

Necrotizing fasciitis of the face triggered by a neglected hordeolum: a case report and literature review

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Necrotizing fasciitis (NF) is a rapidly progressive, life-threatening soft tissue infection that rarely involves the periorbital region. We report an unusual case of periorbital NF caused by methicillin-sensitive *Staphylococcus aureus* (MSSA) in a previously healthy 48-year-old woman, originating from a neglected, recurrent hordeolum—an otherwise benign eyelid condition. The infection resulted in an extensive full-thickness defect of the upper eyelid and adjacent temporal area, presenting major reconstructive challenges. Reconstruction was performed using a radial forearm free flap combined with a buccal mucosal graft to restore both anterior and posterior lamellae, achieving functional eyelid protection and improved visual acuity. This case highlights the potential for seemingly minor, recurrent eyelid infections to progress rapidly to devastating NF even in the absence of systemic symptoms or risk factors. Early recognition and multidisciplinary management were critical to preventing further morbidity. To our knowledge, MSSA has not previously been reported as a causative agent of periorbital NF, underscoring the need for clinical vigilance and timely intervention in common eyelid conditions to avoid catastrophic complications.

Abbreviations: MRI, magnetic resonance imaging; MSSA, methicillin-sensitive *Staphylococcus aureus*; NF, necrotizing fasciitis; RFFF, radial forearm free flap

Keywords: Case reports / Microsurgery / Necrotizing fasciitis / Orbital cellulitis / Soft tissue infections

INTRODUCTION

Necrotizing fasciitis (NF) is a rare but rapidly progressive and potentially fatal soft tissue infection characterized by widespread necrosis of the fascial planes and surrounding tissues. NF typically affects the extremities, abdominal wall, or perine-

um; however, facial involvement is extremely rare, with fewer than 40 cases documented in the literature [1,2]. Facial NF is most commonly associated with trauma or odontogenic infections, which account for up to two-thirds of reported cases, whereas approximately one-third present without an identifiable etiology [2]. Furthermore, progression of a hordeolum to orbital cellulitis and subsequently to facial NF is exceedingly rare [3].

Total eyelid loss, defined as a full-thickness defect of the upper and lower eyelids, is an uncommon and surgically challenging condition. Urgent coverage is required to prevent corneal dryness, infection, and potential globe perforation [4]. If left untreated, prolonged globe exposure can lead to exposure keratitis, infection, and visual impairment due to eyelid retraction [5].

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Surgical management is often complicated by a lack of adjacent healthy tissue; in cases where local flaps are not feasible, free flap reconstruction may be required [6]. Only a few cases of total eyelid loss successfully treated with free flaps have been reported in the literature [6,7].

We report a rare case of facial NF that invaded the entire upper eyelid and developed after a neglected, recurrent hordeolum. We describe the successful reconstruction of this extensive full-thickness upper eyelid defect using a radial forearm free flap (RFFF) combined with a mucosal graft.

CASE REPORT

A 48-year-old woman presented to the clinic with a rapidly developing infectious skin defect involving the left upper eyelid and extending into the temporal region. She had a 4- to 5-year history of intermittent hordeolum in the same area; however, a new episode that began approximately 7 days before presentation progressed unusually rapidly, with marked swelling, increasing pain, and skin discoloration. There was no history of trauma or recent surgical intervention in the affected region. The patient had no other known underlying medical conditions.

On clinical examination, a full-thickness skin defect was noted, extending from the lateral aspect of the left upper eyelid to the temporal region. The defect measured approximately 4 × 7 cm and demonstrated clear signs of infection, with necrotic tissue and bone exposure evident in the temporal area (Fig. 1). The lesion caused exposure of the superior conjunctival fornix and partial loss of the upper tarsus. The patient reported rapidly worsening vision in the left eye, with only light perception remaining.

The function of the lower eyelid was relatively preserved; however, severe lagophthalmos was present despite partial clo-

sure of the upper eyelid. The cornea exhibited exposure keratopathy with marked opacity. Fundoscopic examination was not possible because of media opacity. Extraocular movements were severely restricted in all directions. In addition, brownish skin discoloration was observed over the left malar and cheek areas, suggestive of underlying infection. Despite the evident clinical signs of inflammation, laboratory investigations—including C-reactive protein, HbA1c, and renal and liver function tests—revealed no significant abnormalities.

