

## Continuing Medical Education:

# Hot, liquid glass injury as a novel mechanism for intraocular foreign body

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### Learning objectives

Upon completion of this activity, participants will be able to:

- Distinguish the epidemiology and anatomy of glass intraocular foreign body (IOFB).
- Evaluate challenges in the surgical approach to patients with glass IOFB.
- Assess potential complications of intact glass IOFB.
- Analyze long-term outcomes after surgical treatment for glass IOFB.

### Authors/Editors disclosure information

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# Hot, liquid glass injury as a novel mechanism for intraocular foreign body

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## Abstract

**Purpose** To report the occurrence of a novel mechanism of IOFB with hot, liquefied glass injury.

**Methods** Retrospective case series.

**Results** Two patients suffered an injury to their eye with hot, liquefied glass. The ocular findings included a single scleral entry wound with multiple glass fragments located inside the eye. Fragments were found embedded in the retina, as well as mobile on the retinal surface.

**Conclusions** This distinctive mechanism involves an initial liquid state of glass causing injury, and results in multiple solidified glass IOFBs despite a single entrance wound. Though intraocular glass is typically inert, the unique characteristics of this injury may warrant a surgical approach. Surgical management proved successful in stabilizing vision and preventing further complications.

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**Keywords:** trauma; foreign body; glass; intraocular

## Introduction

Glass IOFBs comprise 6–9% of all IOFB injuries.<sup>1</sup> Despite the inert nature of glass, and the lack of significant ocular tissue reaction to its presence within the eye, glass IOFBs are typically surgically removed. Removal presents significant challenges to the surgeon: the size of the glass IOFB is typically larger than the entrance wound; the irregular shape of the glass IOFB often makes it difficult to grasp with forceps as well as remove; the sharpness of the edges of the glass IOFB can cause lens and retinal damage; and slippage of the glass

IOFB within the eye can create further ocular injury.<sup>2</sup>

In this review, we present two unique cases of glass IOFB injuries incurred at a glass bangle factory in India. Presentation and management are described to highlight a novel mechanism of injury. This distinctive mechanism involves an initial liquid state of glass causing injury, and results in multiple solidified glass IOFBs despite a single entrance wound.

## Case reports

### Case 1

A 35-year-old male worker in a glass bangle factory sustained an injury when hot, liquid glass splashed into his right eye. On presentation to an ophthalmologist 2 days later, best-corrected visual acuity (BCVA) was 20/60 in the affected eye. Intraocular pressure was low. The examination revealed a single entrance wound in the supero-temporal sclera. There was no inflammatory reaction, however, the patient had developed a traumatic cataract. Dilated fundoscopic examination revealed 51 fragments of red glass. Some pieces were embedded in the retina with surrounding chorioretinal oedema, haemorrhage, and a flap retinal tear, while others were mobile and resting on the retinal surface (Figure 1a).

### Case 2

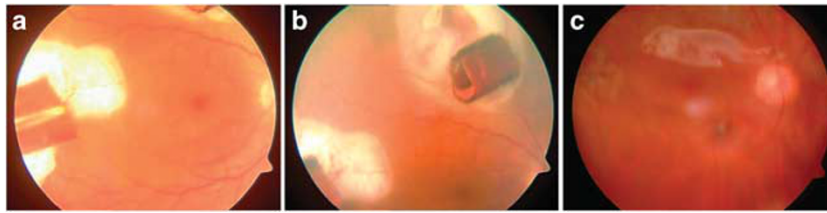
A 30-year-old male worker in a glass bangle factory sustained a similar injury when hot, liquid glass splashed into his left eye. He presented 20 days later to an ophthalmologist with BCVA of 20/30 in the affected eye. Intraocular pressure was within normal limits and symmetrical. There was no inflammatory reaction. Dilated fundoscopic examination showed 11 fragments of green glass. Again, some pieces were embedded in the retina with

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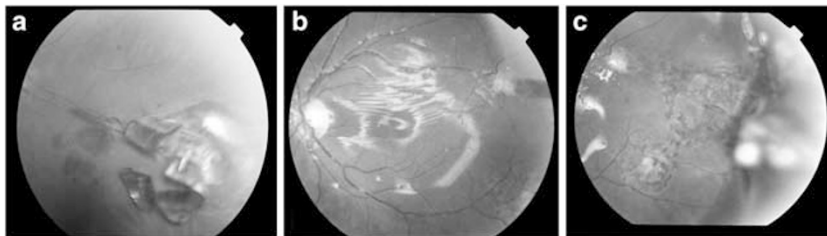
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**Figure 1** Fundus photos of glass IOFB preoperatively (a, b) and postoperatively (c).



