An unexpected finding: metal or glass foreign body?

Dr Han Zhang, MBCHB

Case report: FB with unclear route of entry

- 56-year-old man with incidental left ethmoidal air cell metallic foreign body. Unclear route of entry.
- Admitted under ophthalmology with perforated microbial keratitis. Discussed with ENT service and imaging reviewed by consultant.

Relevant Past medical history

Patient has a history of schizophrenia, on review of mental health notes there were no reports of self insertion of any foreign body (FB) into the eye. However there was a report of a previous ophthalmology operation following an assault in 1992

Ophthalmology letter 1992

- Seen by Ophthalmology registrar at Wellington Hospital
- Left eyelid laceration following assault with broken glass
- Repaired under GA
- Piece of glass found in wound

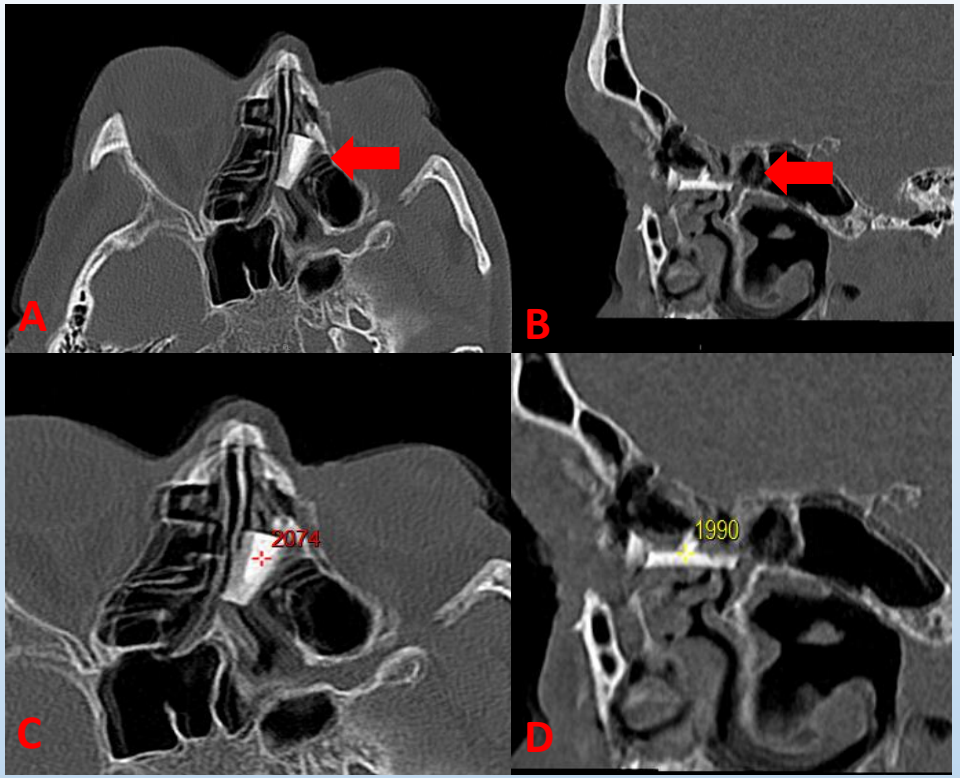

Figure 1. Foreign bodies (arrows) in the left ethmoidal air cell on axial (**A,C**) and sagittal (**B,D**) CT scans with the attenuation values ranged from 1990 (**D**) to 2074 (**C**).

Findings: Appearance of FBs on CT

- The attenuation value of objects on CT can be used to help determine the material (Figure 1C and 1D).
- All glass is radiopaque. The measurement for the density of an object on CT can be extrapolated from it's attenuation value which is measured in HU (Hounsfield Units). Essentially the denser the object the higher the HU.
- Studies [1,2] that have measured attenuation levels for glass report levels ranging from 500-1900 HU to at least 2000 HU.

ENT Radiology MDM

"On the imaging it was noted that there were three parts to this object and some additional small tiny metal pieces next to the eyeball itself. The consensus was that no surgical management of this is necessary as it is not causing any symptoms but we strongly recommend that **the patient should never have an MRI scan due to this foreign being metallic**. "

Discussion

The radiology report says the "Left ethmoid air cells demonstrate a metallic density structure". However if you measure the attenuation value of the foreign body (1990 HU, 2074 HU) it's density is more in keeping with glass than metal, which is further reinforced by the positive clinical history for glass foreign bodies found in the region.

Without definitive surgery to remove the foreign body and confirm that it is not metal, the MDM conclusion is reasonable. However an MRI should not be absolutely contraindicated and if at some point an MRI is required, further review of the imaging would be indicated.

This interesting case of an unexpected foreign body raises a good learning point that not everything that appears 'bright' on CT is not metal and the use of objective measures such as the attenuation of the object can aid in the characterization of foreign bodies, which could be further enhanced by its 3D quantitative measurements.

References:

1. Carneiro BC, Cruz IA, Chemin RN, et al. Multimodality Imaging of Foreign Bodies: New Insights into Old Challenges. RadioGraphics [Internet]. 2020 [cited 2022 May]; 40:1965-1986. Available at https://pubs.rsna.org/doi/epdf/10.1148/rg.2020200061
2. Jarraya M, Hayashi D, de Villiers RV, et al. Multimodality Imaging of Foreign Bodies of the Musculoskeletal System. AJR [Internet]. 2014 July [cited 2022 May]; 203 (1): W92-W102. Available at https://www.ajronline.org/doi/full/10.2214/AJR.13.11743?mobileUi=0