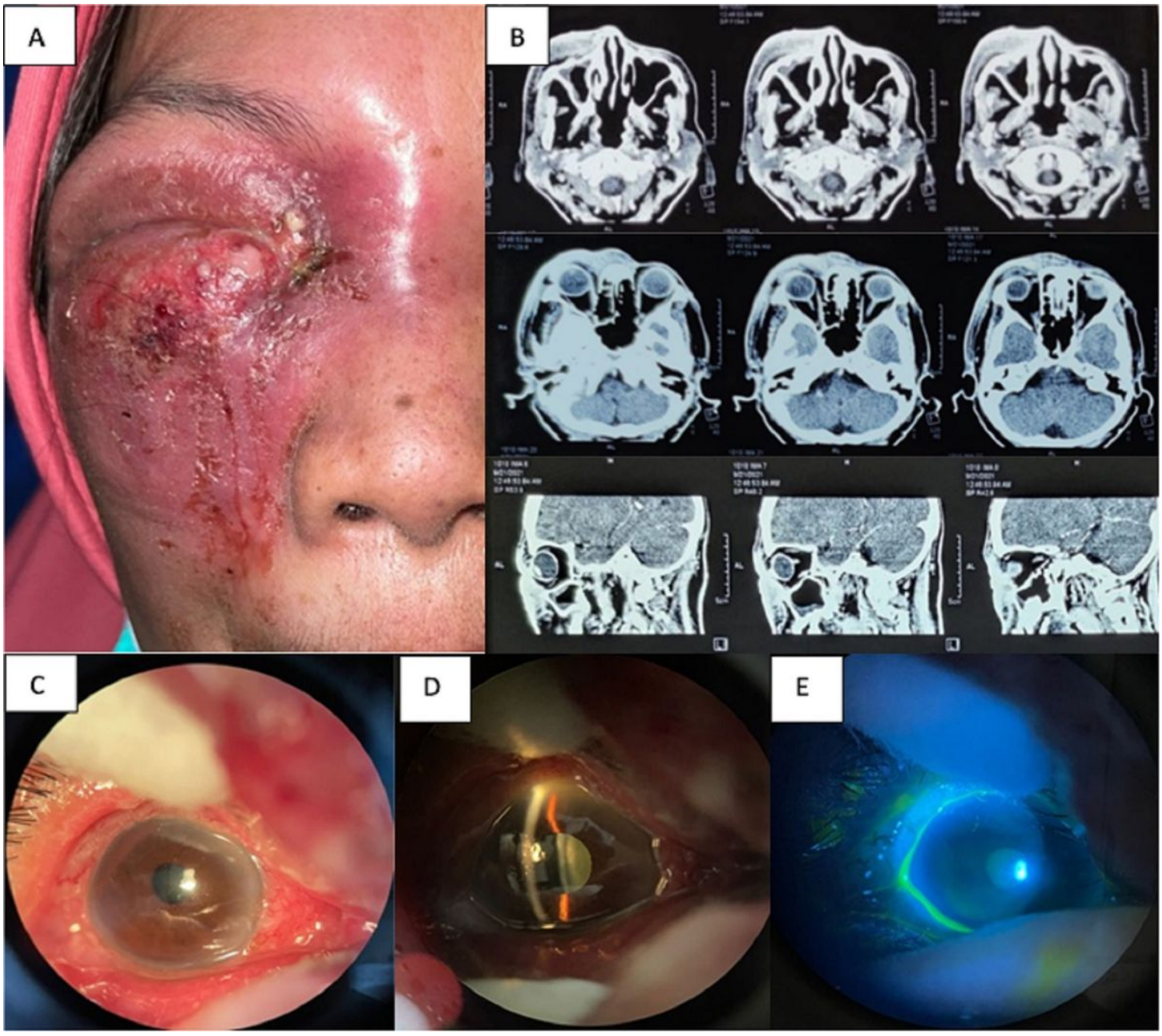

Figure 1

Clinical presentation at admission: (A) Swelling and redness with some pus and crust in the right upper- and lower-eyelid; (B) Orbital CT-Scan with contrast showed pre- and post-orbital cellulitis of the right eye; (C)(D) right eye's slit lamp examination showed conjunctival and ciliary injection; (E) cornea staining was clear with no sign of erosion or ulcer.

