

Intraocular Foreign Bodies Following Ocular Trauma: A Case Series of Diverse Anterior Segment Presentations and Surgical Management

¹*Dr Nandish Lukhi, ²Dr Farheen Maniyar, ³Dr Arvind Tenagi, ⁴Dr Daisy Vishwakarma, ⁵Dr Samyakta Shetti, ⁶Dr Dipti Chothani and ⁷Dr Aishwarya Ekande

^{1, 6, 7} junior resident, department of ophthalmology, Jawaharlal nehru medical college belagavi

^{2, 4, 5} Assistant professor (Department of ophthalmology jawaharlal nehru medical college belagavi)

³ Professor and former Head of department of ophthalmology Jawaharlal nehru medical college Belagavi

¹nandishlukhi45@gmail.com, ²drfarho@gmail.com, ³drtenagi@yahoo.com, ⁴daisyvishwakarma@gmail.com,

⁵samyaktashetti@yahoo.com, ⁶diptisojitra03@gmail.com and ⁷ekandeaishwarya5@gmail.com

Corresponding author: nandishlukhi45@gmail.com

Received: 24th April, 2026; Revised: 20th May 2026; Accepted: 30th June, 2026; Available Online: 10th July, 2026

ABSTRACT

Background:

Intraocular foreign bodies (IOFBs) constitute a significant form of ocular trauma and may produce a wide spectrum of anterior segment manifestations depending on the nature, size, location, velocity, and duration of retained material. Metallic, glass, and particulate foreign bodies may become embedded within ocular tissues or remain within the anterior chamber, producing inflammation, corneal and iris damage, traumatic cataract, or secondary complications. Delayed presentation may further complicate diagnosis and surgical management. This case series describes three clinically distinct presentations of retained intraocular foreign bodies involving the anterior segment and highlights the importance of meticulous slit-lamp examination, gonioscopy, anterior segment imaging, radiological evaluation, and individualized surgical intervention.

Case Series:

Three patients with retained intraocular foreign bodies following ocular trauma were evaluated and managed. The first case was a 51-year-old construction worker with a remote and poorly defined history of ocular foreign-body exposure who presented with a progressive whitish growth over the left cornea. Examination revealed a grade II nasal pterygium with an underlying anterior chamber lesion clinically suggestive of a granuloma. Best-corrected visual acuity was 6/12 in the affected eye and intraocular pressure was 21.6 mmHg. Anterior segment optical coherence tomography and orbital radiography demonstrated a discrete approximately 2-mm radio-opaque metallic foreign body. Surgical exploration revealed a 2 × 2-mm metallic fragment embedded within the iris stroma and encapsulated by chronic inflammatory granulomatous tissue. Pterygium excision with conjunctival autografting was combined with foreign-body removal, and the fragment was successfully mobilized into the anterior chamber following anterior chamber washout and subsequently extracted.

The second case involved a 49-year-old man who sustained a high-velocity penetrating injury to the right eye when a vehicle side mirror shattered following a road traffic accident. He presented with severe ocular pain, profound diminution of vision, foreign-body sensation, and photophobia. Visual acuity was hand movements close to face, and intraocular pressure could not initially be measured because of the open-globe injury. A full-thickness corneal tear measuring approximately 3.5 mm was associated with a 3.5 × 3-mm glass fragment located inferonasally within the anterior chamber and traumatic anterior lens capsule damage. Primary corneal repair with anterior chamber foreign-body removal was performed. Subsequent examination demonstrated traumatic cataract, necessitating cataract extraction with intraocular lens implantation. At six weeks after cataract surgery, visual acuity had improved to 6/18 (p) with an intraocular pressure of 15.1 mmHg.

The third case was a 54-year-old man who developed diminished vision, persistent watering, redness, and severe foreign-body sensation after exposure to wind-blown dust. Slit-lamp and gonioscopic examinations demonstrated multiple particulate foreign bodies adherent to the corneal endothelium, freely floating within the anterior chamber, and deeply lodged in the inferior angle. Visual acuity was 6/12, improving to 6/9 with pinhole, with an intraocular pressure of 18.5 mmHg. Therapeutic anterior chamber washout using an ophthalmic viscosurgical device facilitated safe detachment and evacuation of the retained particles. By postoperative day 15, visual acuity improved to 6/9 (6/6 with pinhole), intraocular pressure normalized to 15.7 mmHg, and the anterior segment inflammation had completely resolved.

Conclusion:

Retained intraocular foreign bodies can present with markedly different clinical manifestations, ranging from chronic

*Author for Correspondence: nandishlukhi45@gmail.com

granulomatous reactions surrounding an occult metallic fragment to acute penetrating injuries with glass and traumatic cataract, or multiple particulate materials dispersed throughout the anterior chamber. Accurate localization and assessment of tissue involvement are essential for selecting the appropriate surgical strategy. Early recognition and meticulous removal of the foreign body, combined with management of associated ocular damage, can result in satisfactory anatomical and functional outcomes.

Keywords: *Intraocular foreign body; ocular trauma; penetrating ocular injury; anterior chamber; metallic foreign body; glass foreign body; traumatic cataract; iris granuloma; anterior chamber washout; anterior segment trauma.*

How to cite this article: Lukhi N, Maniyar F, Tenagi A, Vishwakarma D, Shetti S, Chothani D, Ekande A., Intraocular Foreign Bodies Following Ocular Trauma: A Case Series of Diverse Anterior Segment Presentations and Surgical Management. *Int J Drug Deliv Technol.* 2026;16(79s):893-904. DOI: 10.25258/ijddt.16.79s.157

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

Ocular trauma remains an important cause of preventable visual morbidity, particularly in individuals exposed to occupational hazards, road traffic accidents, construction-related activities, and high-velocity projectiles [1]. Among traumatic ocular injuries, the presence of an intraocular foreign body (IOFB) represents a particularly challenging clinical entity because the foreign material may produce both immediate mechanical damage and delayed inflammatory, infectious, toxic, or structural complications [2,3]. The clinical presentation is highly variable and depends on the composition, size, shape, velocity, and anatomical location of the foreign body, as well as the interval between injury and presentation [4]. Anterior segment IOFBs are especially important because they may involve the cornea, anterior chamber, iris, angle, lens, and adjacent ocular structures, sometimes with relatively subtle external findings despite significant intraocular pathology [5,6].

