Signature: © Pol J Radiol, 2010; 75(3): 55-60

Polish Journal of Radiology
www.PolRadiol.com
CASE REPORT

Received: 2009.11.04
Accepted: 2010.06.12

Itraorbital organic foreign body – radiological methods in diagnosis – case report

Agnieszka Shein-Filipowicz[1], Radosław Kaźmierczak[1], Bogusław Kostkiewicz[2], Joanna Sempińska-Szewczyk[1], Artur Sankowski[3]

[1] Department of Ophthalmology CSK MSWiA, Warsaw, Poland
[2] Department of Neurosurgery CSK MSWiA, Warsaw, Poland
[3] Department of Radiology, CSK MSWiA, Warsaw, Poland

Author's address: Radosław Kaźmierczak, Department of Ophthalmology CSK MSWiA, Wołoska 137 Str., Warsaw, Poland, e-mail: radekkazmierczak@interia.pl

Summary

Intraorbital foreign bodies, especially non-metallic ones, remain an important diagnostic and therapeutic problem. Organic foreign bodies contain large quantities of bacterial flora contributing to rapid onset of inflammation which may promptly damage the optic nerve. Further progression of inflammation may involve the structures of central nervous system. US examination is a preliminary, commonly available diagnostic method, although it is not always successful in visualizing foreign bodies. CT scan remains a standard investigation used to visualize intraorbital foreign bodies, although with organic foreign bodies, its results may be inconclusive. MRI allows for visualization and precise identification of foreign bodies, which is vital for surgery. The issue of intraorbital foreign bodies is an interdisciplinary problem requiring the co-operation between ophthalmologists and neurosurgeons.

Key words: foerign body • wood • orbit • computed tomography • magnetic resonance imaging

PDF file: http://www.polradiol.com/fulltxt.php?ICID=881151

Aim of Report

The aim of this report is to present diagnostic management and treatment of a patient with intraorbital foreign body.

Case Report

In May 2008, a 32-year-old man reported to the emergency unit of the Department of Ophthalmology at CSK MSWiA hospital in Warsaw. The man presented with growing edema of orbital tissues and left eye exophthalmos. These symptoms co-existed with impaired vision and pain in left eye as well as accumulation of considerable amounts of puss in conjunctival sac of left eye.

Medical history revealed that the patient suffered an injury of left orbital area in the preceding week and had a penetrating wound of lower eyelid as a consequence of falling on wooden branches lying on the ground. The patient reported to his regional hospital, where he was seen by a surgeon. Cranial x-ray did not reveal any pathological lesions in and around left orbit. Having received a proper wound dressing the patient was discharged from hospital with recommended check-up visit at surgical outpatient clinic.

Two days after the injury the patient attended surgical check-up visit, complaining of considerable exacerbation of vision in the left eye (he reported that he could only see as much as a hand in front of his eye) and growing pain in the orbital area. Systemic antibiotic therapy was started. Despite this treatment, further vision impairment and severe pain in and around left eye persisted for two more days. Apart from these symptoms, patient's general condition deteriorated and he had fever. Persistent vision impairment, progressing edema of left orbital tissues and fever up to 39.5°C made the patient seek medical attention at emergency unit of the Department of Ophthalmology at CSK MSWiA hospital in Warsaw.

On the day of admission patient's general condition was moderate and he had fever. Physical examination revealed

Figure 1. The left orbit image with lower lid line wound.

Figure 2. The exophthalmos left orbit image with conjuctivial oedema and injection.