On radiologic examination, facial magnetic resonance imaging (MRI) revealed soft tissue swelling and enhancement involving the left temporalis muscle and lacrimal gland, with evidence of osteomyelitis of the exposed left lateral orbital rim (Fig. 2). Methicillin-sensitive *Staphylococcus aureus* (MSSA) was isolat-

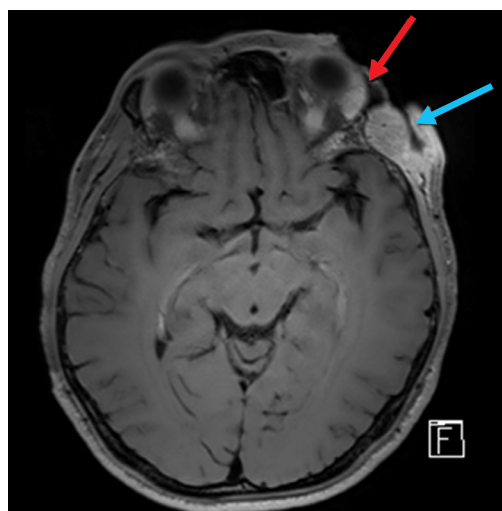


Fig. 2. Facial magnetic resonance imaging showing soft tissue swelling and enhancement involving the left temporalis muscle (blue arrow) and lacrimal gland (red arrow), with evidence of osteomyelitis of the exposed left lateral orbital rim.



Fig. 1. A 48-year-old woman with an extensive defect of the left upper eyelid/temporal region. (A) Initial photograph showing marked tissue loss of the upper eyelid and the temporal region with gentle eyelid closure. (B) Clean wound bed seen after serial debridement in open position of the eyes.

ed from the wound culture, establishing a definitive diagnosis of NF.

Initial management included intravenous cefazolin, selected based on its efficacy against MSSA, as well as moxifloxacin and gentamicin eye drops for adjunctive ocular surface protection. Intravenous cefazolin was continued for a total of 17 days, according to culture-directed therapy and daily clinical assessment. Following a multidisciplinary consultation with the departments of plastic surgery, ophthalmology, and radiology, surgical reconstruction was planned to reduce lagophthalmos by covering the entire defect, including the globe, with a soft tissue flap. Because of ongoing infection, serial debridement was performed to remove extensive necrotic tissue from the upper eyelid, lateral orbital rim, and left temporal area, resulting in a relatively clean wound bed (Fig. 1B).

For soft tissue reconstruction, an RFFF was planned, accompanied by a buccal mucosal graft to cover the exposed conjunctiva. The harvested radial artery and venae comitantes from the flap were anastomosed end-to-end with the superficial temporal artery and vein. Flap vessel patency was assessed intraoperatively using visual inspection and indocyanine green fluorescence imaging.

The harvested buccal mucosa was sutured onto the undersurface of the flap in the globe region. This was performed to cover the exposed fornix and bulbar conjunctiva, thereby improving corneal protection and reconstructing the posterior lamella. The mucocutaneous junction of the posterior lamella was reconstructed by suturing the flap and mucosa together (Fig. 3A). The remnant tarsus in the medial area was approximated to the neo-upper eyelid to achieve proper anatomical alignment (Fig. 3B). After shaping the RFFF to adequately cover the defect, a tarsorrhaphy was performed to immobilize the eyelids and stabilize the flap and grafts during the initial healing period. Postoperatively, intravenous antibiotics were administered, and moxifloxacin ointment was applied regularly.

Overall, successful reconstruction of the full-thickness upper eyelid and the large open temporal wound was achieved using a vascularized free flap and an oral mucosal graft without major complications such as fistula formation, infection, or flap necrosis. The reconstruction restored not only anatomy but also function, including blinking ability (Fig. 4). Ophthalmologically, reduction of lagophthalmos led to improvement in corneal keratopathy and visual acuity, progressing from light perception positive to hand motion positive.



Fig. 3. Intraoperative photographs. (A) Intraoperative view showing buccal mucosal graft placement to reconstruct the posterior lamella and mucocutaneous junction. (B) Clinical photograph taken immediately after reconstruction using a radial forearm free flap.

