Case report/Kazuistyka

Intraorbital foreign bodies – 5 own cases and review of literature

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A B S T R A C T

Five patients were surgically treated for intraorbital foreign body: a 14-year-old girl had a door glass splinter, a 23-year-old man a metallic foreign body – gunshot pellet, a 55-year-old man a splinter from a metallic bar, a 48-year-old patient the splinters of circular saw and 61-year-old man with shot. Two foreign bodies were removed using the Krönlein-Reese-Berk lateral orbitotomy, two others by Sewell medial orbitotomy and one with superior orbitotomy of Dandy-Naffziger. Radiographs and CT scans were used to identify and localize intraorbital foreign bodies. In one case we found coexistence foreign body (shot) and tumor – inflammation pseudotumor of the orbita. It is possible, that in this case long-time occupy foreign body in the orbita was a cause of that tumor. All foreign bodies were successfully removed, and postoperative course was uneventful. The Krönlein-Reese-Berk orbitotomy provides a satisfactory access to the lateral and posterior orbit, which is of particular importance in the case of a deeply penetrating foreign body (metallic or glass). Surgical removal of intraorbital foreign bodies is a classic example of an interdisciplinary therapeutic approach. Best outcome is usually a result of a team of an ophthamologist, ENT surgeon, maxillary surgeon and possibly also neurosurgeon performing the operation.

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Introduction

The most common cause of head and neck anatomical structures penetration by a foreign body are traffic accidents, chance shots from hunting rifles, and accidents at work, especially in metalworking [1, 2]. Orbital bony frame and soft tissues constitute natural protection against foreign body penetration of the cranium. However, this protection only works if orbital structures can contain the impact force [3].
Statistical analyses have shown, that intraorbital foreign bodies penetrating the area of the upper eyelid are more likely to damage the structures of the anterior cranial fossa than it is in the case of penetrating trauma to the lower eyelid [4]. Penetrating injury to the orbit necessitates a complex diagnostic process. Conventional X-ray films may help visualise radiopaque foreign bodies, e.g. metal filings or gunshot pellet [5]. Ultrasonography can be useful, but does not precisely determine foreign body location, and especially within the posterior portion of the orbit [6]. Angiography is of essential importance when vessel damage is suspected. Accurate foreign body localization is possible with CT or magnetic resonance imaging; the latter in the case of a non-metallic foreign body [7, 8]. CT is undoubtedly the most useful accessory investigation; it precisely defines the location of the foreign body, its topographic relationships as well as the presence of other, e.g. intracranial injuries [9]. Ophthalmic examination must be performed immediately following orbital trauma, and before and after each surgical intervention [10].

The treatment of choice consists of foreign body removal procedure focused on the preservation of oculomotor muscles, eyeball, and the optic nerve functions [11]. Of course, preservation of function depends on foreign body location, size and the type as well as on the time elapsing after injury. At best, surgical intervention should be undertaken before the entry wound and canal have healed. Delayed surgery hinders identification and removal of the foreign body [12].

Case reports

Case No. 1

Through inattention and lack of adequate supervision at her father’s glazier workshop, a 14-year-old girl sustained a craniofacial injury from hitting against a glass door, which resulted in foreign body (glass splinter) penetration of the right orbit. She was admitted to the ENT Department on the day of injury; physical examination revealed oedema of the right upper and lower eyelids. An ophthalmic examination demonstrated blindness of the eye. Posteroanterior and right lateral radiographs of the right orbit showed a shadow of 2 cm x 0.8 cm in size consistent with a foreign body (Fig. 1).

The orbit was then scanned using 5 mm coronal and sagittal CT planes. A foreign body was visualised penetrating the right eyeball, slightly oblique at the periphery and reaching the posterior orbital wall (Figs. 2 and 3). A team of ENT and ophthalmic surgeons performed the Krönlein-Reese-Berk lateral orbitotomy. The lateral bony wall of the orbit was moved aside. Following the dissection of orbital soft tissues, a foreign body, penetrating the posterior pole of the eyeball, was identified and removed. Eyeball wound was surgically managed, and the orbital wall fragment was repositioned. Postoperative course was uneventful. The patient was discharged from hospital on postoperative day 7 and asked to come in for follow-up in five days after discharge. The visual acuity after the operation was the same than before it – the eye was blind.

Fig. 1 – Case No. 1. A radiograph of the right orbit – foreign body is visible in the superior eyeball

Case No. 2

While cleaning a hunting rifle, a 23-year-old professional hunter accidentally pulled on the trigger and gunshot pellet was released towards his left orbit. The consulting
ophthalmologist found a full-thickness corneal and scleral wound in the left eyeball and also iris, ciliary and vitreous body prolapse, intraocular haemorrhage, oedema of the left upper and lower eyelids, post-traumatic cataract, and blindness. The patient was referred to the ENT Department for sinus X-ray (Fig. 4) and orbital CT (Fig. 5). Metallic material was detected in the lateral portion of the left orbit, half-way through its height, within the lateral rectus. The entry wound was localized in the inferolateral quadrant of the left orbit. A team of ENT and ophthalmic surgeons performed the Krönlein-Reese-Berk lateral orbitotomy. The lateral bony wall of the orbit was moved aside. Following the dissection of orbital soft tissues, gunshot pellet was identified and removed. Eyeball wound was surgically managed, and the orbital wall fragment was repositioned. The patient was discharged from hospital and asked to come in for follow-up in five days. The visual acuity did not change after the operation – the eye was blind.