The mechanism of entry plays a major role in determining the clinical spectrum. High-velocity metallic fragments generated during construction or industrial activities may penetrate the cornea and become embedded in the iris or other anterior segment structures [7,8]. Such foreign bodies may remain clinically occult for prolonged periods and can become surrounded by chronic inflammatory tissue, resulting in a granuloma or mass-like lesion that may mimic other anterior segment pathologies [9]. In contrast, glass fragments associated with road traffic or other high-energy trauma can produce an obvious penetrating wound, anterior chamber inflammation, iris or lens injury, and traumatic cataract. Small particulate materials may behave differently, remaining dispersed within the anterior chamber, adhering to the corneal endothelium, or becoming lodged within the iridocorneal angle [10,11].

The diagnosis of an anterior segment IOFB requires a systematic ophthalmic assessment. A detailed history should establish the mechanism and circumstances of injury, although the absence of a clear traumatic history does not exclude a retained foreign body, particularly when presentation is delayed or the original event was poorly remembered [12,13]. Visual acuity and intraocular pressure should be documented whenever clinically safe,

followed by careful examination of the eyelids, conjunctiva, cornea, anterior chamber, iris, pupil, lens, and posterior segment [14]. Slit-lamp examination provides critical information regarding the location and appearance of foreign material and associated tissue reaction [15]. Gonioscopy can be particularly valuable for detecting fragments hidden within the anterior chamber angle, while anterior segment optical coherence tomography may assist in defining the anatomical relationship of an intraocular lesion with adjacent structures [16,17].

Imaging is selected according to the suspected composition and location of the foreign body. Plain radiography can identify radiopaque metallic fragments, whereas ultrasonography may provide useful information when visualization of intraocular structures is limited [18]. Cross-sectional imaging may be required in selected traumatic cases to delineate the extent of ocular injury and associated orbital or intracranial pathology. The choice of imaging should be guided by the clinical circumstances and suspected nature of the foreign material. Importantly, the possibility of an IOFB should remain high on the differential diagnosis when clinical findings are disproportionate to the apparent external injury [19,20].

Management requires more than simple extraction of the foreign body. The surgeon must simultaneously address the entry wound, associated corneal or scleral damage, anterior chamber inflammation, iris injury, lens disruption, traumatic cataract, and any other structural complications. The surgical approach depends on the location and characteristics of the IOFB [21]. Foreign bodies embedded within the iris may require careful mobilization before extraction, whereas freely mobile anterior chamber fragments may be removed through an appropriately planned anterior segment approach. Ophthalmic viscosurgical devices can facilitate controlled manipulation and separation of particulate material from delicate intraocular structures [22]. When the lens capsule has been breached, as may occur with glass or other penetrating fragments, management of the resulting traumatic cataract may require either immediate or staged cataract surgery with subsequent intraocular lens implantation depending on the clinical situation [23].

The timing of intervention is also influenced by the nature of the foreign body and the extent of associated injury.

Organic or contaminated material carries an increased risk of intraocular infection, whereas metallic foreign bodies may induce chronic inflammatory responses or tissue toxicity depending on their composition and duration of retention. Delayed cases may therefore present with unusual findings such as granulomatous encapsulation, corneal opacity, iris defects, persistent inflammation, or secondary lens changes [24]. Conversely, acute penetrating injuries require prompt recognition and stabilization of the globe before definitive visual rehabilitation.

The present case series illustrates three distinct clinical patterns of anterior segment intraocular foreign bodies. The first case demonstrates a chronically retained metallic foreign body embedded in the iris and surrounded by granulomatous tissue in association with a grade II nasal pterygium. The second demonstrates an acute penetrating ocular injury caused by a glass fragment, complicated by traumatic cataract following anterior capsule disruption. The third demonstrates multiple particulate foreign bodies following exposure to wind-blown dust, with material adherent to the corneal endothelium, floating within the anterior chamber, and impacted in the inferior angle. These cases collectively emphasize that anterior segment IOFBs may have diverse presentations and require individualized diagnostic and surgical strategies. Therefore, it is of interest to describe the clinical presentations, anatomical characteristics, diagnostic evaluation, surgical management, and outcomes of these three patients with retained intraocular foreign bodies.

CASE PRESENTATION

Case 1: Left Eye Grade II Nasal Pterygium With a Metallic Foreign Body Granuloma Stuck in the Iris

A 51-year-old male construction worker presented with a progressive whitish growth encroaching onto the cornea of the left eye. The patient recalled a remote and poorly defined episode in which a foreign body had entered the left eye while working at a construction site; however, the exact nature, timing, and circumstances of the injury were uncertain. The prolonged and ill-defined interval between the presumed trauma and presentation made the retained foreign body clinically unsuspected initially. The patient did not report a clearly documented acute ocular injury at the time of presentation.

On ophthalmic examination, the best-corrected visual acuity was 6/12 in the left eye, while the recorded unaided visual acuity was 6/18 (p) in both eyes. Intraocular pressure was 21.6 mmHg in the left eye and 15.3 mmHg in the right eye. Examination of the anterior segment revealed a grade II nasal pterygium involving the left eye, with mild conjunctival congestion. The cornea was otherwise described as clear. The anterior chamber was of normal depth. The iris in the affected eye showed an abnormal lesion described clinically as a foreign-body granuloma, while the pupil was sluggishly reactive. Early senile immature cataractous changes were noted in the lens. The combination of the progressive pterygium and

the suspicious anterior chamber lesion prompted further evaluation of the anterior segment. Anterior segment optical coherence tomography was performed as part of the diagnostic work-up. Orbital radiography using a Water's view demonstrated a discrete, approximately 2-mm radio-opaque foreign body of metallic density localized to the left anterior segment. The imaging findings established the presence of a retained metallic foreign body despite the absence of a clearly defined recent traumatic history.

Based on the clinical and radiological findings, the patient was diagnosed with a left-eye grade II nasal pterygium associated with a metallic intraocular foreign body granuloma embedded in the iris. The treatment plan consisted of pterygium excision with conjunctival autografting combined with removal of the retained foreign body. The combined approach was selected to address both the ocular surface pathology and the intraocular retained material during the same surgical treatment.