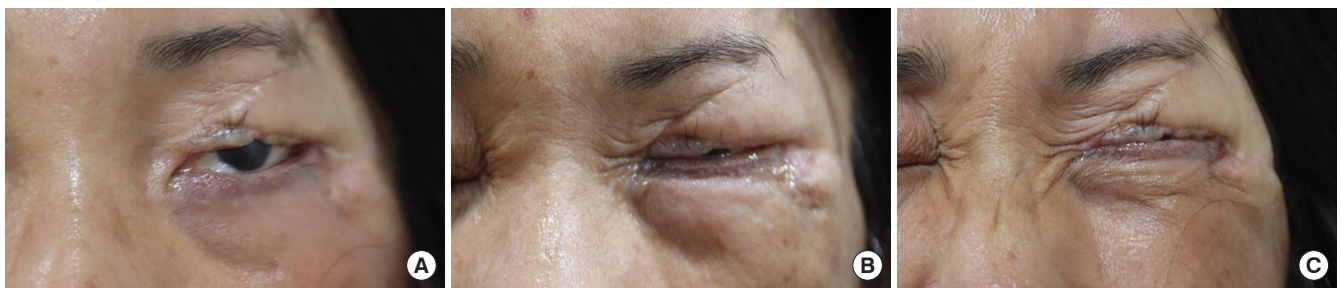


Fig. 4. Two-year postoperative follow-up photographs demonstrating preserved eyelid function, including full eyelid opening and graded closure. (A) Eyes open. (B) Gently closed. (C) Tightly closed.

LITERATURE REVIEW

NF is a rapidly progressive, life-threatening soft tissue infection characterized by widespread fascial necrosis and systemic toxicity [8]. Its global incidence is estimated at 0.3–32.6 cases per 100,000 population annually, with mortality rates reaching 25%–80% when diagnosis and treatment are delayed [9]. Early signs are often subtle and may mimic cellulitis, delaying recognition.

NF is classified into four types: Type I (polymicrobial, 70%–90%), Type II (monomicrobial, usually caused by group A streptococcus or occasionally MRSA), Type III (caused by *Clostridium*, *Vibrio*, or other Gram-negative bacteria), and Type IV (fungal infections such as *Candida* and zygomycetes) [10]. Risk factors include advanced age, diabetes mellitus, immunocompromised status, chronic kidney or heart disease, and recent trauma or surgery [11]. Poor prognostic indicators include hypotension, leukocytosis, and elevated C-reactive protein.

Prompt surgical debridement combined with broad-spectrum intravenous antibiotics is essential to reduce mortality and morbidity. Cohort studies have shown better outcomes when surgery is performed within 6–12 hours of symptom onset [12]. Scoring systems such as the Laboratory Risk Indicator for Necrotizing Fasciitis score can support clinical suspicion, but definitive diagnosis usually requires surgical exploration or histopathology [13].

NF most commonly affects the extremities, abdominal wall, and perineum, while facial involvement—particularly periorbital—is exceedingly rare. The rich vascular supply of the face and the orbital septum's barrier effect are believed to account for this low incidence [14]. When facial NF occurs, it can cause devastating complications, including soft tissue destruction, ocular involvement, permanent disfigurement, and vision loss. Because of the functional and aesthetic importance of this region, early recognition and multidisciplinary management are essential.

Although facial NF is exceptionally rare, several case reports have been published in recent years. Oliver-Gutierrez et al. [15] conducted a multicenter review of nine predominantly female patients with periorbital NF, most cases caused by *Streptococcus pyogenes*, with outcomes ranging from vision preservation to orbital exenteration. Arun et al. [16] described two cases of rapidly progressing periorbital NF with systemic deterioration, both requiring emergency surgical debridement and reconstruction. Huang et al. [17] reported a case in a healthy 26-year-old man with no risk factors, also caused by *S. pyogenes*. Across these reports, early diagnosis and immediate, aggressive treatment were consistently emphasized as crucial for improving outcomes.

DISCUSSION

The initial presentation of this patient—with extensive skin necrosis and unhealthy granulation tissue but no systemic signs of infection—was unusual. Delayed treatment of a long-standing, recurrent hordeolum likely contributed to the progression to NF. This case underscores the importance of close monitoring and timely intervention for seemingly benign conditions such as hordeolum, which, in rare instances, can lead to extensive eyelid involvement, anatomical compromise, and significant risk to the patient's health [3].

Extensive infections in the facial region pose significant therapeutic challenges due to the complex anatomy, functional importance, and aesthetic considerations of the area [18]. Although most cases of hordeolum resolve spontaneously without medical intervention, this report demonstrates the potential for severe complications. Facial NF is uncommon compared with involvement of the extremities or perineum because of the face's rich blood supply [14]. Although the eyelids are highly vascularized and generally resistant to infection, their thin skin and minimal subdermal fat allow inflammatory edema to accumulate, compromising capillary perfusion and predisposing to necrosis. This impaired blood flow can cause rapid tissue necrosis [3]. In this case, prompt surgical debridement and intravenous antibiotic therapy immediately after presentation were crucial to halting disease progression.