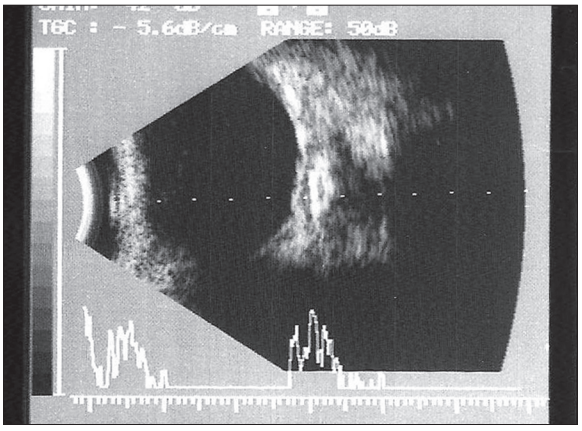

Figure 3. B-scan / T5 ultrasound of the left eye: Hyperechogenic structure behind the eyeball.

best visual acuities was 20/20 in the right eye; Hand movement and inability to read Snellen chart with left eye. We did not observe any deviations in the examination of lids, orbit and anterior segment of right eye. Dominant features in the image of left eye included exophthalmus and considerable inflammatory infiltration in the orbit, which was hard on palpation. Furthermore, at the borderline of lower eyelid and cheek, there was a suppurating entrance of wound, leading in the upper temporal direction, possibly deeper into lateral intraorbital space (Figure 1).

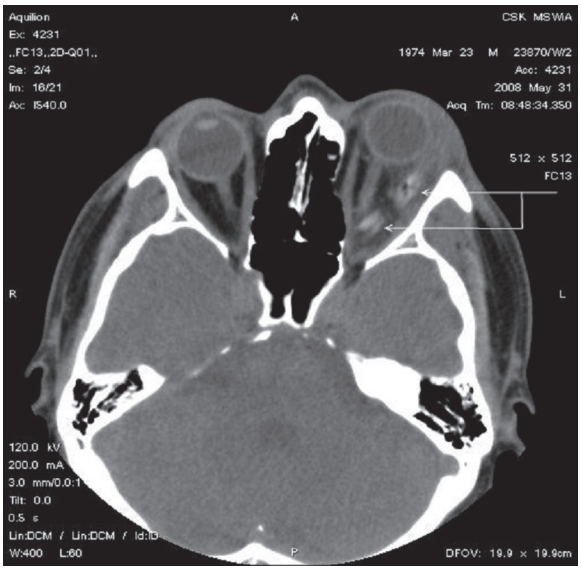

Figure 4. Horizontal plain computer tomography of orbits: suspected foreign body in left orbit.

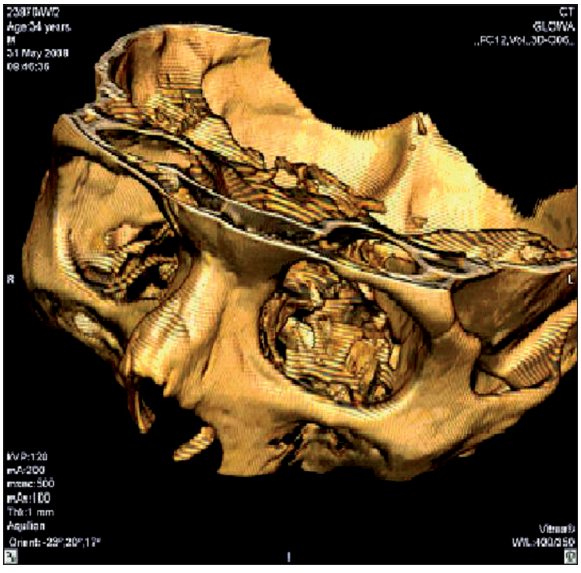

Figure 5. Orbits 3D reconstruction does not reveal any foreign bodies in the left orbit.

Eyeball motility was markedly restricted in all directions. Left eyelids failed to close completely and there was a considerable ciliary and coniunctival injection and conjunctival edema with its fold protruding beyond lid slit and considerable amounts of puss in conjunctival sac as well as on the eyelashes (Figure 2). The cornea was clear, anterior chamber was of medium depth, without exudates, the pupil was round, of medium width, with sluggish direct and normal indirect papillary response to light. Intraocular pressure was 15 mmHg in the right eye and 23 mmHg in the left eye.