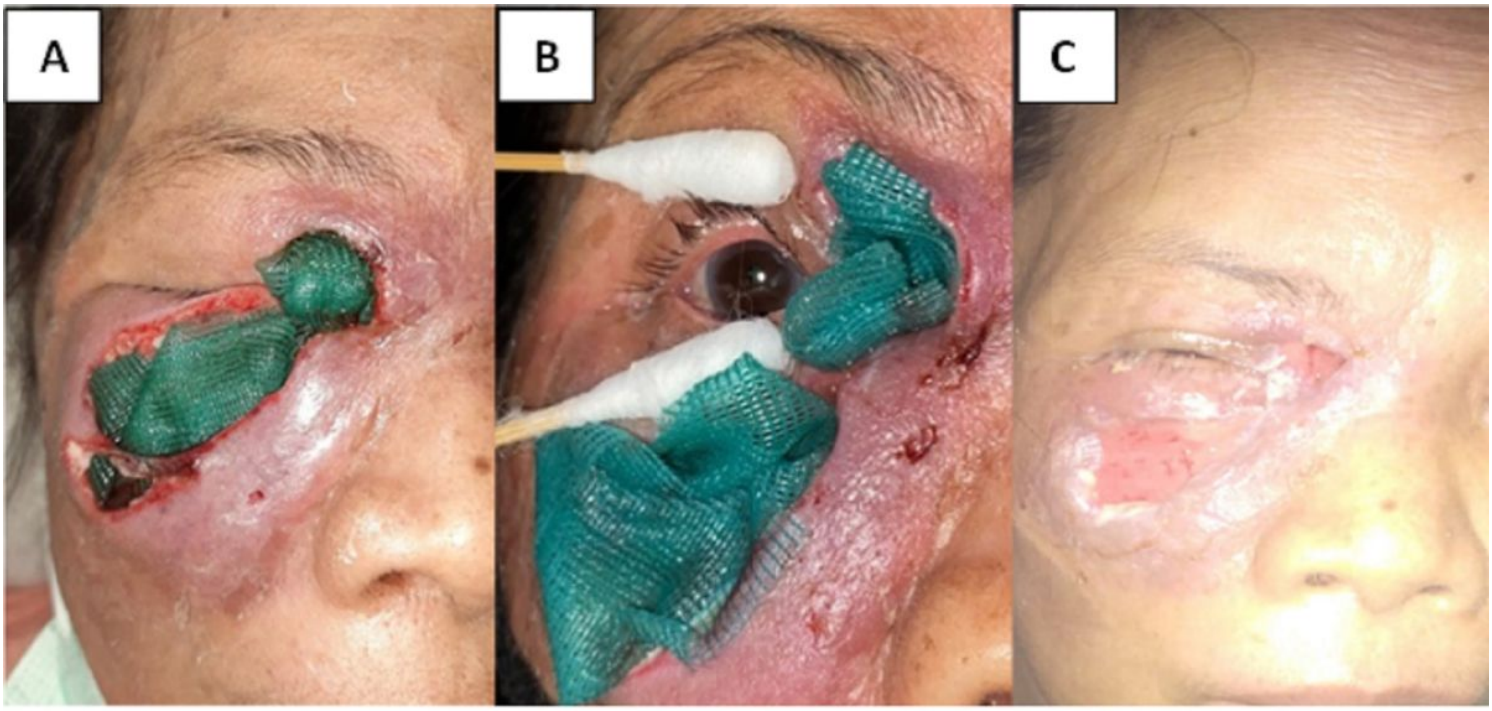

Figure 2

Clinical presentation after surgery. (A) on the third day; (B) on the fifth day; (C) on the tenth day.

