Intraocular Foreign Body: Case Report of Delayed Siderosis

Abdullah Al-Ani, MD/PhD Candidate [1,2] ; Kian Madjedi [3], MS, MD; Shellina Kherani RN, BScN[5] ; Natalia Figueiredo, MD [3]; Rajinder Nirwan, MD, FRCSC [3]; Andrzej Kulaga, MD, FRCPC [4]; Hendrik Louw, MD.; Andrew C. Crichton, MD, FRSCS[3] and Amin Kherani, MD, FRSCS [3,5]

[1]Biomedical Engineering Graduate Program, University of Calgary, Calgary, AB, Canada; [2]Leaders in Medicine Program, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada; [3]Department of Ophthalmology, Division of Surgery, University of Calgary, Calgary, AB, Canada; [4]Department of Pathology & Laboratory Medicine, University of Calgary, Calgary, AB, Canada; [5]Calgary Retina Consultants, Calgary, AB, Canada

Background

- Intraocular foreign bodies (IOFB) are common, representing approximately 15% of ocular trauma worldwide and resulting in a wide variety of intraocular pathologies [1,2].
- These injuries lead to various visual outcomes depending on the IOFB's composition, mechanism of injury, and location, among other factors.
- Though the composition of IOFBs can vary, most (~80%) are metallic, followed by glass and wood [3–5].
- Young males represent the majority of IOFB patients, and injuries are commonly sustained in a workplace setting.
- IOFB composition and ocular structures involved often dictate management approaches and clinical outcomes.
- Other factors have been reported in the literature to affect visual outcomes including time to removal, size and shape of IOFB, ocular structures affected and entry site.
- Canadian studies that investigate IOFB injuries in a national context are limited.

A Retrospective Chart Review

- A retrospective chart review of 28 cases managed by Dr. Amin Kherani was conducted to begin understanding IOFB injuries within a Canadian context.
- Primary variables of interest include IOFB composition, location, surgical approach, time to surgery, outcomes and complications.
- From this series, we highlight a unique case of siderosis detailing the clinical findings, retinal imaging, IOFB characteristics and surgical extraction.

Ocular siderosis

- The visual outcomes of IOFB patients are strongly associated with the various complications they develop[6].
- Retained iron containing IOFBs can cause ocular siderosis, a deposition of iron in ocular epithelial structures, including the lens epithelium, iris, ciliary bodies and the retinal pigment epithelium [11].
- This deposition exerts a cytotoxic effect, ultimately resulting in cataract formation, glaucoma, pupillary mydriasis, and retinal degeneration [2].
- We report the surgical removal of a 53-year-old metallic IOFB following significant vision loss and glaucoma in a case of delayed siderosis.

CASE REPORT

Delayed siderosis from a 53-year-old metallic IOFB

- 82-year-old male with a history of ocular injury. Referred for management of an IOFB, elevated intraocular pressure (IOP) and visual loss OD.
- 53 years prior, he felt something strike his right eye while hammering metal on metal. Vision was not affected after the incident.
- Three decades later, cataract surgery was performed with a good visual outcome for the subsequent 15 years.
- Ocular examination showed:
  - 20/200 OD and 20/20 OS.
  - IOP 37 OD and 22 OS
  - Superior penetrating corneal scar OD
  - Anterior uveitis OD
  - Hyperchromic heterochromia OD
  - Iris transillumination OD
  - PCIOL OU
  - Pigment changes on macula OD with a gray-white nodular elevated chorioretinal scar.
  - Encapsulated IOFB impacted within the inferotemporal retina and deeper layers.
  - Optic nerve cupping OD > OS

Imaging Studies

- Diagnostic fundus photograph, fluorescein angiogram, B-scan ultrasonography, and Optical Coherence Tomography (OCT) and CT Scan confirmed presence of an encapsulated IOFB embedded in inferior temporal retina.

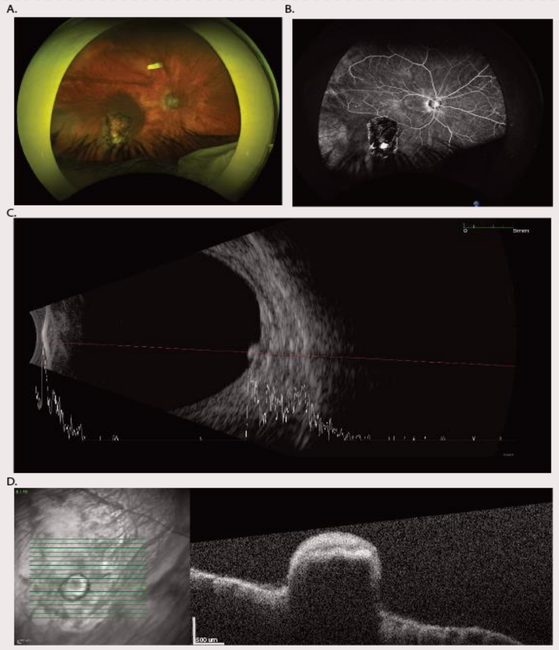

Figure 1. Colour fundus photograph; B) Venous phase fluorescein angiogram; C) B-scan ultrasonography D) OCT through IOFB.