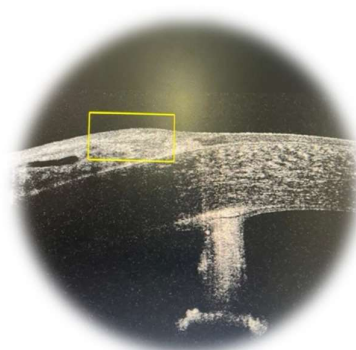
Anterior segment: OS



X-ray orbit (water's view)



AS OCT: OS



Visual Acuity	OD	OS
Unaided	6/18 (P)	6/18
BCVA	6/9(P)	6/12

Intraocular pressure	OD	OS
	15.3 mmHg	21.6 mmHg

	OD	OS
Eyelid	Normal	Normal
Conjunctiva	Grade II nasal pterygium	Mild congested , Grade II nasal pterygium
Cornea	Clear	Clear
AC	Normal depth	Normal Depth
Iris	Normal colour & pattern	Foreign body granuloma
Pupil	RRR	Sluggish reactive
Lens	Early SIMC	Early SIMC

Intraoperative findings and surgical management

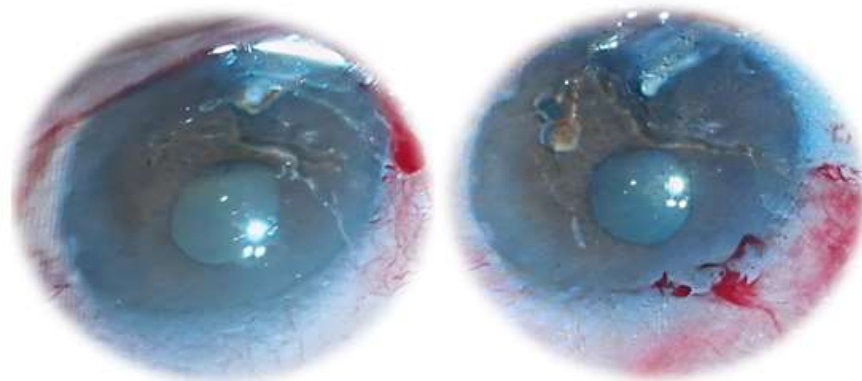
Intraoperative exploration revealed a 2 × 2-mm metallic foreign body embedded within the iris stroma. The foreign body was surrounded and encapsulated by chronic inflammatory granulomatous tissue, confirming the clinical impression of a foreign-body granuloma. The finding also demonstrated that the metallic fragment had remained within the anterior segment sufficiently long to become incorporated into the iris tissue and surrounded by chronic inflammatory tissue.

Careful surgical manipulation was undertaken to mobilize the embedded metallic fragment while minimizing additional damage to the iris and adjacent anterior segment

structures. Following anterior chamber washout, the foreign body was successfully mobilized from its position within the iris stroma into the anterior chamber. The fragment was subsequently positioned for extraction through a side-port entry. The retained metallic foreign body was removed successfully.

The ocular surface component was managed concurrently with excision of the grade II nasal pterygium and placement of a conjunctival autograft. Thus, the operative procedure addressed both the chronic surface lesion and the underlying retained intraocular foreign body.

Left eye pterygium excision with Conjunctival Autograft (CAG) combined with foreign body removal.



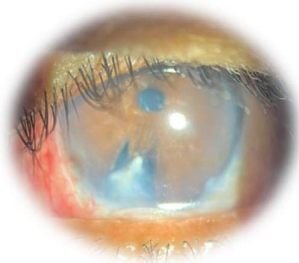
INTRA OP FINDINGS

1. A 2 X 2 mm metallic foreign body found embedded in the iris stroma and encapsulated by a chronic inflammatory granuloma.
2. Successful mobilization of the shard into the anterior chamber following an AC wash, prepared for extraction via side-port entry.

Postoperative course and outcome

The postoperative course was documented over subsequent follow-up. At seven weeks, visual acuity was recorded as 6/18 (p) improving to 6/9 (p), with an intraocular pressure of 19.4 mmHg. The conjunctiva remained congested. An endothelial opacity at the 7-o'clock position was described as an adherent leucoma. The anterior chamber was of normal depth. An iris defect was present, and the pupil was fixed and irregular. The lens was described as greyish.

Despite the structural changes remaining after removal of the foreign body, the postoperative visual acuity showed improvement compared with the preoperative best-corrected visual acuity. The case demonstrates the unusual presentation of a chronically retained metallic intraocular foreign body as an iris granuloma in a patient with an ill-defined remote history of occupational ocular trauma.



POD : 7 WEEKS - VA : 6/18 (p) – 6/9 (p) - IOP : 19.4 mmhg

	OD
Eyelid	Normal
Conjunctiva	congested
Cornea	Endothelial opacity @7 o'clock (adherent leucoma)
AC	Normal depth
Iris	Iris defect +
Pupil	Fixed , irregular
Lens	greyish

Case 2: Right eye Penetrating Ocular Injury with Intraocular Foreign Body (Glass) with Traumatic Cataract

A 49-year-old male presented with severe ocular pain and sudden diminution of vision in the right eye following a

high-velocity road traffic accident. According to the history provided, the patient's car side mirror shattered after a collision with a motorcycle, resulting in penetration of glass fragments into the right eye. The patient subsequently experienced persistent foreign-body sensation and photophobia. There was no reported loss of consciousness or seizure activity following the accident, and the patient was systemically stable at presentation.

The initial visual assessment demonstrated profound impairment of the affected eye. Unaided visual acuity in the right eye was recorded as hand movements close to face, while the left eye had an unaided visual acuity of 6/6. Best-corrected visual acuity in the right eye remained at hand movements close to face. Intraocular pressure could not be reliably recorded in the right eye because of the open-globe injury, whereas the left-eye pressure was 16 mmHg.

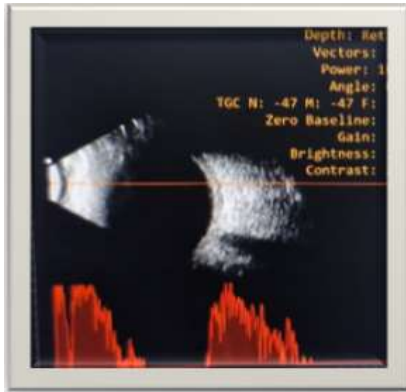
External and slit-lamp examination demonstrated evidence of significant penetrating ocular trauma. The right eyelid showed laceration and abrasion, and subconjunctival haemorrhage was present. A full-thickness longitudinal corneal tear measuring approximately 3.5 mm was identified, extending below the pupillary area. The anterior chamber was narrow and contained +4 anterior chamber cells, indicating marked traumatic inflammation. A glass fragment measuring approximately 3.5 × 3 mm was identified within the inferonasal portion of the anterior chamber.

