



## Retained anterior chamber graphite foreign body with delayed inflammation

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### ARTICLE INFO

#### Keywords:

Intraocular graphite  
Retained foreign body  
Endothelial damage

### ABSTRACT

**Purpose:** To report a case of retained anterior chamber graphite foreign body with subsequent inflammation 20 years later.

**Observations:** A 29-year-old female who presented with first episode of acute blurring of vision and eye redness was noted to have a retained intraocular graphite foreign body in her anterior chamber. She recalled being accidentally hit by a mechanical pencil 20 years ago.

**Conclusions and importance:** Retained intraocular graphite foreign bodies are inert and generally do not cause inflammation. This is the longest reported duration of retained anterior chamber graphite foreign body that developed subsequent inflammation and corneal endothelial damage only 20 years later.

### 1. Introduction

Intraocular foreign bodies are not uncommon, accounting for 28.6 % of all open globe injuries.<sup>1</sup> Whilst organic foreign bodies are often associated with severe inflammation, the inflammation generated by inorganic foreign bodies depend on its material.<sup>2</sup> Inert foreign bodies such as glass, plastic may remain quiescent for an extended period of time.<sup>2</sup> Pencil lead consists of graphite, wax, clay and animal fat.<sup>3</sup> Graphite, the main constituent, is inert<sup>3</sup> and has been demonstrated to generally not cause any reaction in the eye for years.<sup>4</sup> However, retained pencil lead in the vitreous cavity has been reported to result in possible sterile endophthalmitis, presumably due to the aluminium component in pencil lead.<sup>5</sup> Potential toxicity of the other components of pencil lead remains unclear.<sup>6</sup> Retained intraocular graphite is rare and only a few case reports exist.<sup>4-13</sup> To our knowledge, this is the first report of an anterior chamber graphite foreign body that was retained for 20 years, the longest reported duration thus far, with subsequent development of inflammation.

### 2. Case report

A 29-year old Malay female presented to the Emergency Department with painless blurring of vision and redness of the left eye of one day duration. She denied any history of ocular trauma. Past medical history was negative. On examination, her visual acuity (unaided) was 6/6 in

the right eye and 6/24 with improvement with pinhole to 6/9 in the left eye. Intraocular pressure was 16 mmHg in the right eye and 13 mmHg in the left eye. Slit lamp examination of her left eye revealed circumciliary conjunctival injection, a small inferior cylindrical black foreign body measuring 1.3mm vertically by 0.6mm horizontally in her anterior chamber (Figs. 1–3) associated with mild cellular activity and inferior corneal touch. There were scattered keratic precipitates, inferonasal peripheral anterior synechiae and pigments on the lens capsule. No hypopyon was noted. There was presence of an old full-thickness corneal shelving wound inferiorly with multiple small intrastromal black particles and inferior epithelial microcysts of the cornea adjacent to the site of the foreign body.

On further history taking, she reported that she was hit in her left eye 20 years ago by a mechanical pencil that was accidentally thrown by another child in school. She did not seek medical attention at that time and had no intervening ocular symptoms until time of presentation. No relative afferent pupillary defect was noted and posterior segment examination was unremarkable. Anterior chamber optical coherence tomography showed presence of an old full-thickness corneal wound with an inferior anterior chamber foreign body (Fig. 4). Corneal pachymetry was 556  $\mu\text{m}$  in the right eye and 575  $\mu\text{m}$  in the left eye. Specular microscopy demonstrated a low endothelial cellular density of 710mm<sup>3</sup> as compared to 2445mm<sup>3</sup> in the right eye. The right eye was normal on examination.

She had a retained intraocular graphite foreign body for 20 years'

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<https://doi.org/10.1016/j.ajoc.2021.101181>

Received 10 February 2021; Received in revised form 26 May 2021; Accepted 24 July 2021

Available online 4 August 2021

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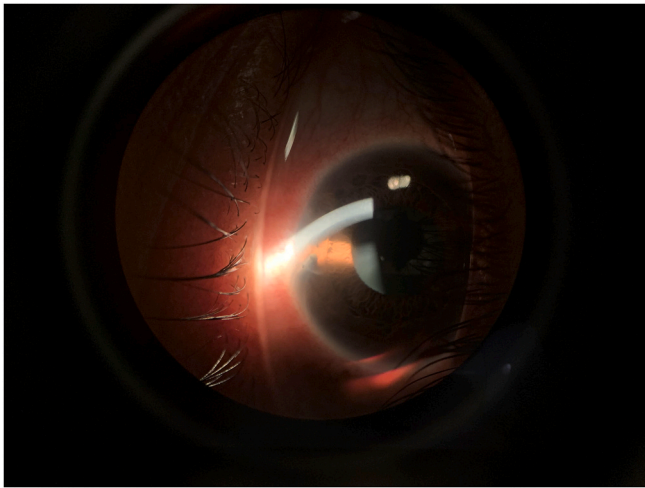


Fig. 1. [Anterior segment photo of left eye with slit beam showing presence of inferior retained graphite foreign body in anterior chamber].

