

Insinuate Orbital Cellulitis Associated With Diesel Explosion-Induced Injury

Yao Chen

Xiangya Hospital Central South University <https://orcid.org/0000-0001-5460-0149>

Jinwei Wang

Xiangya Hospital Central South University

Lu Chen

Xiangya Hospital Central South University

Sha Wang (✉ wangsha_1982@csu.edu.cn)

Xiangya Hospital Central South University

Jia Tan

Xiangya Hospital Central South University

Case report

Keywords: diesel, trauma, orbit

Posted Date: July 8th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-687354/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Diesel-related orbital cellulitis is uncommon, it has an insinuate appearance whereas develops aggressively, leading to severe vision loss or poor reconstruction. Here we present a case of diesel explosion-associated eyelid trauma with toxic orbital cellulitis, who at last obtained relatively sound vision and appearance after several rounds of surgeries, which is rarely seen for the trauma itself.

Case presentation: A 33-year-old male was injured in the right eye by diesel engine explosion. He was initially treated for right eye eyelid laceration however the trauma developed into toxic orbital cellulitis on the next day. Orbital debridement and removing of the orbital residual diesel fluid was performed on him immediately. However, on the second day necrosis developed in the eyelid and sub-dermal tissue. Therefore he received another orbital debridement to remove the necrotized tissue and awaited the subsequent right eyelid skin grafting surgery. The patient finally got his right eye vision saved as well as maintaining a relatively sound structure of the eyelid.

Conclusion: Timely debridement and removing the residual diesel in the orbit is necessary for the recovery of patient with diesel-related toxic orbital cellulitis.

Background

Diesel-related toxic orbital cellulitis is uncommon and often appeared to be harmless at first¹. In orbital CT scan, diesel dispersed in the orbit is likely to be confound with air, thereby the foreign body and its related severity tend to be overlooked. The prognosis of diesel-related orbital cellulitis is usually poor, resulting in blindness or deformation^{2,3}. Herein we present a rare case with diesel explosion-associated eyelid trauma which developed necrotic orbital cellulitis rapidly and fortunately maintained vision as well as construction in the end.

Case Presentation

A 33-year-old healthy male was struck in the right eye by diesel engine explosion for 2 days. His visual acuity was 20/200 in OD (right eye) and 20/20 in OS (left eye). Intraocular pressure was normal in both eyes. Examination of his right eye revealed swollen eyelid with a 1cm-long laceration, hyphema and corneal edema. No discharge or necrosis was present in the wound (Fig. 1A). Orbital CT (Computerized Tomography) scan showed an intact eye ring with periorbital hypodensity bubbles (Fig. 1C) and no sign of foreign body. The patient received tetanus prophylaxis, topical antibiotics, prophylactic brimonidine in OD after cleaning the wound.

One day later the patient complained of progressive swelling of the eyelid accompanied with pain. The visual acuity of OD dropped to light perception. Greyish white necrotic substances that flew from the palpebral fissure were seen. A sample of the discharge was cultured to detect the presence of bacteria. The patient was diagnosed orbital cellulitis (OD) and received intravenous methylprednisolone sodium succinate and piperacillin-tazobactam. On the third day blisters and a yellow discharge were detected at

the fringe of eyelid (Fig. 1B). His white blood cell count was $25.6 \times 10^9/L$, with neutrophils constituting 80% of the total white blood cell count. Orbital CT scan was conducted again which revealed that the hypodensity bubbles had decreased (Fig. 1D).

Since general application of antibiotics and methylprednisolone sodium succinate did not work, orbit exploration and decompression were performed on the right eye. Massive grey tissue enwrapping a greasy liquid smelling like diesel was found during the operation. In addition, multiple yellow liquefactive necrosis was identified in the eyelid. We removed massive necrotized lesions and liquefactive tissue through debridement. Multiple drainage strips were inserted into the lesion (Fig. 2A). Two days after the surgery, his white blood cell count decreased to $11.8 \times 10^9/L$. The antibiotic treatment was changed to vancomycin according to the sample culture result (*staphylococcus epidermidis*). The vision in OD turned hand move and the eyelid swelling was alleviated. However, the subdermal necrosis worsened (Fig. 2B). Thus a second debridement was performed and the necrotized tissue was completely removed (Fig. 2C). The defected eyelid was recovered by skin grafting surgery 1 month later. Observations made on the 3-month and 6-month revealed that the visual acuity in OD was finger count and the skin graft had survived well. No ptosis was found and the eye movement was not impaired. Mild opacity was found in the cornea. Hyphema and corneal edema resolved whereas mydriasis and lens opacity persisted (Fig. 2D).