The findings of indirect ophthalmoscopy with Volk lens:
- right eye: normal image of the eye fundus,
- left eye: pale optic disc, with clear-cut borders, folded macular retina, otherwise, the picture of eye fundus was normal.

Figure 6. Horizontal plain magnetic resonance of orbits: left orbit foreign body.

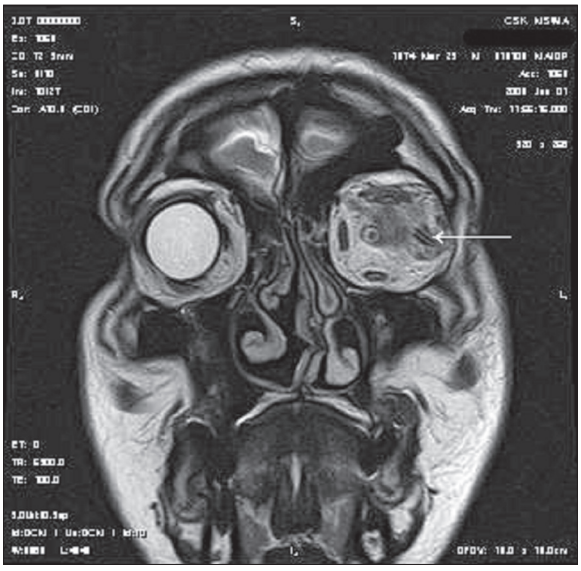

Figure 7. Orbital magnetic resonance: a frontal plain image showing left orbit foreign body.

B-scan with overlapping A-scan US image of the left orbit and left eye indicated possible intraorbital foreign body (Figure 3).

Diagnostic imaging was extended with orbit-targeted CT scan of the head. Horizontal plain CT scans of left orbit suggested the presence of intraorbital foreign body (Figure 4), which was not confirmed in 3D reconstruction of the orbits (Figure 5). To verify these findings the patient underwent MRI examination of the orbits (Figures 6, 7).

Following the detection of inorganic foreign body in left orbit, systemic broad-spectrum antibiotic therapy was started with the following agents: ceftriaxone 2×1000 mg i.v., clindamycin 2×600 mg i.v. and fluconazole 1×200 mg i.v. Topical treatment was also introduced with levofloxacine drops 5 times a day and gentamycin ointment twice

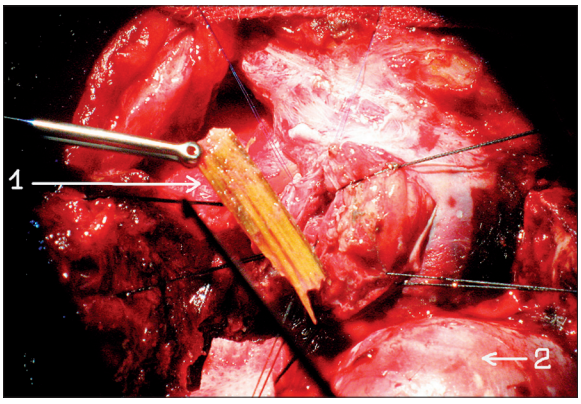

Figure 8. Left orbit intrasurgery view: 1. Splinter no. 1 2. Pole of brain's left frontal lobe.

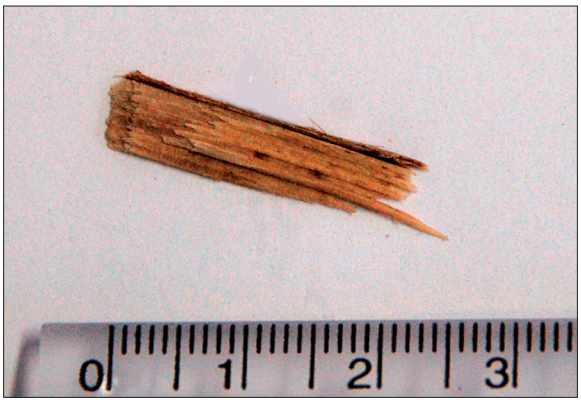

Figure 9. Left orbit foreign body: splinter no. 1.

daily into the conjunctival sac of left eye. This therapy resulted in the improvement of patient's general condition and normal body temperature.