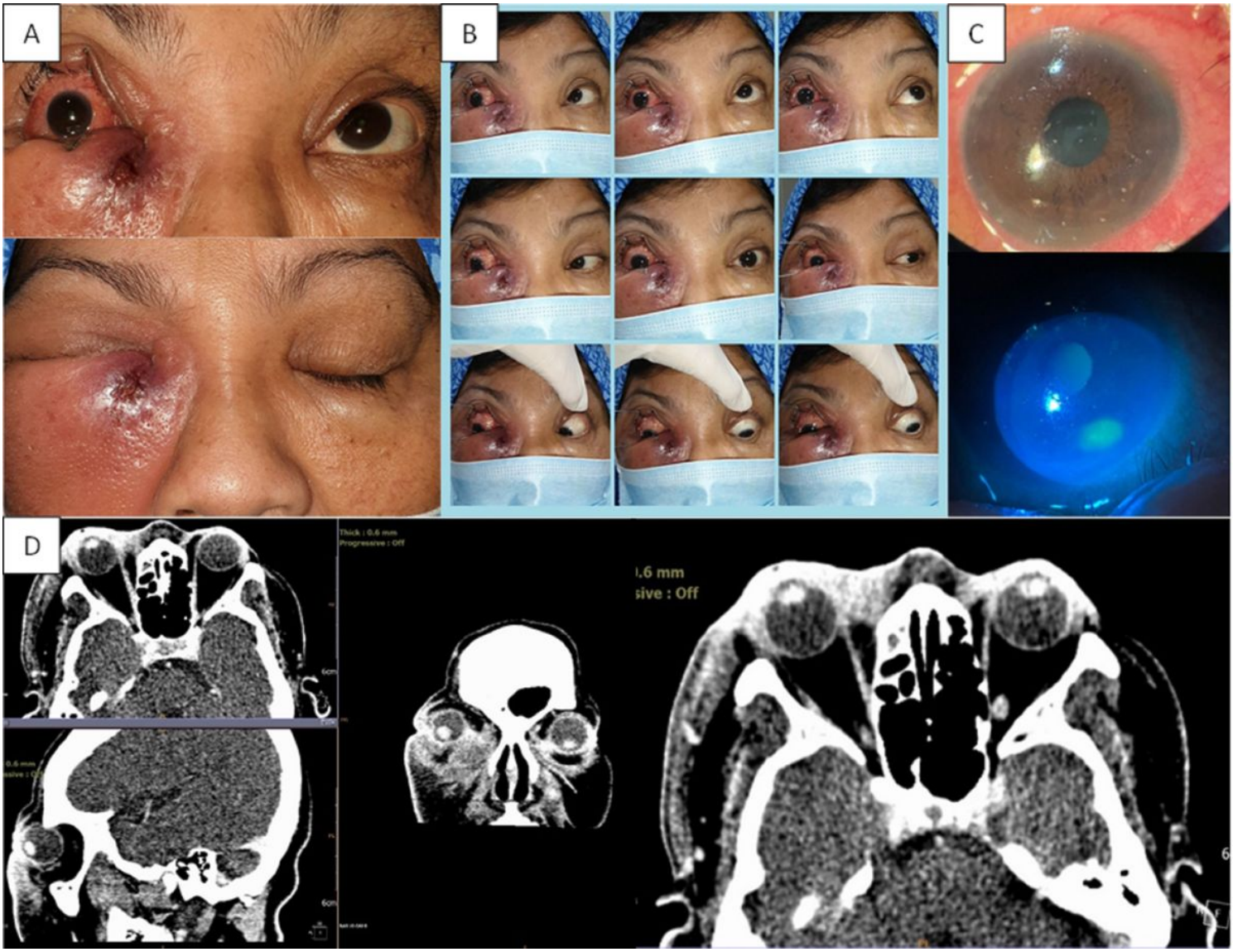

Figure 3

The first admission at the ER. (A) Red and swollen of the inferior palpebra extending to the maxillary area with fistula seen at the inferior palpebra; (B) restriction of the ocular movement of the right eye; (C) corneal erosion was found on the right eye; (D) orbital CT-Scan showed edema of the soft tissue in the superior and inferior palpebra, maxillary sinusitis and bilateral mastoiditis.

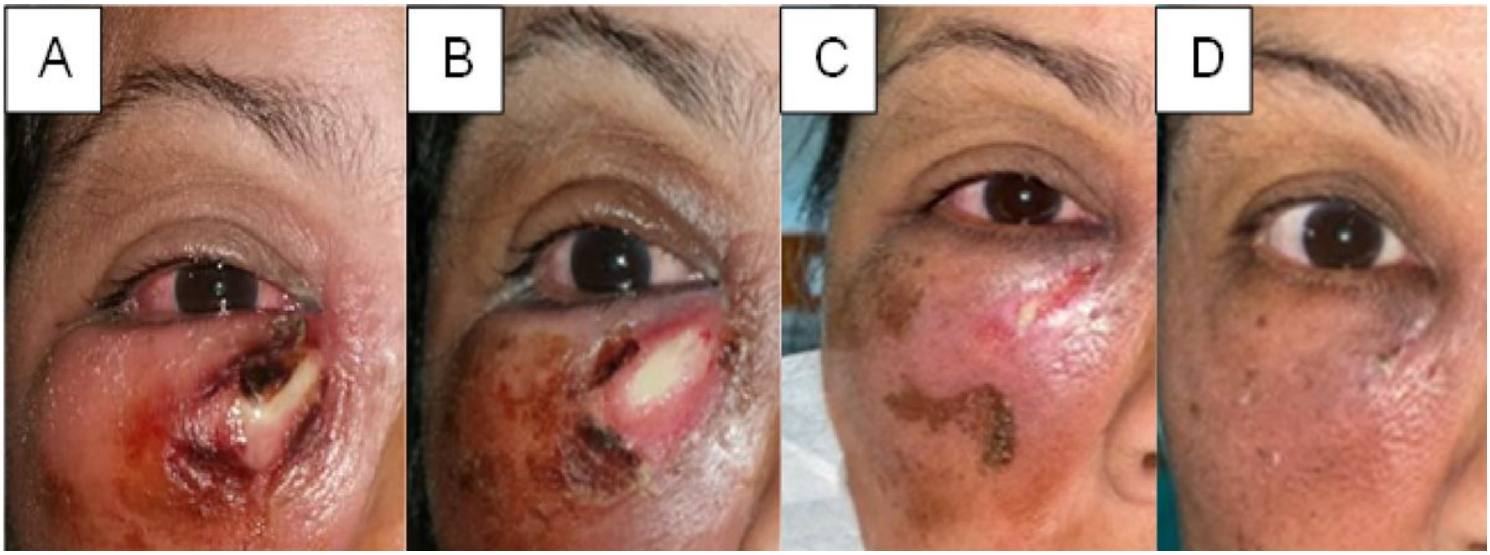

Figure 4

Clinical improvement after the treatment. (A) on the third day; (B) fifth day; (C) seventh day; (D) second month after discharge.