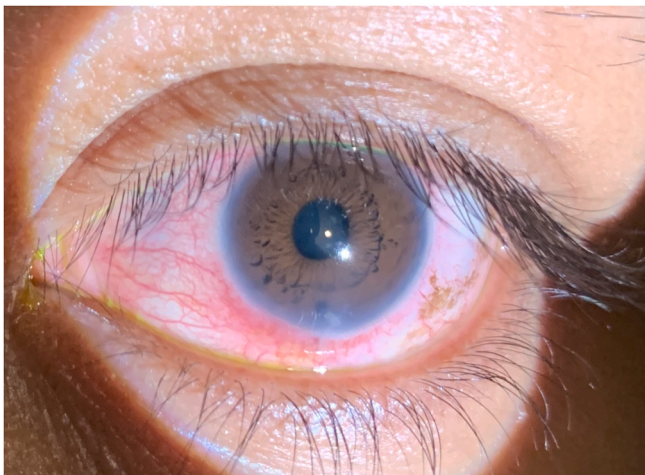


Fig. 2. [Anterior segment photo of left eye showing presence of inferior retained graphite foreign body in anterior chamber with inferior epithelial microcysts (without fluorescein staining)].

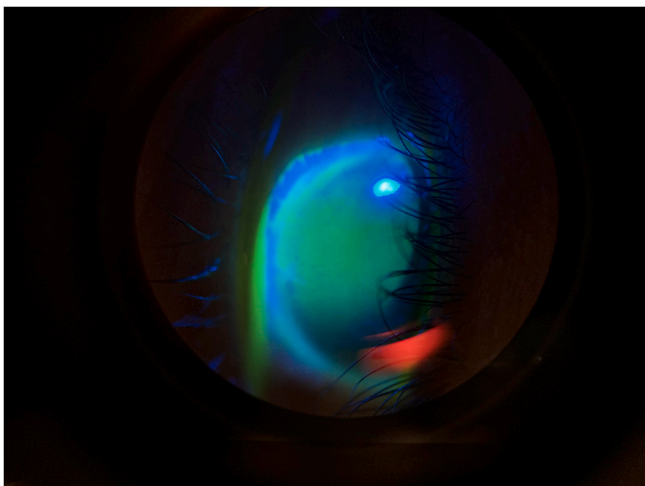


Fig. 3. [Anterior segment photo of left eye showing presence of inferior retained graphite foreign body in anterior chamber with inferior epithelial microcysts (with fluorescein staining)].

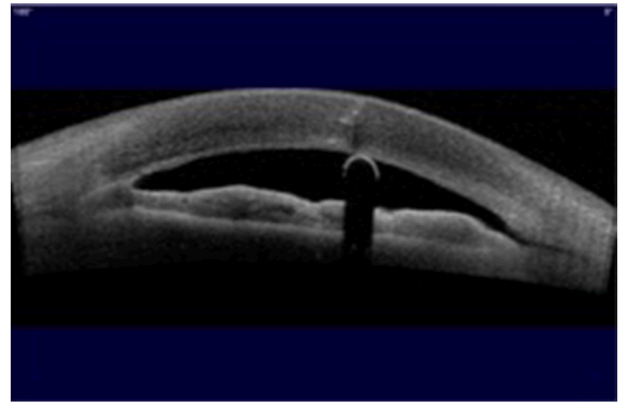


Fig. 4. [Anterior chamber optical coherence tomography showing presence of an old full-thickness corneal wound with an inferior anterior chamber foreign body].

duration in her anterior chamber, which was quiescent for many years, with delayed inflammation and endothelial cell damage 20 years after the initial insult. She was started on topical Moxifloxacin 0.5 % eyedrops as prophylaxis against possible infection, and Prednisolone acetate 1 % eyedrops every 3 hourly to her left eye. There was improvement of the inflammation in her left eye with topical eyedrops (Fig. 5).

She then underwent surgical removal of the anterior chamber graphite foreign body a month later. The foreign body was removed uneventfully with forceps and there was no evidence of fibrosis or granulomatous reaction at the adjacent iris tissue. Her left eye visual acuity improved to 6/6 on post-op day one and a clear cornea was noted (Fig. 6). Corneal pachymetry after one month post-operation was 547  $\mu\text{m}$  in the right eye and reduced to 564  $\mu\text{m}$  in the left eye. Specular microscopy showed an endothelial cellular density of 776mm<sup>3</sup> in the left eye as compared to 2469mm<sup>3</sup> in the right eye (Fig. 7).

