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Case Report

A case of transpetrosal penetrating head injury near the sigmoid sinus

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ABSTRACT

Background: Penetrating brain injury is relatively rare, which occurs in 0.4% of all head trauma. In past reports, the orbit, nasal cavity, and oral cavity are the most common routes of entry of foreign substances into the skull. In this case report, we experienced a rare case of head trauma who injury through the petrosal bone. To the best of our knowledge, there is no similar literature.

Case Description: A 69-year-old man accidentally fell from a stepladder with a height of 3 m. There was a sprinkler on the ground, and it went through his posterior part of the right auricle at the collision. He was alert on admission. However, neurological examination showed right trigeminal, abducens, and facial nerve palsy. Computed tomography was performed, and it revealed that the objects penetrated the petrosal bone. Furthermore, it caused traumatic subarachnoid hemorrhage and acute subdural hemorrhage. Fortunately, it did not reach any cerebral artery and cerebral parenchyma. Immediately it was surgically removed with a good outcome.

Conclusion: When suspected sigmoid sinus injury in head penetrating injury, craniotomy should be considered with bleeding from the sigmoid sinus during surgery.

Keywords: Penetrating head injury, Petrosal bone fracture, Sigmoid sinus

INTRODUCTION

Head penetrating injuries are relatively rare and reported to be about 0.4% of head trauma.[4] The entry route of head penetrating injury is reported to the orbit, nasal cavity, and oral cavity. However, as far as we looked, there is no case report of penetrating the petrosal bone. There are important structures such as the external auditory meatus and sigmoid sinus near the petrosal bone. Venous sinus bleeding during trauma can cause massive bleeding and can also be a fatal cause.

We report a case in which a foreign body invaded the sigmoid sinus through the petrosal bone and suspected venous sinus injury was removed by craniotomy.

CASE PRESENTATION

A 69-year-old man fell from a stepladder with a height of about 3 m, and a sprinkler head penetrated the posterior part of the right auricle. His Glasgow Coma Scale was initially 15,

and no obvious motor paralysis or sensory impairment was observed. He had abduction disorder of the right eye, paralysis of the right facial muscles, and decreased perception of the right face.

Computed tomography revealed that the body had penetrated the petrosal bone [Figure 1a], and traumatic subarachnoid hemorrhage [Figure 1b] and acute cerebellar tent area. Subdural hematoma was observed [Figure 1c], the internal auditory meatus was also deviated [Figures 1c and d]. and the body was close to the sigmoid sinus [Figure 2]. Digital subtraction angiography (DSA) showed no major artery damage. However, the sigmoid sinus was deviated, compression or damage due to the presence of foreign matter was suspected [Figure 3]. The patient subsequently underwent emergency surgery on the same day.

Operation

The operation was performed in the lower-left lateral position. The skin incision was designed in 2 pieces because we were able to rotate over a wide area to observe the vicinity of the middle fossa and sigmoid sinus [Figure 4]. First, the skin was cut from the temporal bone side above the foreign body. The skull was exposed and a rectangular craniotomy was performed above the foreign body to expose the middle skull base. From there, the bone was excised toward the foreign body, and the condition of the site where the tip of the foreign body had invaded was confirmed. However, it was difficult to identify the point of the damaged sigmoid sinus, and the foreign matter remained fixed to the surrounding bone. Therefore, a skin cut was added in the direction of the sigmoid sinus, and the approach was performed from the back of the foreign body. The mastoid air cell around the foreign body was scraped with a steel bar to dig up the foreign body. No damage to the skin of the auditory canal was evident. The sigmoid sinus body was not exposed and bone was removed. Bone removal was continued, and when the stability of the foreign substance was completely released, the foreign substance was removed with care. After removing the foreign matter, no clear bleeding from the sigmoid sinus or leakage of spinal fluid from the skull was observed. During the first operation, no obvious damage resulting in cranial nerve palsy was observed. The abdominal fat was filled in the mastoid air cell that had been removed to prevent cerebrospinal fluid leakage after the operation of closing the wound, and it was adhered with fibrin glue [Figure 5].

