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Clinical Case of Surgical Removal of a Foreign Body From the Anterior Chamber Angle after Explosive Injury with Restoration of Visual Function

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Abstract:

Objective: To present a clinical case of successful removal of a foreign body from the anterior chamber angle following an explosive injury, accompanied by the restoration of visual functions.

Material and methods: A comprehensive ophthalmologic examination was performed prior to foreign body removal and at 1 and 6 months postoperatively. The assessment included visual acuity testing, biomicroscopy, ophthalmoscopy, tonometry, anterior segment optical coherence tomography, and gonioscopy.

Results: The patient's medical history revealed a mine-explosive injury and subsequent surgical intervention for orbital foreign body removal. The patient reported no complaints apart from gradually decreasing visual acuity and pain. Following removal of the foreign body from the anterior chamber angle, improvements in visual acuity were observed, with no recurrences of iridocyclitis over a 6-month follow-up period. The intervention contributed to normalization of intraocular pressure and discontinuation of hypotensive therapy.

Conclusion: This clinical case underscores the necessity and efficacy of foreign body removal in patients following explosive injuries, because such intervention facilitated the reduction of intraocular pressure, inflammatory manifestations, and metallosis, with no disease recurrence observed in the long term.

Key words: explosive injury, anterior chamber angle, metallic foreign body, gonioscopy, optical coherence tomography (OCT).

Introduction

Penetrating ocular injuries occurring in the context of armed conflict represent one of the most prevalent and severe forms of ophthalmic trauma in the Ukraine-Russia war. According to data presented at the Congress of the European Society of Cataract and Refractive Surgery (ESCRS), ocular injuries account for up to 13% of all combat-related wounds in contemporary conflicts [1]. Fragmentation injuries and explosive devices remain the dominant mechanisms of trauma, often accompanied by both penetrating and non-penetrating injuries to the ocular structures and orbit.

Frontline practice in Ukraine confirms this data. Since the start of the full-scale invasion on 24 February 2022, a significant proportion of ocular injuries have been caused by the use of cluster munitions, landmines, unmanned aerial vehicles (UAVs), and regular artillery. According to previous studies, during the Anti-Terrorist Operation (ATO) in 2014, the share of eye injuries ranged from 7% to 14% of the total number of combat injuries [2, 3].

The prevalence of open globe injuries in wars involving widespread explosive trauma reaches 50–60%, with intraocular foreign bodies detected in 37–56% of such cases [3]. In Ukraine, these injuries – such as iridocyclitis, hyphaemia, increased intraocular pressure, and vitreous haemorrhages – are frequently observed as complications, particularly in the presence of metallic foreign bodies and inadequate eye protection. The key factors contributing to complications include the following: 1) the use of modern fragmenting munitions; 2) insufficient eye protection among military personnel and civilians; and 3) delays in evacuation and diagnosis, often due to destruction of medical infrastructure and logistical challenges [4, 5].

Given these risks, early detection of orbital foreign bodies using high-precision diagnostic tools – such as OCT, computed tomography (CT), and prompt surgical intervention – are vital to prevent irreversible complications and preserve visual function. The limited statistical data from internal investigations underscores the necessity for systematic registration of combat-related ocular injuries, standardization of treatment protocols, and enhancement of the material and technical base of ophthalmological units.

Objective

To present a clinical case of successful removal of a foreign body from the anterior chamber angle following an explosive injury, accompanied by the restoration of visual functions.

Case description

The patient, P, a 30-year-old male, was admitted to the ophthalmology department of the Central Polyclinic of the Ministry of Internal Affairs of Ukraine, based at the Department of Ophthalmology and Optometry of the Postgraduate Education Institute of the National Bogomolets Medical University. He presented with complaints of decreased vision in the right eye. His medical history included a mine-explosive injury (MEI) 2 months previously, along with second-degree burns of the neck and face, and a diagnosed iridocyclitis of the right eye. The patient was referred for a repeat examination of the right orbital region with the aim of foreign body removal, which was confirmed by results from a control CT scan. The primary complaint was a reduction in visual acuity in the right eye.