The iris was described as having normal colour and pattern, although the pupil was sluggishly reactive. The lens showed traumatic changes, with injury to the anterior capsule attributed to the penetrating glass fragment and an associated hazy lens glow. These findings indicated that the glass fragment had not merely entered the anterior chamber but had also breached the anterior lens capsule, creating the substrate for development of a traumatic cataract.

B-scan ultrasonography of the right eye demonstrated positive lens echoes, with an empty vitreous echo pattern and a flat retina. The optic nerve head shadow was positive. Plain MRI of the brain was reported as showing normal brain parenchyma. The combination of the clinical examination and imaging findings supported the diagnosis of an anterior segment penetrating injury with a retained glass foreign body and associated traumatic lens damage.

The patient was diagnosed with a right-eye penetrating ocular injury with an intraocular glass foreign body and traumatic cataract. The initial treatment plan consisted of removal of the foreign body from the anterior chamber along with primary repair of the corneal tear under local anaesthesia. The visual prognosis was considered guarded because of the penetrating nature of the injury, profound initial visual impairment, anterior chamber inflammation, and lens involvement.

B SCAN: OD



Axial & oblique B Scan

- Empty vitreous echos , Retina Flat
- Lens echos positive
- Optic nerve head shadow positive

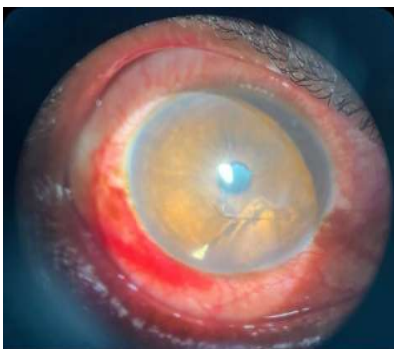
MRI brain plain: Suggestive of normal brain parenchyma



Visual Acuity	OD	OS
Unaided	HMCF	6/6
BCVA	HMCF	-

Intraocular pressure	OD	OS
	Error (due to open globe injury)	16 mmhg

OD



- **EOM:** Full and free in all gazes no nystagmus

	OD	OS
Eyelid	Laceration and abrasion	Normal
Conjunctiva	subconjunctival hemorrhage	Normal
Cornea	Full-thickness longitudinal corneal tear (~3.5 mm) extending below the pupillary area.	Clear
AC	Narrow with +4 AC cells Glass fragment (3.5 mm x 3 mm) located infero-nasally in the AC.	Normal Depth
Iris	Normal colour & pattern	Normal colour & pattern
Pupil	Sluggish reactive pupil	RRR
Lens	Traumatic lens changes noted (glass damaged the anterior capsule); hazy glow.	Early SIMC

PLAN OF TREATMENT

Right eye foreign body removal from Anterior Chamber with primary corneal tear repair under LA under Guarded visual prognosis.



POST OP (DAY 1)

VA – CF 1MTR

IOP – 9.9 mmhg

Intraoperative and early postoperative management

The glass foreign body was removed from the anterior chamber and the corneal wound was primarily repaired. On postoperative day 1, visual acuity in the right eye was recorded as counting fingers at 1 metre, and intraocular pressure was 9.9 mmHg. The early postoperative findings reflected the severity of the initial open-globe injury and the associated anterior segment damage.

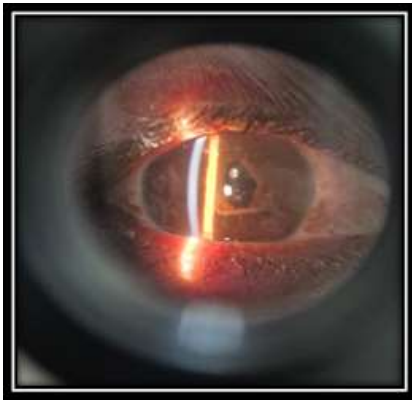
Subsequent assessment following primary repair demonstrated that the glass shard had breached the anterior lens capsule. This resulted in rapid progression of traumatic cataract. Because of the lens injury and consequent visual impairment, a secondary surgical intervention was undertaken. Cataract extraction with

intraocular lens implantation was performed under local anaesthesia, with the visual prognosis remaining guarded.

Postoperative outcome

At six weeks following cataract surgery, the right-eye visual acuity had improved to 6/18 (p), while intraocular pressure was 15.1 mmHg. The improvement from the initial hand-movement level of vision demonstrated functional recovery following definitive management of the penetrating injury, removal of the retained glass fragment, primary corneal repair, and subsequent management of the traumatic cataract.

This case illustrates the acute and complex presentation of a glass intraocular foreign body following high-velocity road traffic trauma. Unlike the chronically retained metallic foreign body in Case 1, the glass fragment produced an immediately evident open-globe injury, severe anterior chamber inflammation, corneal disruption, and direct anterior lens capsule damage requiring staged visual rehabilitation.



POD : 6 WEEKS (After cataract surgery)

VA : 6/18 (p)

IOP : 15.1 mmhg

The primary repair revealed that a glass shard had **breached the anterior capsule**, sparking the rapid onset of a **traumatic cataract**.

To restore the patient's sight, a secondary intervention was performed: cataract extraction and **intraocular lens (IOL) implantation** under LA under GVP.

Successfully reopened the window to the world by restoring sight to a shattered eye.