After consultation with neurosurgeon, the patient was qualified for urgent surgical removal of intraorbital foreign body.

Preoperative management included the identification of patient's blood type, blood count, ionogram, coagulogram, urea levels, creatinine levels, CRP and the preparation of two units of packed red blood cells pre-tested for serological compatibility.

The patient in good general condition and without fever was transferred to the Department of Neurosurgery at CSK MSWiA hospital in Warsaw, where he was informed of necessary surgical treatment and possible complications. The removal of foreign body was possible using the access through left fronto-orbito-zygomatic craniotomy.

During surgery, two oblong wooden foreign bodies were removed from the left orbit. Their sizes were 27×5 mm (Figures 8, 9) and 45×5 mm (Figures 10, 11). Distal ends of these foreign bodies pushed against muscular cone and left optic nerve. Purulent secretion was found in the orbit. Due to this fact as well as considerable tightness of intraorbital structures bone flap was not restored to its anatomical location; instead, it was temporarily sewed in the subcutaneous pocket of left iliac fossa.

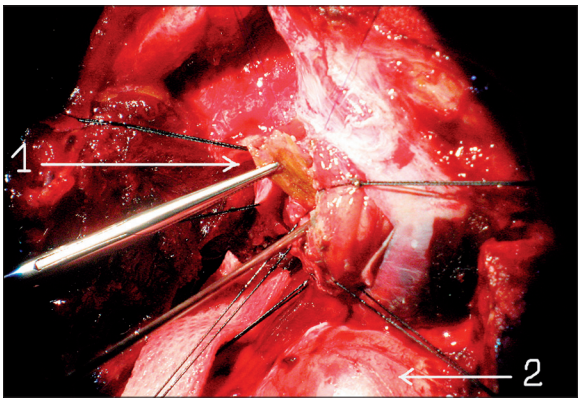

Figure 10. Left orbit intrasurgery view: 1. Splinter no. 2 2. Pole of brain's left frontal lobe.

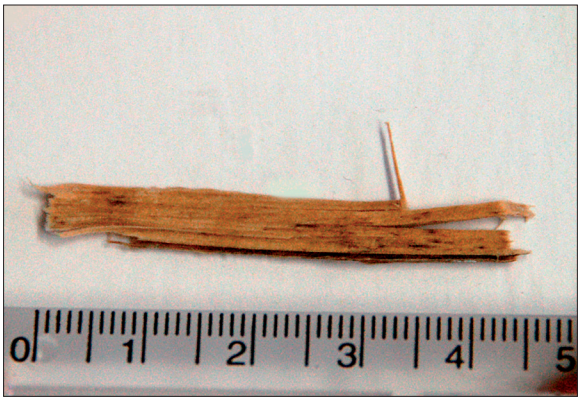

Figure 11. Left orbit foreign body: splinter no. 2.

On post-operative day 2, check-up ophthalmological examination revealed:
- right eye status as on the day of admission;
- left eye visual acuity – distance vision 2/50 with forced head position and inability to read Snellen chart for near distance. Normal eyeball motility in all directions. Sluggish direct and normal indirect papillary response to light in the left eye. Anterior segment of the eye with minor superficial injection, lens with slight posterior subcapsular opacification.

Indirect ophthalmoscopy with the use of Volk lens revealed:
- right eye: normal picture of eye fundus;
- left eye: optic disc with clear-cut border at fundus level, light pink in its medial part and pale grey in its lateral parts, absence of macular reflex, normal blood vessels and other eye fundus structures.