The investigative methods employed during the examination allowed for a comprehensive assessment of the ocular condition and confirmed the presence of a foreign body, which necessitated surgical intervention.

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Best-corrected visual acuity (BCVA) was measured using an automated visual acuity testing system (Carl Zeiss VISUS II, Germany) with an autorefractometer (TOPCON KR-800S, Japan), a computerised phoropter (Reichert Inc., 11625B, USA), and an optical mark projector (SZP 350 Zeiss, Germany). The BCVA was 0.5 in the right eye (OD), while the left eye (OS) demonstrated a visual acuity of 1.0. This indicated partial preservation of photoreceptor function in the affected eye.

Intraocular pressure (IOP) was measured using the ICare tonometer (ICare IC100, Finland), revealing a pressure of 26 mmHg in the right eye, despite ongoing hypotensive therapy with dorzolamide administered twice daily. The left eye's IOP was within normal limits at 15 mmHg. Elevated IOP in the affected eye suggested a risk for secondary glaucoma or an inflammatory component related to the presence of a metallic foreign body.

Anterior segment examination via slit-lamp biomicroscopy (Carl Zeiss Meditec AG, Germany) revealed a clear cornea. However, an entry wound was visualised at the 3 o'clock position, indicative of a penetrating injury (Fig. 1). A hyphaemia measuring up to 1.5 mm in height was observed within the anterior chamber, representing a blood clot resulting from traumatic injury to the iris or ciliary body vasculature.

Gonioscopy using Volk gonio lenses (Volk Optical, USA) allowed for the identification of a metallic foreign body located in the anterior chamber angle at the 5 o'clock position (Figs. 2, 3). This method provided direct visualisation of the fragment's location, which was crucial for planning the surgical approach.

Fig. 1. Biomicroscopy image demonstrating a penetrating corneal injury; the entry wound is located at the 3 o'clock position, indicative of a penetrating wound.

Fig. 2. Gonioscopy revealing a metallic foreign body located in the anterior chamber angle at the 5 o'clock position.

Fig. 3. Gonioscopy showing a corneal entry wound at the 3 o'clock position, characteristic of a penetrating injury.

The crystalline lens was clear, with no signs of opacification or traumatic cataract. The vitreous body remained transparent, without evidence of haemorrhagic retinopathy or prolapse. The retina appeared unremarkable, indicating that the injury was confined to the anterior segment of the eye.

Anterior segment OCT was performed using the TOPCON Triton Plus device in Anterior 3D mode. Visualisation of the anterior chamber at the 5 o'clock projection revealed signs of a penetrating corneal wound (Fig. 4), and the presence of a metallic foreign fragment in the anterior chamber angle was confirmed (Fig. 5).

At the conclusion of the diagnostic stage, CT of the orbit was performed in frontal and sagittal projections (Figs. 6, 7). The scan revealed a hyperdense foreign body within the right orbital cavity, further confirming the presence of a residual metallic fragment following the explosive injury.

These examinations in combination provided an objective picture of the anatomical and functional state of the organ of vision, allowing verification of the indications for surgical intervention to remove the foreign body.

Course of the surgery. The surgical intervention was performed in a specialised ophthalmic operating room, adhering to all

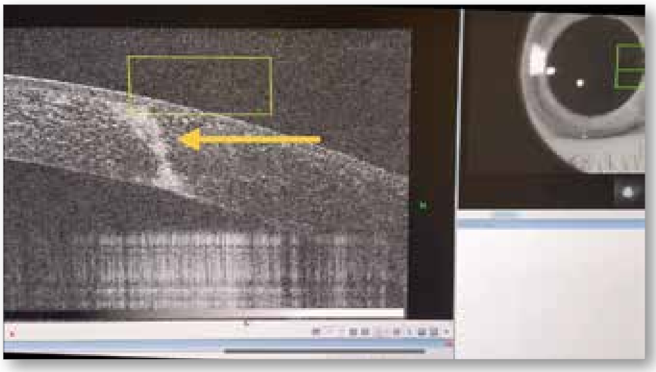

Fig. 4. Anterior segment optical coherence tomography (OCT) showing a penetrating corneal wound; the entry site is located at the 3 o'clock position (indicated by the yellow arrow).