### 3. Discussion

Cases of retained intraocular graphite are rare.<sup>4–13</sup> It has been described to be retained in the conjunctiva,<sup>7,8</sup> posterior segment,<sup>4,5</sup> cornea,<sup>8–11</sup> lens<sup>12</sup> and anterior chamber.<sup>6,13</sup> There have also been cases of retained intraorbital graphite foreign body with delayed presentation of optic neuropathy<sup>14</sup> and of orbitocerebral abscess.<sup>15</sup>

Intraocular graphite retained in the conjunctiva simulates melanoma, and was noted by Guy and Rao, to present as an enlarging darkly pigmented mass on the conjunctiva, after the patient sustained a pencil injury 17 years before.<sup>7</sup> In the posterior segment, retained intraocular graphite has been shown to not cause inflammation despite being attached to the inferior retina and remained quiescent over 6 years of follow-up with serial fundus fluorescein angiograms and electroretinograms.<sup>4</sup> However, retained intraocular graphite in the vitreous cavity has been reported to result in possible sterile endophthalmitis 2 days after primary corneal suturing and lens extraction had been performed for the penetrating injury with a graphite pencil.<sup>5</sup> There have been a few cases of corneal graphite particles, all of which, was not associated with inflammation, and were only noted incidentally 3 months,<sup>8</sup> 3 years,<sup>9</sup> 8 years<sup>10</sup> after the time of injury with graphite pencil and one had no history of ocular trauma recalled.<sup>11</sup> These cases suggest that retained intraocular graphite is inert and generally do not cause much inflammation.

There exist two other cases of intraocular graphite retained in the anterior chamber, as with our case. In the first case, a 6-year-old girl was noted to have a 1.5mm graphite foreign body in the anterior chamber with an old full thickness corneal scar in her left eye after having mild pain in her same eye for two days' duration. She had a history of being accidentally poked in the left eye with a pencil by another child 4 months

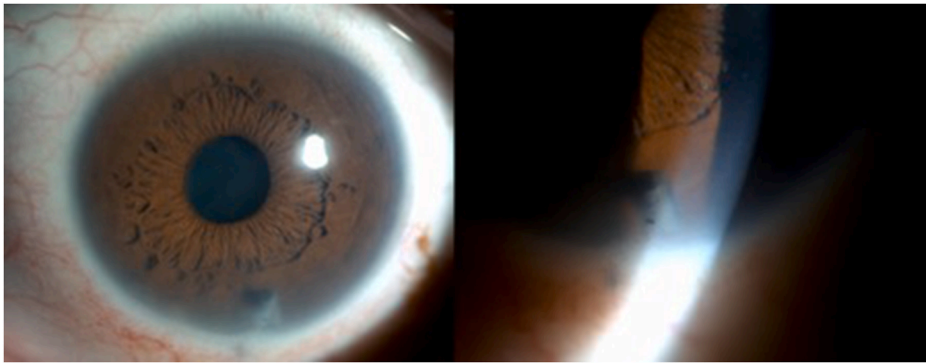


Fig. 5. [Anterior segment photo of left eye showing presence of inferior retained intraocular graphite in anterior chamber (one day after initiation of topical steroid/antibiotic eyedrops)].



Fig. 6. [Anterior segment photo of left eye after removal of retained graphite in anterior chamber on post-op day one].

prior. There was no inflammation noted and a decision was made to remove the foreign body due to the possible damage to the eye should the foreign body dislodge.<sup>6</sup> For the second case, a 28-year-old male had reported visual disturbances and redness of his right eye for 4 weeks. He was initially treated for herpetic stromal keratitis due to predominant inferior stromal oedema, epithelial microcysts and moderate anterior chamber inflammation. However, after 3 months of treatment with topical anti-viral and anti-inflammatory eyedrops, an inferior graphite foreign body was noted in the inferior chamber angle. He had a history of trauma with a mechanical pencil 12 years before presentation. Surgical removal of the anterior chamber graphite foreign body resulted in resolution of corneal oedema, however endothelial cell density remained reduced.<sup>13</sup>

Our case was similar to the second case with delayed inflammation, corneal oedema, epithelial microcysts and endothelial damage noted years after the initial trauma from the mechanical pencil. Both cases had good response to topical anti-inflammatory agents and had resolution of corneal oedema after surgical removal of the anterior chamber foreign body. These cases show that anterior chamber graphite foreign bodies can remain dormant for years and can cause late-onset inflammation and corneal endothelial damage. We describe the longest retained anterior chamber graphite foreign body at 20 years, as compared to 4 months<sup>6</sup> and 12 years<sup>13</sup> in current literature. Persistent anterior chamber reaction and deposition on the endothelial surface was also noted by Gül et al., with a small residual graphite foreign body on the lens, with effective resolution of inflammation and foreign body particle with topical steroids.<sup>12</sup> Thus, we propose, that small pieces of retained graphite foreign body in the anterior chamber can deposit on the endothelial surface and cause inflammation that responds to topical steroid medication or surgical removal of the foreign body. Alternatively, anterior chamber graphite foreign bodies could have caused inflammation by mechanical trauma to the corneal endothelium due to its constant contact.