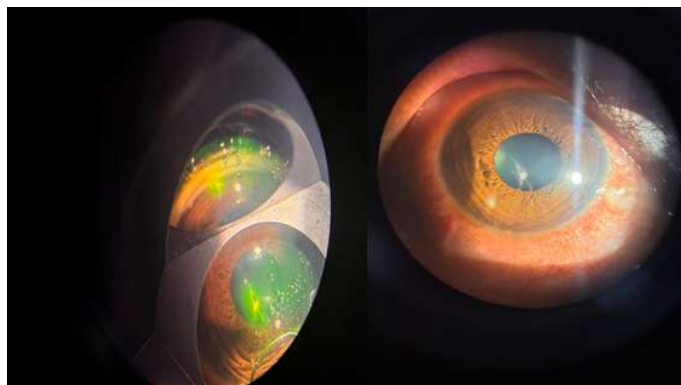
Case 3: Multiple Particulate Intraocular Foreign Bodies Following Wind-Blown Dust Injury

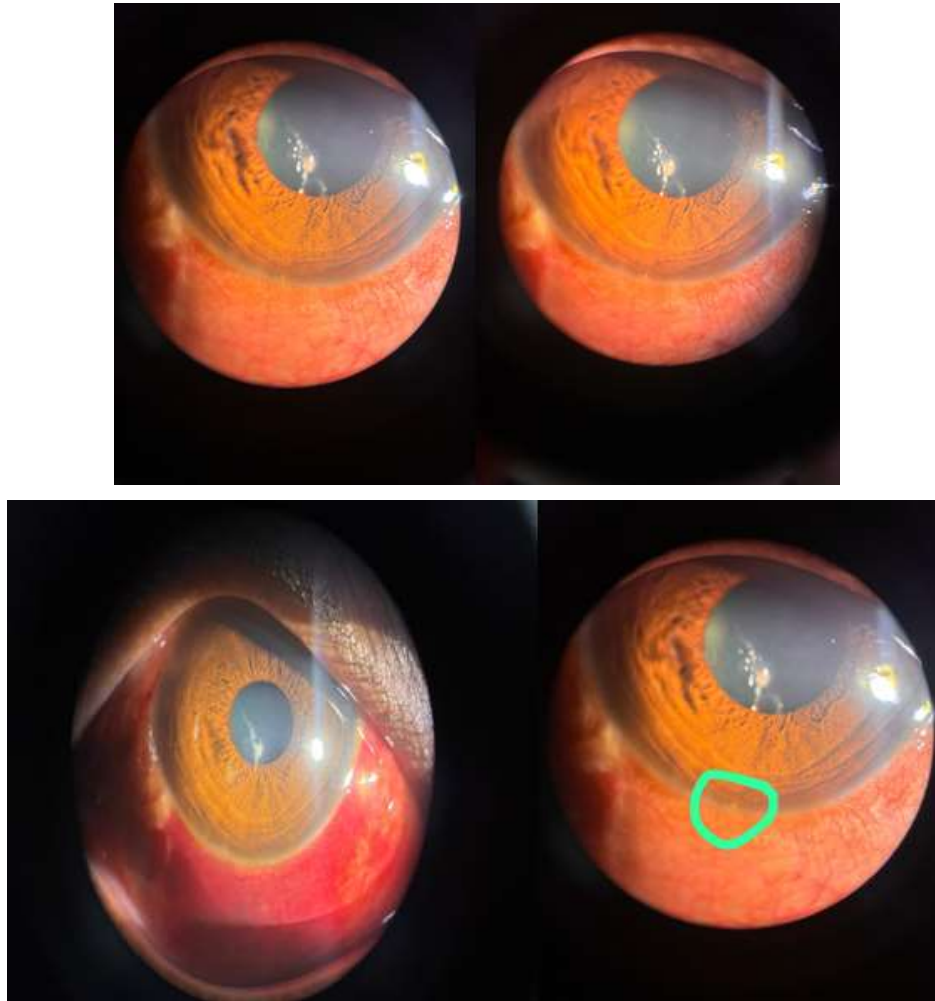
A 54-year-old male presented to the ophthalmology outpatient department with a two-day history of diminished vision, persistent watering, redness, and severe foreign-body sensation in the right eye following exposure to wind-blown dust. The relatively short interval between the exposure and presentation suggested an acute traumatic inflammatory process. The patient's symptoms were predominantly ocular and were associated with clinically demonstrable particulate material within the anterior segment.

Visual acuity in the right eye was 6/12, improving to 6/9 with pinhole. Intraocular pressure was 18.5 mmHg. Slit-lamp examination revealed marked circumferential congestion. Unlike a single localized foreign body, multiple particulate foreign bodies were identified at different anatomical sites within the anterior segment. Some particles were adherent to the corneal endothelium, while others were freely floating within the anterior chamber. Additional particulate material was identified deeply lodged within the inferior anterior chamber angle.

The distribution of the foreign bodies demonstrated the importance of detailed anterior segment examination and gonioscopy in cases of particulate ocular trauma. The material was not confined to the ocular surface and could not be considered merely superficial dust contamination. Its presence on the corneal endothelium, within the anterior chamber, and deep within the inferior angle established the diagnosis of penetrating ocular trauma with retained intracameral particulate foreign bodies.

The final diagnosis was right-eye penetrating ocular trauma with retained intracameral particulate foreign bodies adherent to the corneal endothelium, freely present within the anterior chamber, and impacted within the anterior chamber angle.





Surgical management

Because of the multiple retained intraocular particles and their adherence to intraocular structures, therapeutic anterior chamber washout was planned. An ophthalmic viscosurgical device was utilized during the procedure to facilitate controlled separation of the retained particulate material from the corneal endothelium and other anterior segment structures. The foreign material was carefully detached and evacuated from the anterior chamber.

The use of an ophthalmic viscosurgical device allowed the retained particles to be manipulated while providing protection to the delicate intraocular tissues. Particular attention was directed toward the particles adherent to the corneal endothelium and those lodged within the inferior angle, where simple surface irrigation would not have been sufficient for complete removal.

Postoperative course and outcome

Following the anterior chamber washout, the patient's ocular symptoms gradually subsided. The postoperative inflammatory response resolved progressively. By postoperative day 15, visual acuity in the right eye had improved to 6/9, with further improvement to 6/6 with pinhole. Intraocular pressure had decreased from the

preoperative value of 18.5 mmHg to 15.7 mmHg. Complete resolution of the anterior segment inflammation was documented.

The favorable short-term outcome following removal of the retained particulate foreign bodies demonstrates that prompt recognition and appropriate anterior chamber clearance can restore visual function and resolve traumatic inflammation, even when foreign material is distributed across multiple anterior segment locations.