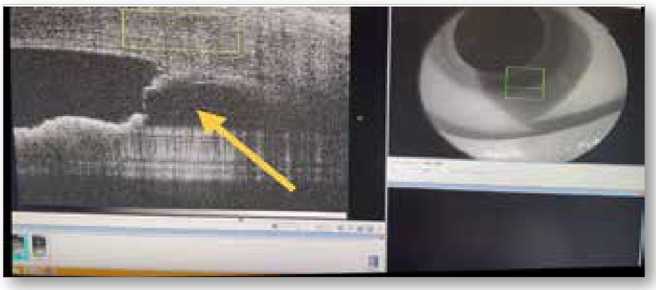

Fig. 5. Anterior segment optical coherence tomography (OCT) showing a penetrating corneal wound; the entry site is located at the 3 o'clock position (indicated by the yellow arrow).

Fig. 6. CT scan of the orbit in the frontal projection showing a hyperdense (hyperechoic) foreign body within the right orbital cavity.

Fig. 7. CT scan of the orbit in the sagittal projection revealing a hyperdense (hyperechoic) foreign body in the right orbital cavity.

aseptic and antiseptic protocols. The patient received local anaesthesia via peribulbar injection using a 0.5% alkaline solution to ensure superficial ocular anaesthesia and reduce discomfort during manipulation. Once adequate anaesthesia was achieved, 2 paracenthetic incisions, each measuring 1.0 mm, were created in the cornea – one in the nasal segment and the other in the temporal segment. A cohesive viscoelastic substance was injected into the anterior chamber to establish a working space, protect the corneal endothelium, and stabilise the ocular structures during the procedure. This approach minimised the risk of mechanical tissue injury during foreign body removal.

Under visualisation with a Carl Zeiss OPMI Visu 150 microscope, the metallic foreign body was identified, located in the anterior chamber angle at the 5 o'clock position, as confirmed by previous examinations. A specialised magnetic instrument (Fig. 8) was employed for removal, enabling high-precision extraction of the fragment with minimal trauma to the surrounding tissues. Following foreign body removal, meticulous aspiration of formed elements from the anterior chamber was performed to eliminate residual hyphaemia and ensure optical clarity of the intraocular media.

Fig. 8. Specialised magnetic instrument used for the removal of a metallic foreign body from the anterior chamber of the eye.

Following the completion of the surgical manipulations, the anterior chamber was reformed, residual viscoelastic material was aspirated, and the paracenthetic incisions were sealed without the need for suturing. The final stage of the operation involved verifying the integrity of the incisions and the stability of the ocular structures. An antimicrobial agent was instilled into the eye to prevent infectious-inflammatory complications. An aseptic dressing was applied over the eye. The procedure lasted approximately 20 minutes and was uneventful. The patient's condition postoperatively was stable, with no signs of haemorrhage or acute inflammation.

Postoperative status of the patient. On the second day after the surgery, the patient was in satisfactory general condition, without signs of pain, inflammation, or discomfort in the operated eye. Examination revealed a significant improvement in functional visual parameters: BCVA in the right eye (OD) was 1.0, indicating complete restoration of visual function following foreign body removal. IOP on the affected side (OD) decreased to 16 mmHg, within physiological limits. Due to normalisation of pressure, the antihypertensive therapy previously administered was discontinued. During the early postoperative period, the patient received standard local antimicrobial and anti-inflammatory treatment in the form of eye drops, along with restrictions on physical activity.

Over the subsequent 6 months of follow-up, no signs of hyphaemia recurrence, iridocyclitis, or elevated intraocular pressure were recorded. All ophthalmic structures remained intact (Fig. 9), the lens was clear, the anterior chamber was free of abnormalities, and the cornea was smooth. Visual acuity remained consistently high, allowing the patient to return to his usual lifestyle without further medication. Thus, the postoperative course was favourable, with no complications and complete functional and anatomical recovery of the eye.

Fig. 9. Gonioscopy images: (A) condition of the anterior chamber angle prior to surgical intervention, showing the foreign body; (B) after surgical intervention, demonstrating the absence of the foreign body.