Six months later the patient reported for surgical restoration of bone flap into its anatomical location. Good functional and cosmetic effects were obtained (Figure 12).

On check-up examination 9 months after the injury, left eye distance visual acuity was 0.1, no injection was found in left eye ball, otherwise, the condition of eyes was just as that on post-operative check-up examination. Kinetic perimetry showed narrowed visual field of left eye with partially retained macular vision (Figure 13).

Figure 12. Cosmetic effect after the restoration of the removed bone flap to the anatomical location.

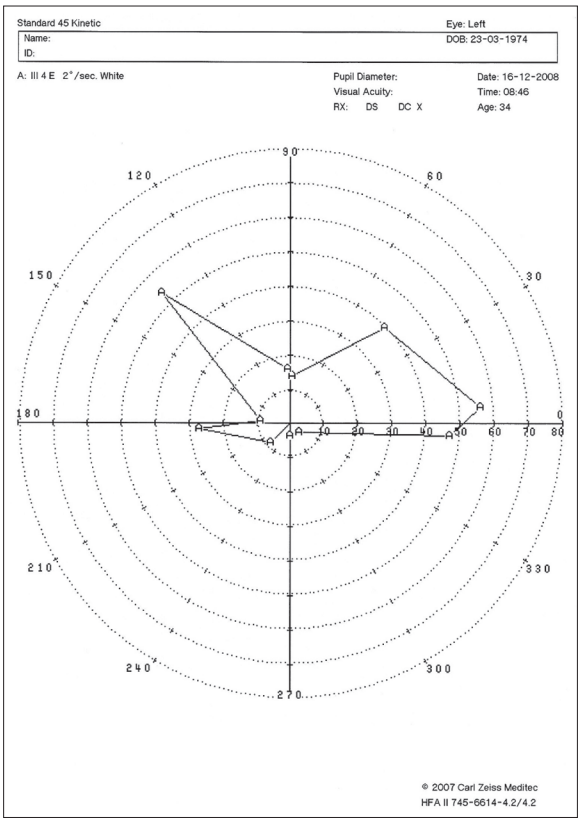

Figure 13. Visual field left eye.

Discussion

Orbital foreign bodies remain a serious diagnostic problem, despite swift development of diagnostic imaging techniques. Many patients with injuries of orbital area report to medical centers which do not have CT or MRI equipment at their disposal. Non-metallic orbital foreign body will not be detected in routine x-ray. Wood accounts for approx. 6% of intraorbital foreign bodies [1]. Penetrating injury of the orbit is a serious life-threatening condition, as piercing foreign body passing through orbital fissure may damage the brain and cavernous sinus. These types of injuries are associated with 25% mortality and therefore, every wound within orbital area requires thorough diagnostic examination to exclude intraorbital foreign body [2].

Apart from patient's history, the symptoms suggestive of intraorbital foreign body often include eyeball dislocation, limited eye motility, double vision, hematoma and inflammation of orbital tissues [3].

Diagnostic difficulties are related particularly to those foreign bodies which penetrate the orbit with relatively small wound [1,4,5]. In such cases, wound entrance may be hardly visible [6], while foreign body is not easily detected on palpation, especially when surrounding tissues are swollen.

Leaving a non-metallic foreign body, especially organic one, in the orbit with its rich bacterial flora leads to quick development of inflammation of orbital tissues, abscesses, consequent intraorbital tightness resulting in the damage of optic nerve and loss of sight. It is also a life-threatening condition due to close vicinity of central nervous system [2,4,5]. The most important issue is prompt diagnosis [1,5,7] and appropriate treatment.

Diagnostic imaging may confirm the presence of intraorbital foreign bodies, define their number and detect their precise location against other anatomical structures as well as visualize the consequences of their penetration, the damage of eyeball, orbital walls and oculomotor muscles.