Discussion

The orbital trauma caused by diesel explosion may be initially innocuous². Clinically, it presents with a slightly bloated tissue with mild skin laceration, which can be easily overlooked. Diesel has liposoluble compounds which are toxic and liposoluble to human tissue, resulting in rapid necrotic progression of the traumatic lesion⁴. In the present case, hypodensity bubbles seen on orbit CT were assumed to air at first, however, after consideration of the history and damaged eyelid, we postulated that the bubbles may indicate a diesel fluid. A second orbital CT scan showed that the bubbles had decreased which suggested that the diesel had pervaded and dissolved into the soft tissues, causing cellulitis. This triggered intraorbital hypertension and even orbital compartment syndrome which collectively contributed to the subdermal necrosis. Although we performed debridement on the patient eyelid on day 3, the necrosis of skin and subdermal soft tissue continued, thereby early timing of debridement is beneficiary for the prognosis.

Similar cases toxic cellulitis associated with diesel have been reported. Bae et al reported chemical orbital injury due to diesel explosion, the swelling eyelid worsened 12 hours after the laceration suturing, the wound swab culture revealed *staphylococcus epidermidis*. The patient underwent 3 rounds of pus drainage and a transplantation of the skin necrosis to retained a structured eyelid². Rabinowitz et al presented a case which developed toxic orbital cellulitis 10 hours after the suturing of eyelid laceration caused by a diesel engine explosion. Debridement and the wound drainage was performed. The patient recovered with a good result of eyelid but his vision was no light perception at last³. Irawati et al reported

a case of blunt trauma from diesel explosion appeared with a harmless laceration on the upper eyelid, which developed ptosis and limited superior eye movement¹.

Diesel-related toxic orbital cellulitis is destructive and has rapidly progression. When a diesel-related orbital cellulitis is susceptible, CT scan should be applied to evaluate the orbital condition. Intravenous third generation cephalosporins together with topical antibiotics were recommended⁵. General application of steroids should be started at diagnosis, Holds et al claimed high dosage of steroids at the beginning if severe inflammation occurred. Most cases need surgical debridement and orbital decompression, some propose observation on the patient if no obvious evidence was found for inflammation⁶. The vision prognosis depends on the chemical toxicity and the damage of optic nerve. In summary, for patient with diesel-associated orbital trauma, a thorough and timely debridement as well as removing of residual diesel is necessary for the patient's prognosis.

Abbreviations

OD right eye

OS left eye

CT Computerized Tomography

Declarations

Ethics approval and consent to participate: This study has received ethics approval.

Consent for publication: This study has consent for publication.

Availability of data and materials: Not applicable

Competing interests: The authors declare they have no competing interests.

Funding: Not applicable

Authors' contributions: YC was a major contributor in writing the manuscript; JW and LC analyzed and interpreted the patient data ; SW and JT edited and revised the manuscript. All authors read and approved the final manuscript.

Acknowledgment: Not applicable

References

1. Irawati Y, Priscilia F, Zakiyah H. Orbital Compressed Air and Diesel Explosion Injury Resembling Orbital Cellulitis: An Unusual Case Am J Case Rep. 2021 Feb 21;22:e929671.

2. Bae KH, Cho NC, You IC, et al. Orbital Cellulitis from an Orbital Compressed Air and Diesel Explosion Injury Korean journal of ophthalmology: KJO 2018: 32; 158–159.
3. Rabinowitz MP, Goldstein SM. Diesel fuel injury to the orbit Ophthalmic plastic and reconstructive surgery 2013: 29; e31-33.
4. McKee RH, White R. The mammalian toxicological hazards of petroleum-derived substances: An overview of the petroleum industry response to the high production volume challenge program. Int J Toxicol. 2014;33:4–16.
5. Holds JB, Patrinely JR, Zimmerman PL, Anderson RL. Hydraulic orbital injection injuries. Ophthalmology. 1993;100(10):1475–82.
6. Gekeler F, Cruz AA, de Paula SA, Dos Santos AC, Chahud F. Intraconal grease-gun injury: a therapeutic dilemma. Ophthalmic Plast Reconstr Surg. 2005;21(5):393–5.