Overall Clinical Spectrum of the Three Cases

The three cases demonstrate substantially different manifestations of anterior segment intraocular foreign bodies. Case 1 represented a chronic occupationally related metallic foreign body that had become embedded within the iris and encapsulated by granulomatous tissue, with the diagnosis established through detailed anterior segment assessment and radiological imaging. Case 2 represented an acute high-velocity penetrating injury in which a glass fragment entered the anterior chamber, produced an open-globe corneal wound, and breached the anterior lens capsule, resulting in traumatic cataract and the need for staged surgical management. Case 3 represented an acute particulate injury in which multiple

foreign bodies were distributed across the corneal endothelium, anterior chamber, and inferior angle and were successfully treated with therapeutic anterior chamber washout.

Together, these cases emphasize the heterogeneity of retained anterior segment foreign bodies and demonstrate that management must be individualized according to the foreign body's composition, anatomical location, chronicity, associated tissue damage, and visual consequences. The cases also highlight the complementary role of slit-lamp examination, gonioscopy, anterior segment imaging, radiography, ultrasonography, and surgical exploration in establishing the diagnosis and guiding definitive treatment.

DISCUSSION

Intraocular foreign bodies represent a heterogeneous group of traumatic ocular lesions whose clinical appearance and consequences depend substantially on the nature of the foreign material, mechanism of entry, anatomical location, and duration of retention. The three cases presented in this series demonstrate this spectrum particularly well, with one patient having a chronically retained metallic fragment embedded in the iris and surrounded by granulomatous tissue, another sustaining an acute penetrating injury with an intracameral glass fragment and traumatic cataract, and a third developing multiple particulate foreign bodies distributed across the corneal endothelium, anterior chamber, and inferior angle. Despite involving the same broad pathological entity, each case required a different diagnostic and surgical strategy.

The first case is notable because the retained metallic foreign body presented in the setting of a relatively remote and poorly defined history of ocular trauma. The patient was a construction worker and presented primarily with a progressive whitish growth over the left cornea. The clinical examination demonstrated grade II nasal pterygium together with a suspicious anterior chamber lesion that was clinically interpreted as a foreign-body granuloma. Radiological examination subsequently demonstrated a discrete radio-opaque metallic foreign body in the anterior segment, while surgical exploration confirmed a 2×2 -mm metallic fragment embedded within the iris stroma and encapsulated by chronic inflammatory granulomatous tissue. The case illustrates an important diagnostic challenge: a retained foreign body may not always present with a clear history of recent trauma or an obvious penetrating wound. In a patient with occupational exposure to metallic fragments, an unexplained anterior segment mass or granulomatous lesion should therefore prompt consideration of a retained foreign body.

The location of the metallic fragment within the iris also influenced its management. Simple extraction was not immediately possible because the fragment had become embedded in the iris stroma and surrounded by inflammatory tissue. The surgical strategy involved controlled mobilization of the fragment following anterior chamber washout, allowing it to be brought into the

anterior chamber and subsequently removed through a side-port approach. This illustrates the importance of adapting the surgical technique to the anatomical relationship between the foreign body and surrounding ocular structures rather than attempting forceful direct extraction. The simultaneous management of the associated grade II pterygium with excision and conjunctival autografting allowed the ocular surface pathology to be addressed during the same operative episode.

The postoperative findings in Case 1 also demonstrate that removal of the foreign body does not necessarily reverse all established structural damage. At seven weeks, visual acuity had improved to 6/9 (p), but an endothelial opacity described as an adherent leucoma, an iris defect, and a fixed irregular pupil persisted. These findings are consistent with the potential consequences of prolonged intraocular foreign-body retention and surgical manipulation. The case therefore emphasizes the distinction between removal of the inciting foreign material and complete restoration of normal ocular anatomy. Functional recovery may remain limited by pre-existing tissue injury even after technically successful extraction.

The second case represents a contrasting clinical scenario. Here, the mechanism was clearly defined and acute: a high-velocity road traffic accident resulted in shattering of a vehicle side mirror and penetration of glass into the right eye. The patient presented with severe pain, sudden diminution of vision, photophobia, and foreign-body sensation. Examination demonstrated an open-globe injury with a full-thickness longitudinal corneal tear, severe anterior chamber inflammation, and a 3.5×3 -mm glass fragment within the inferonasal anterior chamber. In addition, the glass fragment had breached the anterior lens capsule, producing traumatic lens changes that subsequently progressed to traumatic cataract.

The combination of a corneal wound and retained intracameral glass required urgent surgical management. Primary corneal repair and anterior chamber foreign-body removal constituted the initial treatment, after which the visual acuity remained substantially impaired. The subsequent recognition of anterior capsule disruption and traumatic cataract necessitated a second procedure involving cataract extraction and intraocular lens implantation. The staged approach demonstrates how management of penetrating ocular trauma may evolve according to the structural consequences that become evident following primary repair. At six weeks after cataract surgery, visual acuity had improved to 6/18 (p), accompanied by an intraocular pressure of 15.1 mmHg.

An important feature of Case 2 was the profound initial reduction in visual acuity to hand movements close to face. The open-globe injury also precluded reliable initial intraocular pressure measurement. These findings highlight the importance of prioritizing globe integrity and structural assessment in severe penetrating trauma rather

than interpreting the initial visual acuity as the final visual prognosis. Following repair, removal of the retained glass fragment and subsequent cataract surgery, useful visual function was restored. Nevertheless, the guarded visual prognosis at presentation was appropriate given the extent of corneal, anterior chamber, and lens involvement.

The third case illustrates a different form of anterior segment foreign-body trauma. Unlike the discrete metallic and glass fragments in the first two cases, this patient had multiple particulate foreign bodies following exposure to wind-blown dust. The particles occupied several anatomical compartments: some were adherent to the corneal endothelium, others were freely floating within the anterior chamber, and additional material was deeply lodged within the inferior angle. The presence of material in the angle was particularly important because such particles could easily be overlooked without careful examination and gonioscopy. The case demonstrates that an apparently minor environmental exposure may result in genuine intraocular retention rather than simple ocular-surface contamination.

The management of Case 3 was correspondingly different. Therapeutic anterior chamber washout was performed using an ophthalmic viscosurgical device to detach and evacuate the retained particulate material while protecting the delicate anterior segment structures. The favorable response was rapid and clinically evident. By postoperative day 15, visual acuity had improved from 6/12 to 6/9, reaching 6/6 with pinhole, while intraocular pressure decreased from 18.5 to 15.7 mmHg and the anterior segment inflammation completely resolved. The outcome indicates that, when intraocular particulate material is recognized promptly and removed before producing substantial structural damage, functional recovery can be favorable.