Discussion

Ocular trauma, particularly in the context of combat operations, remains a significant medical challenge, often accompanied by complications such as hyphaemia, iridocyclitis, elevated intraocular pressure (IOP), and the risk of metallosis. In light of Russia's full-scale invasion of Ukraine since 2022, the number of patients with ocular injuries caused by explosive devices and UAV debris has markedly increased. According to data from the Ukrainian Healthcare Centre, ocular injuries constitute approximately 10–15% of all combat-related wounds [6].

Comprehensive diagnostic approaches – particularly the combined use of CT, OCT, and clinical examinations (gonioscopy, biomicroscopy) – enable precise localisation of foreign bodies, assessment of the depth of injury, and evaluation of damage to intraocular structures. In this case, timely detection of a metallic foreign body in the anterior chamber angle was crucial because it caused ocular hypertension, iridocyclitis, and hyphaemia. Similar complications are well documented in the literature, notably in the works of Kuhn et al. [7], who emphasise that even microscopic fragments can lead to severe outcomes if treatment is delayed.

The surgical intervention employed a modern microsurgical approach: the use of viscoelastic substances, minimally invasive paracenteses, intraocular aspiration, and magnetic tools for fragment removal. This strategy minimised the risk of inflammatory spread, reduced the likelihood of metallosis, and preserved the transparency of ocular media. Such an approach aligns fully with current principles of managing intraocular foreign bodies, as outlined in the guidelines of the American Academy of Ophthalmology [8].

It is important to underscore that treatment efficacy is heavily dependent on timely intervention. According to Mahapatra et al. [9], early surgical management of anterior chamber metallic foreign bodies results in a preservation of visual functions in over 90% of cases. In our clinical case, surgical treatment allowed complete restoration of vision (OD = 1.0) by the second day post-procedure, demonstrating the high effectiveness of the chosen surgical strategy.

Additionally, the psychological and social impact of ocular trauma in military and civilian populations during wartime must be considered. Restoring visual function is not only a physical recovery but also an emotional and psychosocial rehabilitation for the patient. Regular monitoring, dynamic postoperative follow-up, and a multidisciplinary approach – including ophthalmologists, psychologists, and rehabilitation specialists – remain key to achieving full recovery.

Conclusion

Thus, the presented clinical case underscores the importance of an integrated approach to the diagnosis and management of combat-related ocular injuries, which encompasses timely identification, surgical removal of foreign bodies, and long-term postoperative monitoring.

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References:

1. Malyugin B: *Combat ocular injuries during Russian-Ukrainian war: clinical data from ESCRS symposium 2023*. Presented at: European Society of Cataract and Refractive Surgeons Congress; 2023 Sep; Vienna, Austria.
2. Kvit Z, Bondar M, Chumachenko S: *Analysis of eye injuries in Ukrainian servicemen during active hostilities*. Ukr J Ophthalmol. 2023; 11(4): 45–52.
3. Thach AB, Ward TP, Hollifield RD, et al.: *Severe eye injuries in the war in Iraq, 2003–2005*. Ophthalmology. 2008; 115(2): 377–382.
4. Colyer MH, Chun DW, Bower KS, et al.: *Perforating globe injuries during Operations Iraqi Freedom and Enduring Freedom*. Ophthalmology. 2009;116(5): 865–873.
5. Weichel ED, Colyer MH: *Combat ocular trauma and systemic injuries*. Curr Opin Ophthalmol. 2008; 19(6): 519–525.
6. Ukrainian Healthcare Centre. *Analytical report on combat injuries among patients in 2022-2023*. Kyiv, 2024.
7. Kuhn F, Maisiak R, Mann L, et al.: *The Ocular Trauma Score (OTS)*. Ophthalmol Clin North Am. 2002; 15(2): 163–165.
8. American Academy of Ophthalmology. *Intraocular Foreign Bodies – Preferred Practice Pattern*. 2023.
9. Mahapatra SK, Samantray SK, Pattnaik K, et al.: *Surgical outcome in intraocular foreign body cases*. Indian J Ophthalmol. 2019; 67(10): 1621–1626.

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