Figures

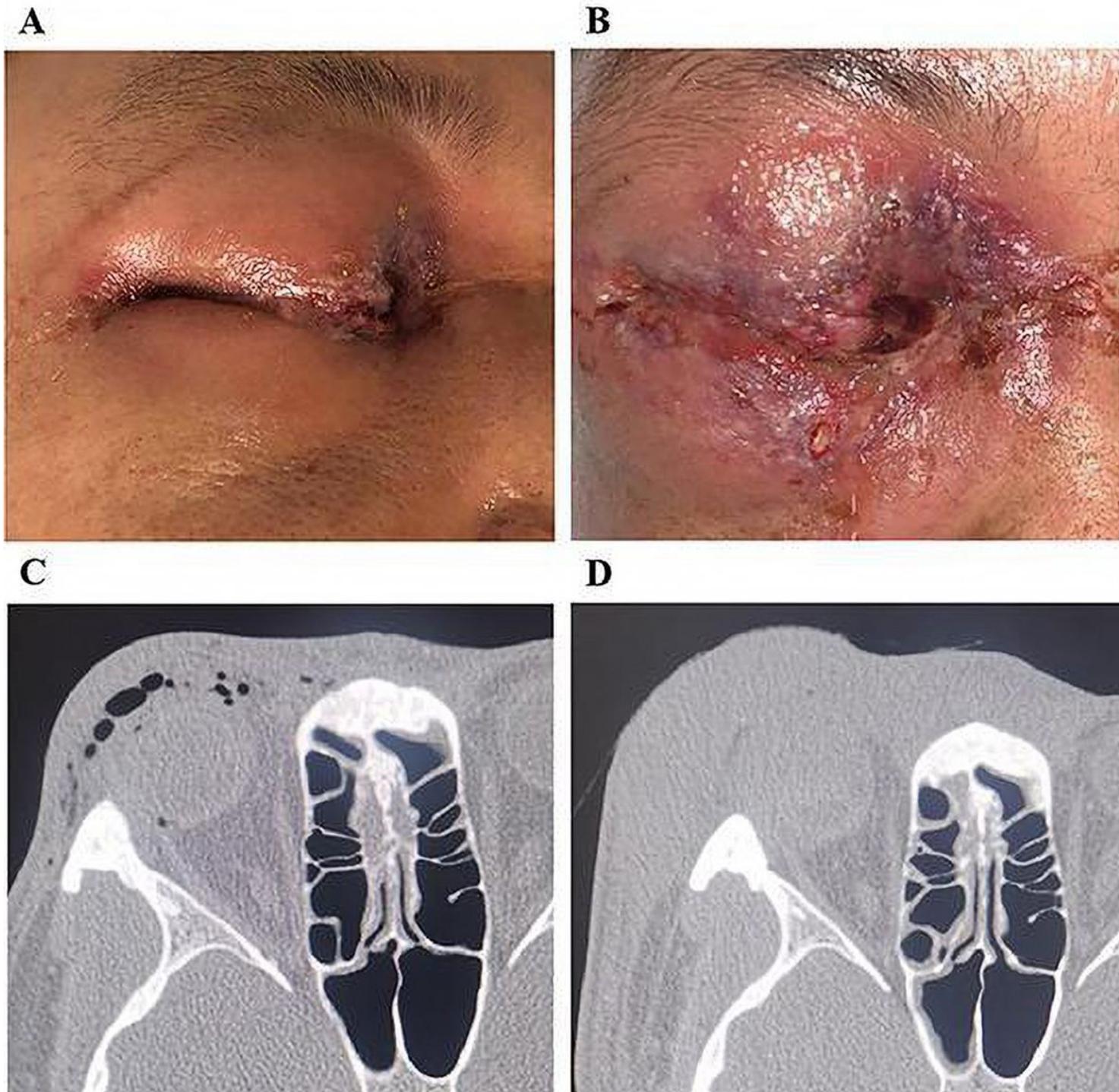


Figure 1

Imaging on presentation. Appearance of the right eye on day 1 (A) and day 3 (B). C. The initial orbital CT scan on day 1. D. A second orbital CT on day 3.