An important observation across the three cases is the relationship between chronicity and tissue response. The first patient had a chronic retained metallic fragment with granulomatous encapsulation and residual structural abnormalities. The second patient had an acute penetrating injury with direct mechanical damage to the cornea and lens. The third patient presented after only two days of symptoms and had multiple retained particles but no documented major structural sequelae following removal. Thus, the cases demonstrate three different stages and patterns of ocular response to retained intraocular material: chronic inflammatory encapsulation, acute mechanical disruption, and acute inflammatory response to particulate contamination.

The composition of the foreign body also influenced the clinical presentation and treatment. The metallic fragment was radio-opaque and became incorporated within iris tissue, allowing radiography to contribute to diagnosis. The glass fragment was visualized directly within the anterior chamber and was associated with an open-globe injury and traumatic cataract. The particulate material in Case 3 required detailed slit-lamp and gonioscopic

examination to establish its distribution. These observations reinforce the importance of selecting diagnostic investigations according to the suspected material and anatomical location rather than relying on a single imaging modality.

The cases further demonstrate that anterior segment examination should extend beyond the obvious site of injury. In Case 1, the clinically apparent pterygium could have focused attention primarily on the ocular surface, while the retained metallic fragment was actually embedded in the iris. In Case 2, the corneal laceration represented only one component of a more extensive injury involving the anterior chamber and lens. In Case 3, particulate material was distributed between the corneal endothelium, anterior chamber, and inferior angle. Comprehensive slit-lamp examination, supplemented by gonioscopy and appropriate imaging, is therefore essential for determining the full extent of retained foreign material.

Another important lesson is that the objective of treatment should be broader than foreign-body extraction alone. In Case 1, pterygium excision and conjunctival autografting were performed together with foreign-body removal. In Case 2, primary corneal wound repair and foreign-body extraction were followed by definitive treatment of traumatic cataract with cataract extraction and intraocular lens implantation. In Case 3, the principal objective was complete anterior chamber clearance while minimizing damage to the corneal endothelium and other intraocular structures. The operative plan in each patient was consequently determined by the associated pathology rather than by the foreign body's presence alone.

The clinical outcomes across the three cases were encouraging despite the differences in severity and chronicity. Case 1 showed improvement in visual acuity following removal of the metallic fragment, although residual iris, pupillary, and corneal changes remained. Case 2 demonstrated substantial functional recovery after primary repair, foreign-body removal, and subsequent cataract surgery. Case 3 achieved near-normal pinhole visual acuity with complete resolution of inflammation following anterior chamber washout. These outcomes support the principle that prompt and anatomically appropriate management can preserve or restore useful vision even when an intraocular foreign body is associated with significant anterior segment pathology.

The series also emphasizes the importance of maintaining a high index of suspicion in occupational and accidental ocular trauma. The first case involved a construction worker, a setting in which high-velocity metallic fragments may occur, whereas the second case resulted from a road traffic accident involving shattered glass. The third case demonstrates that environmental particulate exposure can also result in intraocular retention. A careful history regarding occupation, mechanism of trauma, type of material involved, and interval since injury can therefore provide important diagnostic clues, even when the patient's recollection is incomplete.

Overall, these three cases provide a representative clinical spectrum of anterior segment intraocular foreign bodies, from chronic metallic iris embedding to acute glass penetration with traumatic cataract and multiple particulate intracamerar foreign bodies following dust exposure. The principal message is that the diagnosis and treatment of IOFBs should be individualized according to mechanism, composition, location, chronicity, and associated tissue injury. Thorough anterior segment examination and appropriate imaging facilitate accurate localization, while carefully planned surgical intervention should aim not only to remove the foreign body but also to repair associated structural damage and preserve visual function.

CONCLUSION

This case series demonstrates the broad clinical spectrum of anterior segment intraocular foreign bodies and emphasizes that their presentation may vary considerably according to the mechanism of injury, composition of the foreign material, anatomical location, and duration of retention. The three cases included a chronically retained metallic foreign body embedded within the iris and surrounded by granulomatous tissue, an acute penetrating glass injury complicated by traumatic cataract, and multiple particulate foreign bodies involving the corneal endothelium, anterior chamber, and inferior angle following wind-blown dust exposure.

The first case highlights the diagnostic difficulty associated with a retained foreign body when the history of trauma is remote or poorly defined. The metallic fragment remained embedded within the iris and developed a chronic inflammatory granuloma, demonstrating that an apparently isolated anterior segment lesion may represent an occult retained intraocular foreign body. The second case demonstrates the potentially severe consequences of high-velocity penetrating trauma, in which a glass fragment produced an open-globe injury, severe anterior chamber inflammation, corneal disruption, and anterior lens capsule injury, ultimately requiring staged management with foreign-body removal, wound repair, and cataract extraction with intraocular lens implantation. The third case illustrates that even particulate material introduced during apparently minor environmental exposure may become genuinely intraocular, with particles adhering to the corneal endothelium, remaining suspended in the anterior chamber, or becoming impacted within the angle.

These cases reinforce the importance of detailed anterior segment evaluation in all patients with suspected ocular foreign-body injury. Slit-lamp examination should be complemented by gonioscopy when angle involvement is suspected and by targeted imaging when the foreign body's location or composition is uncertain. Plain radiography proved useful in identifying the metallic fragment in Case 1, while ultrasonographic assessment contributed to evaluation of the severely traumatized globe in Case 2. The diagnostic approach should therefore be

tailored to the mechanism and suspected characteristics of the foreign body.

Successful treatment requires consideration of the entire spectrum of associated ocular damage rather than foreign-body extraction alone. Depending on the clinical circumstances, management may require anterior chamber washout, careful mobilization and extraction of an embedded fragment, repair of a corneal wound, management of iris injury, or subsequent treatment of traumatic cataract. The use of an ophthalmic viscosurgical device in Case 3 facilitated controlled removal of particulate material while protecting the anterior segment structures.

The visual outcomes in this series were favorable following individualized surgical management. The first patient demonstrated improvement in visual acuity despite residual structural changes associated with chronic foreign-body retention. The second patient achieved useful visual recovery following staged management of the penetrating injury and traumatic cataract. The third patient achieved 6/9 visual acuity, improving to 6/6 with pinhole, together with normalization of intraocular pressure and complete resolution of inflammation by postoperative day 15.