Ocular trauma caused by pencils are not uncommon in children.<sup>3</sup> Although generally considered as inert, removal of retained graphite foreign bodies is recommended, given that it can lead to delayed inflammation and corneal endothelial cell damage. In view of persistent corneal endothelial damage and the possible need for endothelial keratoplasty in the future, retained graphite foreign bodies should be removed at the earliest appropriate opportunity. As graphite foreign bodies may be hidden in the anterior chamber angle and may only result in ocular inflammation years after the initial insult, there should be a high suspicion for intraocular foreign bodies in cases of localized corneal oedema with endothelial damage. Childhood ocular injuries are often unwitnessed, unreported by the child, unsuspected by the parents, and not easily visible in a non-ophthalmic setting. Early suspicion, examination under anaesthesia and definitive early intervention can be sight saving in cases like these.

#### 4. Conclusion

Retained anterior chamber graphite foreign bodies can remain dormant for long periods after the initial trauma and can cause ocular inflammation and corneal endothelial damage years later.

#### Patient consent

The patient consented to publication of the case orally. This report does not contain any personal information that could lead to the identification of the patient.

#### Funding

No funding or grant support.

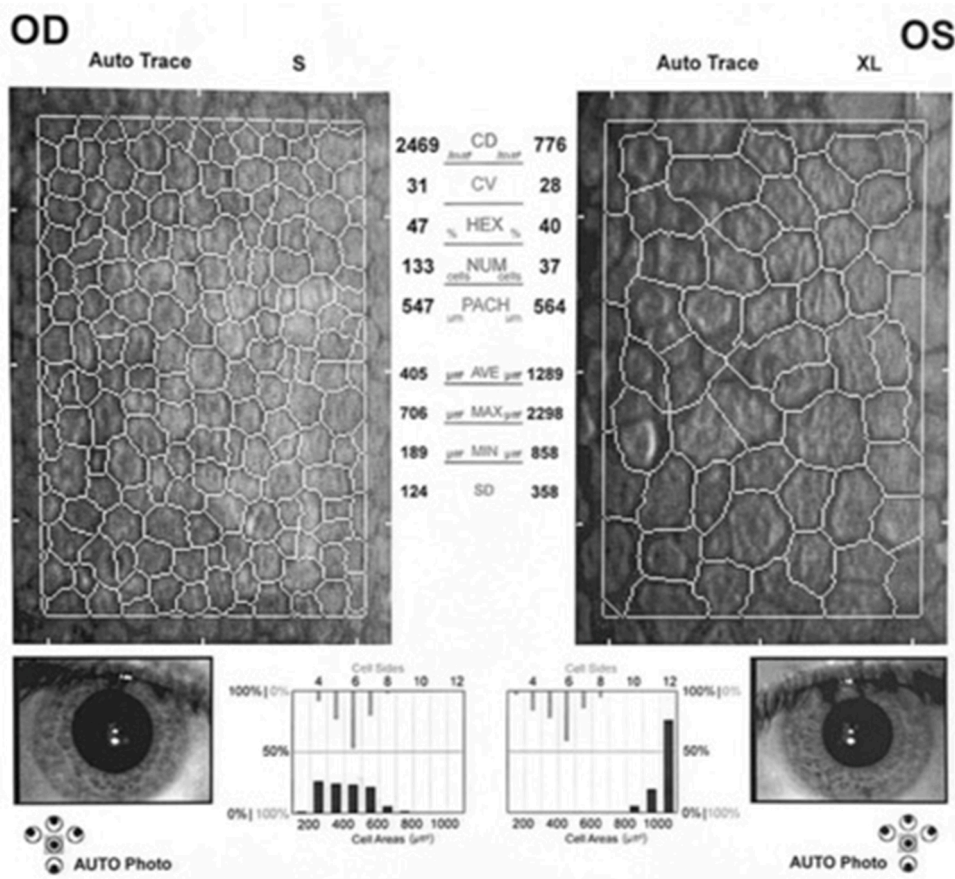


Fig. 7. [Endothelial cell count one month after removal of left intraocular graphite foreign body].

**Ethics approval**

Not applicable.

**Authorship**

All authors attest that they meet the current ICMJE criteria for Authorship. CA wrote the original draft. YTH, NGS and PS revised and edited the manuscript. All authors read and approved the final manuscript. All authors attest that they meet the current ICMJE criteria for authorship.

**Declaration of competing interest**

The authors; CA, YTH, NGS and PS declare that they have no competing interests.

**Acknowledgements**

None.

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