Ultrasound being a non-invasive and commonly available method may be a preliminary examination. Unfortunately, it is not always capable of visualizing a foreign body and its location is not precise. On the other hand, US may detect possible complication of foreign body penetration such as intraocular or intraorbital hematoma, vitreous exudate and retinal detachment.

Nowadays, computed tomography is a standard method used for the identification of intraorbital foreign bodies. It is highly effective in depicting foreign bodies of considerable density such as metallic foreign bodies, glass or stone, but it may fail to detect organic foreign bodies [8,9]. Wood is characterized by varying density in CT scan, depending on its water content, hardness of particular wood type and the time it remains in tissues [10].

Dry wood is hypodense and resembles gas in CT scan (Figure 4), which is often found in orbital tissues after injuries [1,11–13] with coexistent sinus damage. Fresh wood also poses a diagnostic problem, as it is isodense with fat [8,11,14]. Wood remaining in the orbit for a long time (several months) is also isodense as a result of its increased water content as well as being surrounded by inflammatory granulation [8].

Magnetic resonance imaging is the most effective investigation used in the diagnosis of intraocular and intraorbital non-metallic foreign bodies [14]. Therefore, MRI should be a primary investigation in all cases where non-metallic foreign body is suspected within orbital structures [2,8,15–18]. Precise detection of interrelations between foreign body and the inside of the orbit is facilitative or even necessary to start neurosurgical treatment.

MRI, however, remains less available and more costly than CT and it is not always faultless, as it was in this case (detecting one organic foreign body instead of two) (Figures 6, 7).

Surgical treatment of both intraorbital foreign bodies and itraorbital tumors lies in the competence of various specialists including neurosurgeons, laryngologists, oral and maxillofacial surgeons and plastic surgeons [19]. Intraorbital foreign bodies and tumors are most commonly diagnosed by ophthalmologists, but they account for considerable proportion of neurosurgical procedures. The diagnosis of intraorbital foreign body requires urgent neurosurgical intervention in order to prevent the development of inflammatory complications and to save patient's life. Surgical treatment may be performed with various access techniques including fronto-temporal-subtemporal craniotomy, fronto-orbito-temporal-zygomatic craniotomy, fronto-orbital craniotomy, frontal craniotomy with superior orbitectomy, lateral orbitotomy, anterior orbitotomy, osteoplastic supraorbital orbitotomy, maxillotomy, lateral rhinotomy [19–22].

In the case reported here, fronto-orbito-zygomatic craniotomy was chosen taking into account the location of foreign body. This approach allowed for best visualization of the structures of lateral part of the orbit, including optic canal [20]. On intraoperative examination it turned out that there were two splinters in the left orbit, located close to each other (Figures 8–11), while only one of them was detected in MRI (Figures 6, 7).

The access through fronto-orbito-zygomatic craniotomy is safe and allows for surgical treatment of foreign bodies and tumors irrespective of their location relative to optic nerve, oculomotor muscles, blood vessels and other intraorbital nerves [22]. Fronto-orbito-zygomatic craniotomy has good cosmetic effect, which is acceptable for patients (Figure 12).

Conclusions

1. Magnetic resonance imaging is a primary examination in patients with suspected non-metallic foreign body within orbital structures.
2. Wood as intraorbital organic foreign body should be considered a life-threatening condition.
3. Despite absence of wound entrance or its small size in the lids, one should take into account possible presence of intraorbital foreign body.
4. It is only prompt surgical intervention that allows for the maintenance of visual function.
5. Unfortunately, despite characteristic clinical symptoms, patients often report to specialist ophthalmologic and neurosurgical centers rather late.
6. Extending the co-operation between a neurosurgeon and an ophthalmologist improves the effectiveness of surgical treatment of pathological conditions within the orbit.
7. Fronto-orbito-zygomatic craniotomy has very good cosmetic effect and is associated with minimum operating risk.

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