Postoperatively, broad-spectrum antibacterial drugs (CTRX and VCM) were administered for 2 weeks to prevent meningitis. He also had continuous lumbar drainage for 1 week to prevent cerebrospinal fluid leakage. There were no apparent symptoms of it.

After surgery, the right hearing was completely lost in the examination. Three weeks after the operation, he was transferred to a rehabilitation hospital.

DISCUSSION

Petrosal bone fractures account for about 20% of all skull fractures and are classified into longitudinal fractures and transverse. It is clinical symptoms include deafness, cerebrospinal fluid effusion, and facial paralysis. About

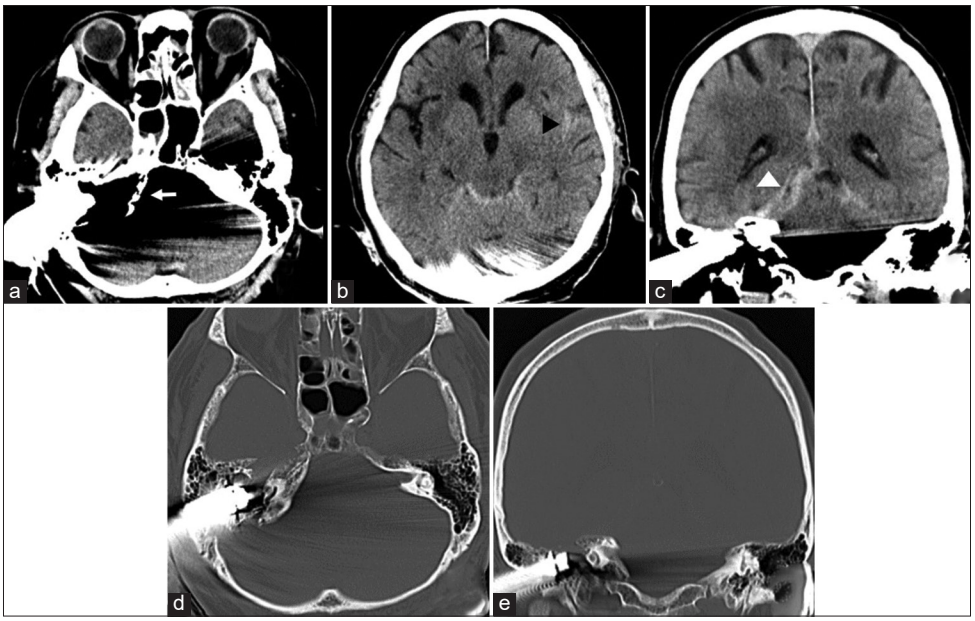

Figure 1: Computed tomography on admission shows a foreign body penetrating right petrosal bone and petrosal bone fracture (a →), traumatic subarachnoid hemorrhage (b ►) and subdural hemorrhage (c ▻). The foreign body stay in the petrosal bone(d,e).

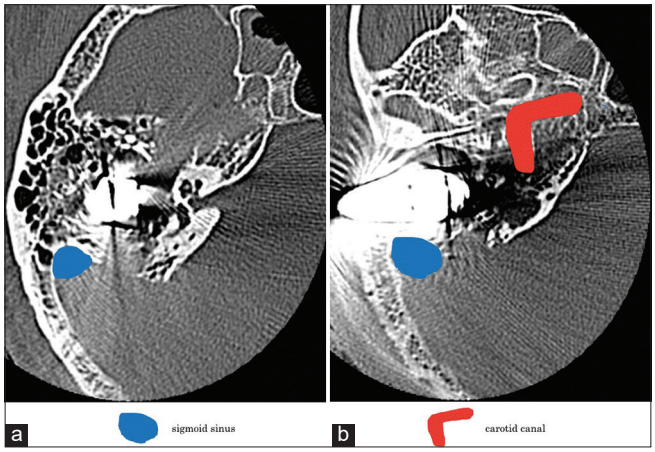

Figure 2: Temporal bone computed tomography on admission shows petrosal apex fracture. The inner ear canal was deviated inward (a). The carotid canal was not injured, but the foreign body was close to the sigmoid sinus (b).