**Figure 2** Fundus photos of glass IOFB preoperatively (a) and postoperatively (b, c).

surrounding chorioretinal oedema and haemorrhage. Other pieces were mobile and located on the retinal surface (Figure 2).

In both cases, the patients were not wearing protective glasses. The patients underwent surgical management to remove the IOFBs. A 20-gauge pars plana vitrectomy (PPV) with removal of IOFB, scleral buckle, endolaser, and silicone oil (SO) injection was performed in each patient (Figures 2b and c). The patient in the first case also underwent pars plana lensectomy (Figure 1c).

Follow-up was maintained for 4 years. The patient in case 1 developed an epiretinal membrane with macular pucker. He underwent a 20-gauge PPV with membrane stripping and SO removal at 4 months, with a resulting BCVA of 20/100 with an aphakic contact lens. The patient in case 2 developed cataract and underwent phacoemulsification and SO removal at 5 months, with BCVA stabilizing at 20/60.

## Discussion

Glass IOFBs pose a specific challenge to the ophthalmologist, as there are pros and cons to surgical management. Glass is typically inert, and therefore will cause virtually no long-term inflammatory damage if retained. A retrospective study by Gopal *et al*<sup>3</sup> showed no adverse events in eight of eight eyes where glass IOFBs were left intact. In the same study, 13/43 eyes that underwent surgical removal of the glass IOFBs experienced iatrogenic retinal breaks. Another review by Milkowski *et al*<sup>4</sup> also revealed no complications with glass IOFBs left intact, even with close proximity to the optic nerve and retina.

On the other hand, complex cases with multiple glass IOFBs may yield different outcomes if not surgically removed. Mechanical complications from retained glass IOFBs can develop. Sharp edges, when moving posterior to anterior, have been reported to cause cataract, corneal oedema, and iridocyclitis.<sup>4</sup> In addition, anterior to posterior migration can cause retinal laceration as well as trauma to the macula and subsequent visual impairment.<sup>2</sup> As described above, liquified glass appears to solidify into many sharp glass fragments upon penetration through the scleral wall and cooling. The mechanism of glass fragmentation is unknown, but may be related to a splatter effect from the point of impact and upon entry into the eye. The numerous glass fragments resulting from these injuries heighten the risk of any potential complications.

Though protective eyewear may decrease the occurrence of such injuries, optimal management when they do occur is debatable. Based on this series, surgical management of similar cases can result in good, sustainable outcomes.

## Summary

### What was known before

- Glass IOFBs are inert. Observation is often the management for these injuries. Mobile IOFBs can result in mechanical damage.

### What this study adds

- Hot, liquid glass injury to the eye can result in multiple glass IOFBs. These foreign bodies can be embedded in the retina or mobile on the retinal surface. In these cases, surgical correction can have good outcomes.

### Conflict of interest

The authors declare no conflict of interest.

### References

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# Hot, liquid glass injury as a novel mechanism for intraocular foreign body

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1. You are called to see a 24-year-old male factory worker who suffered a right eye injury yesterday. Hot liquid glass splashed into his eye and he now complains of eye redness and blurry vision with some pain. What should you consider regarding glass injuries to the eye?
  - A Glass comprises 6–9% of all IOFB injuries
  - B Glass promotes significant inflammatory reactions within the eye
  - C Glass IOFB are typically treated conservatively without surgery
  - D Glass IOFB left intact inevitably promote severe ocular complications
  
2. What are characteristics and challenges of glass IOFB during surgery?
  - A The size of the glass IOFB is usually smaller than the entrance wound
  - B Glass usually is easier to grasp compared with other types of IOFB
  - C The sharpness of glass can promote lens and retinal damage
  - D There are no reports of iatrogenic retinal breaks during intraocular glass removal
  
3. The patient is hesitant regarding surgery. Which of the following complications has been reported among patients with glass IOFB left intact?
  - A None
  - B Iritis only
  - C Cataract only
  - D Cataract, corneal oedema, iridocyclitis, and trauma to the macula

4. What can you tell this patient regarding the long-term outcomes of the two patients in this case review?
  - A Both patients had no complications and no need for repeat surgery
  - B Both patients experienced BCVA of 20/60 to 20/100
  - C Both patients required repeated surgeries to remove missed IOFB
  - D Both patients were blind in the affected eye after surgery

### Activity evaluation

1. The activity supported the learning objectives.				
Strongly disagree				Strongly agree
1	2	3	4	5
2. The material was organized clearly for learning to occur.				
Strongly disagree				Strongly agree
1	2	3	4	5
3. The content learned from this activity will impact my practice.				
Strongly disagree				Strongly agree
1	2	3	4	5
4. The activity was presented objectively and free of commercial bias.				
Strongly disagree				Strongly agree
1	2	3	4	5