Surgical removal of IOFB

- 23-gauge pars plana vitrectomy (PPV)
- Bent 23-gauge MVR blade
- End-gripping forceps
- Endolaser demarcation
- C3F8 gas exchange

Pathology

- Pathological evaluation confirmed 1.5 mm isolated IOFB, irregular, rusty, and yellowish/brown in colour.

Figure 2: A) The retrieved IOFB . B) IOFB is magnetic (sticks to a magnet)

Discussion

- Eight weeks post-op, OD BCVA 20/400, IOP of 11.
- Uveitis resolved, PCIOL stable, IOFB Impact site healed.
- To the best of our knowledge this is the first reported case of a chronic IOFB retained for **over five** decades prior to siderosis and surgical removal. Prior to this report, ocular siderosis was thought to occur within eight years of the ocular injury with retained iron-containing IOFBs [8].
- Decision to remove an IOFB in the posterior segment requires careful considerations of the risks and benefits of the procedure[7,8]. If the patient develops PVR, vitreous hemorrhage, or retinal detachment, PPV must be performed. Removal of an encapsulated chronic IOFB without clinical or electrophysiological evidence of siderosis remains controversial.
- If a decision is made to **not** remove a chronic posterior segment IOFB, regular assessment of visual acuity, IOP, fundus and ERG are crucial [10].
- ERG is especially important in retained IOFB cases as electrophysiological signs of siderosis may precede its classical clinical manifestations [11].

References

1. Adesanya, O. O. & Dawkins, D. M. Intraorbital wooden foreign body (IOFB): mimicking air on CT. Emerg. Radiol. 14, 45–49 (2007).
2. Loporchio, D. et al. Intraocular foreign bodies: A review. Surv. Ophthalmol. 61, 582–596 (2016).
3. Fulcher, T. P., Mcnab, A. A. & Sullivan, T. J. Clinical Features and Management of Intraorbital Foreign Bodies. Ophthalmology 109, (2002).
4. Zhang, Y., Zhang, M., Jiang, C. & Qiu, H. Y. Intraocular Foreign Bodies in China: Clinical Characteristics, Prognostic Factors, and Visual Outcomes in 1421 Eyes. Am. J. Ophthalmol. 152, 66–73.e1 (2011).
5. Woodcock, M. G., H Scott, R. A., Huntbach, J. & Kirkby, G. R. Mass and Shape as Factors in Intraocular Foreign Body Injuries. Ophthalmology 113, 2262–2269 (2006).
6. Ehlers, J. P. et al. Metallic Intraocular Foreign Bodies: Characteristics, Interventions, and Prognostic Factors for Visual Outcome and Globe Survival. Am. J. Ophthalmol. 146, 427–433.e2 (2008).
7. Kannan, N. B., Adenuga, O. O., Rajan, R. P. & Ramasamy, K. Management of Ocular Siderosis: Visual Outcome and Electroretinographic Changes. J. Ophthalmol. 2016, 1–5 (2016).
8. O'Duffy, D. & Salmon, J. F. Siderosis bulbi resulting from an intralenticular foreign body. Am. J. Ophthalmol. 127, 218–219 (1999).
9. Casini, G., Sartini, F., Loiudice, P., Benini, G. & Menchini, M. Ocular siderosis: a misdiagnosed cause of visual loss due to ferrous intraocular foreign bodies—epidemiology, pathogenesis, clinical signs, imaging and available treatment options. Doc. Ophthalmol. 142, 133–152 (2021).
10. Kuhn, F., Mester, V. & Morris, R. Intraocular Foreign Bodies. in Ocular Trauma : Principles and Practice (eds. Kuhn, F. & Pieramici, D. J.) (Thieme Medical Publishers, Incorporated, 2002).
11. Sahay, P. et al. Detection and monitoring of subclinical ocular siderosis using multifocal electroretinogram. Eye 33, 1547–1555 (2019).

Acknowledgements

- Calgary Retina Consultants (CRC) staff, Leslie Burns and Samantha Martin.
- Dr. Etienne Benard-Seguin and April Ingram
- 7 years of funding support from CIHR, ACHRI, LiM, BMEG, CSM and Brain Canada.