Abstract  Orbitocranial injuries caused by a wooden foreign body are rarely encountered. We present a 17-year-old boy who sustained an intracerebral injury from a wooden foreign body via the transorbital route. Almost all neuro-ophthalmological signs were present due to penetration of the material into the optic canal and superior orbital fissure. There was a minute laceration on the upper eyelid, whereas the eye bulb was macroscopically intact. The wooden foreign body (6.5 cm in length) was removed via the upper eyelid. The diagnostic and therapeutic modalities of intracranial injuries caused by a wooden foreign body through the transorbital route are discussed in this paper.

Key words  Optic canal; orbitocranial penetrating injury; superior orbital fissure; wooden foreign body

Introduction  Intraorbital injuries caused by foreign bodies are encountered today due to the high number of traffic accidents. These injuries can involve a variety of materials: metal, glass, but also wood. Intraorbital wooden penetrations may lead to ocular damage as well as bone fractures, or even intracranial injuries. It may be hard to detect intraorbital wooden material using plain radiographs, computer tomography (CT), and magnetic resonance (MR) imaging. Herein, we describe a patient who was injured by a wooden foreign body penetrating into the intracranial cavity through the upper eyelid, the superior orbital fissure (SOF), and the optic channel.

Case report  A 17-year-old boy sustained a vehicle accident and was evaluated in the emergency unit. Neurological examination showed that the patient was fully conscious and at the Glasgow Coma Scale
Fig. 1. (a) CT demonstrating the hypodense line of the foreign body, which is similar to that of air, extending from the right orbit to the right petrous apex. (b) MR image revealing the hypointensity of the foreign body extending through the superior orbital fissure from the right ocular bulb to the lateral cavernous sinus.

235x545 (GCS) of 15. He had a 0.5-cm skin laceration on the right upper eyelid with ptosis. The right pupil was dilated with absent light reflex. He suffered ophthalmoplegia and visual loss in the right eye. Plain radiographs were unremarkable. On CT, a thin trajectory, which was consistent with air density, was observed extending from the anterior right orbit to the petrous apex (Figure 1a). On MR imaging, the right orbit was found protruded together with the increased mass of retrobulbar fat planes and muscles. Intensity reduction, appearing as signal void in all sequences, was observed throughout the line extending through the SOF from the posteromedial part of the globe to the lateral part of the cavernous sinus and was associated with exophthalmus (Figure 1b). Digital subtraction angiogram was performed in order to delineate the possible relationship with vascular structures, particularly the cavernous sinus and the carotid artery. No significant vascularization was found along the hypodense trace.

The patient was operated upon under general anesthesia. A 1-cm incision centered on the laceration scar was made on the right upper eyelid. Meticulous dissection allowed us to reach the foreign body at the deeper planes and wooden material (6.5 cm in length) was pulled out with forceps. No significant hemorrhage or CSF leak was noted. Ophthalmoplegia and visual loss remained unchanged on follow-up.

Discussion Intracranial penetration by a wooden foreign body via the transorbital route is rarely encountered. It may cause panophthalmitis, CSF fistula, and brain abscess complications as well as injuries due to direct impaction. Therefore, it is crucial to make a diagnosis at an early stage.2,3,7,8 Wood can hardly be detected on plain X-rays or ultrasound. CT is quite helpful if any intraorbital foreign body is metallic-stained or if a granuloma has developed around it, or if 48 hours have elapsed, which is enough time for the body to reabsorb the previously oozed fluid around the material. Contrarily, some authors believe that CT is not as helpful as expected in detecting wooden material, particularly if the material is dry. The density of wood is almost the same as that of intracranial and orbital soft tissue; in addition, it is hard to discriminate it from isodense fat tissue. Furthermore, it may have the same density
of air and thereby resemble air of acute stage. Therefore, CT should be supplemented with MR imaging for the diagnosis.\textsuperscript{3,5,6} In our case, the wooden object was observed in the form of an air-density line extending from the orbit to the intracranial compartment. MR images were not found superior to CT in distinguishing it from the air, since it had the same intensity as air on MR. This image was thought to be of wooden origin for it appeared hypodense on CT and hypointense on MR images with keen borders along a straight line, preserving its original size and shape on CT even two days following the trauma.

If the wooden material is long enough and the tip is pointed, it can easily penetrate through a small entry hole to the deeper planes of the orbit and even into the intracranial cavity.\textsuperscript{4} The globe can escape from being penetrated due to the scleral resistance and global displacement. This penetration can be via the orbital roof, showing up with fracture images.\textsuperscript{1,9} However, the optic foramen or SOF may permit this penetration as well, without any bony violation or visible fractures on orbital X-rays. In our case, the wooden material was found to have penetrated to a plane between the globe and the orbital roof through a small entry point which was hardly visible on the upper eyelid and extending to the SOF and optic canal and ultimately reaching the lateral part of the cavernous sinus. The distal part was already embedded in the orbit that was invisible from outside.

The SOF is a small, but functionally very important area just lateral to the optic canal. It has a neural component formed by the oculomotor, trochlear, ophthalmic, and abducens nerves and branches of the carotid sympathetic plexus plus a venous component formed by the superior and inferior ophthalmic veins.\textsuperscript{10} Penetration via the SOF may cause injuries to CN\textsubscript{3,4,5,6}, and/or caroticocavernous fistula.\textsuperscript{11} Injuries to these cranial nerves, as in our case, may cause visual loss, ptosis, and total ophthalmoplegia.

In cases like ours, an extradural approach to the superior orbital fissure by means of pterional craniotomy can be an option at operation.\textsuperscript{10} We, however, preferred to pull the material out because its smooth edges were not in contact with vascular structures.

In conclusion, foreign body penetration should be suspected in patients with orbital trauma and upper eyelid laceration and the presence of wooden material in those cases that have intraorbital air density on CT. If not diagnosed and treated properly, these cases may have high rates of morbidity and mortality. A continuous line with straight contours of air density, if unchanged over several days, suggests wooden material inside the eye.

References
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