Case No. 3

On cutting a metallic bar in a factory hall with no face shield, a 55-year-old man sustained a splinter injury to the right orbit. The patient underwent ophthalmic examination on arrival; despite the trauma vision remained unchanged; visual acuity in the right eye was 5.0/8.0.

Noncontrast CT was performed with a slice thickness of 2 mm and secondary reconstruction. A metallic foreign body of 4 mm x 4 mm in size was identified in the right orbit. The object was located outside the eyeball at 12 o’clock position, slightly over the superior rectus and beneath the orbital roof, and at 14 mm from the anterior wall of the frontal bone. The structures of the right and left eyeballs and the left orbit appeared normal (Figs. 6 and 7).

The patient was operated on in the ENT Department using the Dandy-Naffziger superior orbitotomy. A metallic splint was localized and removed (Fig. 8.). A rubber drain was positioned in the orbit. Postoperative course was uneventful, and vision remained unchanged. The visual acuity 14 days postoperatively improved to 5.0/6.0.

Case No. 4

A 48-year-old patient, when operating a circular saw at home, cutting metal pipe, got injured in his left eye socket, as the
splinters of circular saw, having the size of 2 and 14 mm where driven into left eye socket (Fig. 9). The patient was admitted to ENT Department, where after performance of CT he was qualified for surgical treatment. Medial orbitotomy by Sewell was performed and splinters got removed. The patient’s sight after the procedure was normal.

Case No. 5

A 61-years-old patient admitted to the Clinic due to a tumour and a foreign body in the right eye socket. The right eye has been blind after injury of the eye socket (gunshot wound), which occurred 25 years before. Since the injury the patient has no light perception in the right eye. So far, the patient refused to agree for removing the foreign body from his eye socket, whereas the tumour in eye socket was
diagnosed three months before admission (Fig. 10). Aspiration fine-needle biopsy has been performed – ‘the cytology picture is that of a benign lesion’. Medial orbitotomy has been performed, with the removal of the entire tumour and evacuation of the foreign body from the eye socket. Outcome of examination of the post-surgery specimen: inflammatory pseudo-tumour of the eye socket. After the operation the eye was blind.

**Discussion**

Penetration wounds of the orbit constitute a complex therapeutic problem necessitating an interdisciplinary approach. A multi-disciplinary surgical team usually consists of an ophthalmologist, maxillary surgeon and neurosurgeon. Inadequate orbital wound management on patient arrival, and negligence to perform imaging studies like CT typically result in foreign body retention. It should be emphasized that even a tiny foreign body retained within the structures of the orbit can cause immediate or delayed complications including chronic orbital inflammation, osteomyelitis, thrombotic vasculitis, and diffuse infections in the form of septicopyaemia [13].

Literature reports recommend surgical removal of each and every foreign body of organic origin. Fulcher emphasized that, in case intraorbital complications should develop, inorganic substances should be removed [14]. Wylegala followed-up a patient with inorganic foreign body retention whose visual acuity was 0.7 [15].

The diagnostic process of intraorbital foreign bodies should include history taking, physical examination, and a variety of plain radiograph projections. Of crucial importance are also CT and MRI scans, which help determine foreign body location and its topographic relationships with neighboring structures (e.g. eyeball, and optic nerve) [16]. Ophthalmic examination, including visual acuity assessment, must be performed immediately following orbital trauma, and before and after each surgical intervention [17].

Complications may develop depending on the entry wound and canal, sharpness of foreign body edge, retention period, and impact force [18]. The optic, ocular motor, and abducent nerves, the eyeball and retinal artery can be damaged. Thus, foreign body removal is always strongly recommended [19].

The authors also recommend accurate assessment of the extent of traumatic injury to the orbit; CT should be performed before any elective surgery [20]. Penetrating trauma of the orbit carries a risk of damage to the structures of the anterior cranial fossa [4].

The Krönlein-Reese-Berk orbitotomy provides a satisfactory access to the lateral and posterior orbit, which is of particular importance in the case of a deeply penetrating foreign body (metallic or glass). Surgical removal of intraorbital foreign bodies is a classic example of an interdisciplinary therapeutic approach. Best outcome is usually a result of a team of an ophthalmologist, ENT surgeon, maxillary surgeon and possibly also neurosurgeon performing the operation.

**Authors’ contributions/Wkład autorów**

According to order.

**Conflict of interest/Konflikt interesu**

None declared.

**REFERENCES/PIŚMIENICTWO**