Although this series is limited by the small number of patients and the heterogeneous nature of the injuries, its value lies in demonstrating the diverse ways in which anterior segment intraocular foreign bodies may present in routine ophthalmic practice. The cases underscore the need for a high index of suspicion, meticulous anatomical localization, appropriate imaging, and timely individualized surgical intervention. Early recognition and comprehensive management can minimize secondary complications and maximize the possibility of preserving useful vision in patients with retained intraocular foreign bodies.

REFERENCES

- [1] Ohlhausen M, Menke MN, Begley CG, Kim SJ, Debiec M, Conrady CD, Yeh S, Justin GA. Advances in the management of intraocular foreign bodies. *Front Ophthalmol (Lausanne)*. 2024;5:1422466. doi:10.3389/fopht.2024.1422466.
- [2] Jung HC, Lee SY, Kim SS, et al. Intraocular foreign body: diagnostic protocols and treatment strategies in ocular trauma patients. *J Clin Med*. 2021;10(9):1861. doi:10.3390/jcm10091861.
- [3] Cho J, Park KH, Lee JK, et al. Intraocular foreign bodies: a review. *Surv Ophthalmol*. 2016;61(6):765-779. doi:10.1016/j.survophthal.2016.03.005.
- [4] Parke DW III, Flynn HW Jr, Fisher YL. Management of intraocular foreign bodies: a clinical flight plan. *Can J Ophthalmol*. 2013;48(1):8-12. doi:10.1016/j.jcjo.2012.11.005.

- [5] Loporchio D, Mukkamala L, Gorukanti K, et al. Intraocular foreign bodies: a review. *Surv Ophthalmol*. 2016;61(6):582-596.
- [6] Zhang Y, Zhang MN, Jiang CH, Yao Y, Zhang K. Intraocular foreign bodies in China: clinical characteristics, prognostic factors, and visual outcomes in 182 eyes. *Retina*. 2011;31(8):1548-1553.
- [7] Chiquet C, Puech C, Zech JC, et al. Intraocular foreign bodies. Clinical characteristics and visual outcomes. *J Fr Ophthalmol*. 2011;34(7):478-485.
- [8] Nicoară SD, Irimescu I, Călinici T, Cristian C. Intraocular foreign bodies extracted by pars plana vitrectomy: clinical characteristics, management, outcomes and prognostic factors. *BMC Ophthalmol*. 2015;15:151. doi:10.1186/s12886-015-0128-6.
- [9] Zhang Y, Zhang MN, Jiang CH, Yao Y, Zhang K. Intraocular foreign bodies: clinical characteristics and prognostic factors influencing visual outcome and globe survival in 373 eyes. *J Ophthalmol*. 2019;2019:5208092. doi:10.1155/2019/5208092.
- [10] Jabłoński M, Winiarczyk M, Biela K, Bieliński P, Jasielska M, Batalia J, Mackiewicz J. Open globe injury with a presence of an intraocular foreign body—epidemiology, management, and risk factors in long-term follow-up. *J Clin Med*. 2022;12(1):190. doi:10.3390/jcm12010190.
- [11] Essex RW, Yi Q, Charles PG, Allen PJ. Post-traumatic endophthalmitis. *Ophthalmology*. 2004;111(11):2015-2022.
- [12] Ehlers JP, Kunimoto DY, Ittoop S, Maguire JI, Ho AC, Regillo CD. Metallic intraocular foreign bodies: management and visual outcomes. *Ophthalmology*. 2008;115(8):1431-1435.
- [13] Loporchio DF, Mukkamala SK, Gorukanti K, et al. Intraocular foreign bodies: a clinical review. *Ophthalmic Surg Lasers Imaging Retina*. 2016;47(7):676-682.
- [14] Zhou Y, Song W, Wang Y, et al. Open globe injuries: review of evaluation, management, and surgical pearls. *Clin Ophthalmol*. 2022;16:1899-1912.
- [15] Kuhn F, Morris R, Witherspoon CD, Heimann K, Jeffers JB, Treister G. A standardized classification of ocular trauma. *Ophthalmology*. 1996;103(2):240-243.
- [16] Kuhn F, Morris R, Mester V. Predicting the need for vitrectomy after penetrating eye injury. *Ophthalmology*. 2001;108(9):1641-1647.
- [17] Kuhn F, Morris R, Witherspoon CD, Mester V. The Birmingham Eye Trauma Terminology system (BETT). *J Fr Ophthalmol*. 2004;27(2):206-210.
- [18] Wani VB, Al-Ajmi M, Thalib L, et al. Vitrectomy for posterior segment intraocular foreign bodies: visual outcomes and prognostic factors. *Retina*. 2003;23(5):643-647.
- [19] Colyer MH, Chun DW, Bower KS, Dick JSB, Weichel ED. Perforating globe injuries during combat. *Am J Ophthalmol*. 2008;146(1):45-51.
- [20] Andreoli CM, Andreoli MT. Surgical rehabilitation of the open globe injury patient. *Am J Ophthalmol*. 2012;153(5):856-860.
- [21] Regan GJ, Foster PJ, et al. Updates on the clinical management of intraocular foreign body. *Asia Pac J Ophthalmol (Phila)*. 2025;14(3):100208. doi:10.1016/j.apjo.2025.100208.
- [22] Ong AY, Goldberg EA, Kearney WC, et al.; IRIS Registry Analytic Center Consortium. Epidemiology, clinical features, and visual outcomes after intraocular foreign body removal: an IRIS® Registry analysis. *Ophthalmol Retina*. 2026;10(4):411-419. doi:10.1016/j.oret.2025.11.002.
- [23] Phogat J, Prabha C, Nada M, Gill S, Sharma A. Intraocular foreign bodies in the posterior segment: clinical characteristics, management, and visual outcomes. *Chin J Traumatol*. 2026. doi:10.1016/j.cjtee.2026.03.005.
- [24] Academy of Asia-Pacific Professors of Ophthalmology, Asia-Pacific Vitreo-retina Society, Academia Retina Internationalis. International consensus and guidelines on the etiology, diagnosis and management of intraocular foreign bodies (IOFBs). 2025.