Although the upper eyelid and temple are atypical sites for NF and MSSA is not a classical pathogen, the diagnosis was supported by the rapidly progressive course, non-enhancing necrotic soft tissue along fascial planes on MRI, and devitalized fascia identified intraoperatively. These findings align with established diagnostic criteria for NF regardless of anatomical location or organism [9,10].

Eyelid reconstruction is often challenging due to the complex anatomy and functional demands of the periorbital region [19,20]. The primary goal of eyelid reconstruction is to restore a functional eyelid that protects the globe, maintains a normal tear film, and preserves vision [21]. The eyelid is conceptually divided into anterior (skin and orbicularis oculi muscle) and posterior lamellae (conjunctiva, tarsus, and eyelid retractors). The conjunctiva, which lines the tarsus and remains flexible in the fornices, plays a critical role in ocular protection by producing mucus and tears, providing mechanical defense, and facilitating smooth globe and eyelid movement. In full-thickness defects, both lamellae usually require reconstruction [22].

Given the size of the defect in this patient, local flaps were not a viable option, necessitating a distant free flap. Several techniques for total eyelid reconstruction have been reported, in-

cluding composite eyelid grafts and locoregional flaps [21]. Our approach—combining a microvascular free flap with a mucosal graft—aligns with a limited number of similar case reports. Full-thickness eyelid reconstruction is especially challenging, as it must restore both aesthetic appearance and essential functions such as blinking [6,7]. In this case, maximal preservation of residual eyelid muscle function enabled restoration of spontaneous blinking.

In our patient, an RFFF was used to reconstruct the outer layer of the upper eyelid and the temporal defect, while an oral mucosal graft reconstructed the inner layer. The mucosal graft is critical for recreating the posterior lamella and mucocutaneous junction [23]. Mucous membrane grafts are particularly effective in patients with sensitive corneas, as they preserve the fornices and reduce the risk of flap retraction [24]. In this case, both lamellae were successfully reconstructed, achieving satisfactory cosmetic results and improving corneal keratopathy through adequate globe protection. Before referral to our department, the patient developed eyelid necrosis and lagophthalmos at an outside clinic. At that stage, simple corneal-protective measures—such as lubrication, nighttime taping or moisture chambers, temporary patching, and early ophthalmologic referral—might have lessened exposure-related damage. After presentation, early debridement with free-flap reconstruction and temporary tarsorrhaphy prevented further deterioration but could not reverse pre-existing injury, underscoring the need for early protection whenever eyelid closure is compromised [19,20].

Although group A streptococcus is the most common causative pathogen in NF [25], this case identified MSSA as the responsible organism. To our knowledge, MSSA has not previously been reported as a causative agent of periorbital NF, making this case the first of its kind. Although MSSA infections are generally considered straightforward to treat with standard antibiotics, this report highlights that MSSA can also cause rapidly progressive, life-threatening infections with extensive necrosis if untreated [26]. These findings expand the known microbiological spectrum of periorbital NF and emphasize the importance of clinician vigilance for atypical pathogens. Culture identification of MSSA allowed targeted therapy with cefazolin, consistent with pathogen-directed management principles for NF [9,10,26].

In our case, NF was caused by MSSA, a pathogen that, to our knowledge, has not previously been reported as a causative organism of periorbital NF. The patient was relatively young, had no systemic symptoms or comorbidities, and developed infection from a long-standing, recurrent hordeolum—a condition typically regarded as benign and self-limiting. This case highlights the unusual and severe progression of what is often con-

sidered a minor eyelid disorder. As reports of facial and periorbital NF continue to increase, future reviews should aim to identify specific risk factors to enable earlier recognition and prompt, aggressive intervention for this rare but potentially devastating condition.

NOTES

Conflict of interest

Han Koo Kim is an editorial board member of the journal but was not involved in the peer reviewer selection, evaluation, or decision process of this article. No other potential conflicts of interest relevant to this article were reported.

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Ethical approval

This report was approved by the Chung-Ang University Hospital Institutional Review Board (IRB No. 2509-014-16276).

Patient consent

The patient provided written informed consent for the publication of the case and related images.

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