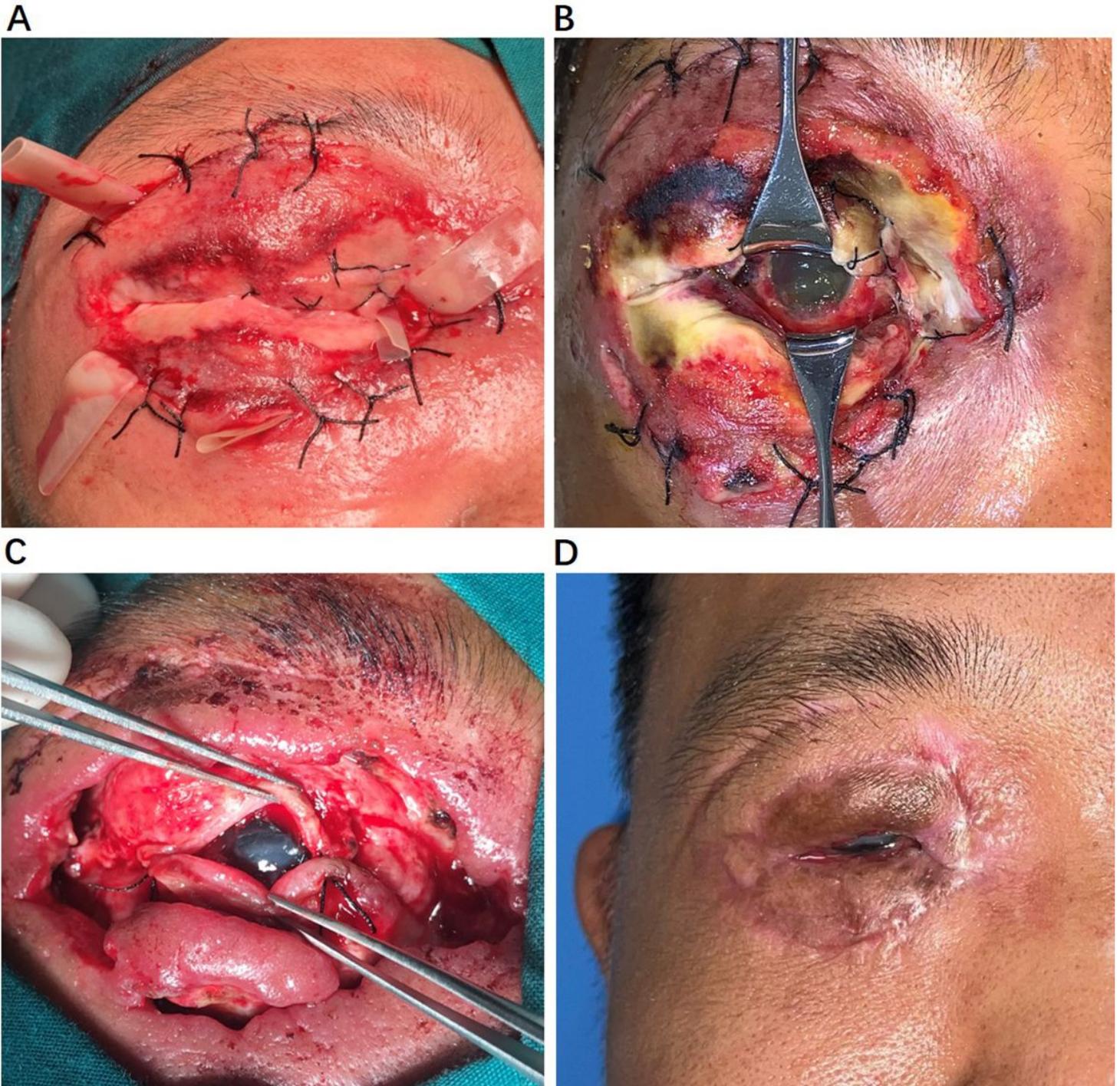


Figure 2

Imaging on debridement and recovery. A. The appearance with drainage inserted into the lesion after the first debridement; B. The necrosis in the right eyelid 2 days after the first debridement; C. The right eyelid after removing all the necrotic tissue during the second debridement; D. The appearance of the right eyelid 6 months after the eyelid skin graft.