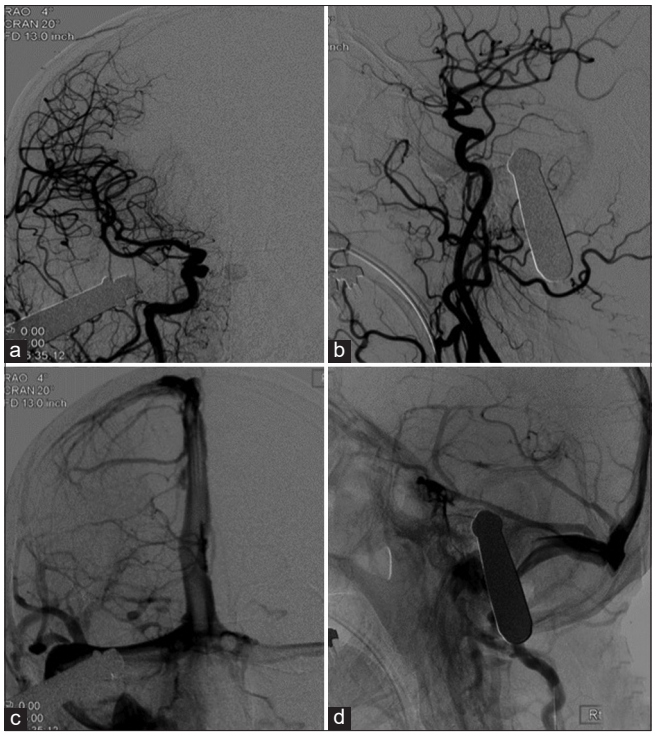

Figure 3: Digital subtraction angiography of the right common carotid artery (a and b) arterial phase; (c and d) venous phase; shows no extravasation, but the foreign body was close to the sigmoid sinus suggesting the possibility of injury or compression.

50% of the cases involved permanent paralysis due to nerve damage.[1] In this case, a foreign body penetrated the petrosal bone and the internal auditory meatus was also deviated. In this case, in addition to facial nerve and acoustic nerve, abducens nerve and trigeminal nerve of palsy were observed in this case. It has been reported that 3% or less.[6] Mechanisms that can cause abducens nerve palsy include those associated

Figure 4: The red line demonstrates a skin incision line for craniotomy (→) (a) and for adding craniotomy to expose the sigmoid sinus (▷). The extracted foreign body is about 8.7 cm in length (b).

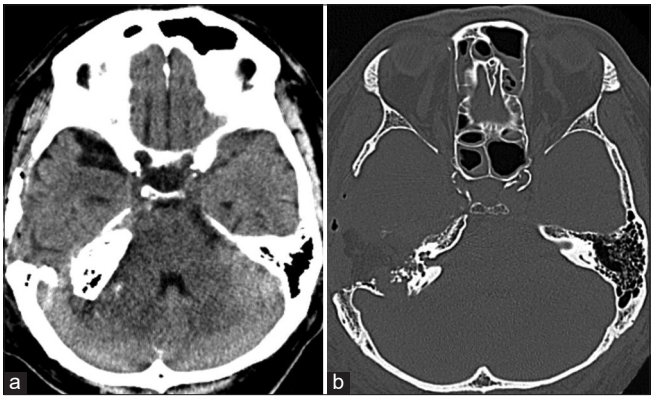

Figure 5: Postoperative head computed tomography showing contusion of the right cerebellum. No postoperative bleeding was observed. (a) Brain window, (b) bone window.

with petrosal fractures, those associated with sphenoid fractures involving the orbital fissure, and the compression of nerves due to cerebral edema may be considered, but in this case, we considered that abducens nerve palsy was caused by the mechanism of above.

For head penetrating injuries, it is recommended to perform surgery within 12 h after the injury to prevent infection.[5] Greenberg recommends DSA before surgery when major arteriovenous damage is suspected or when there is clear arterial hemorrhage.[2]

In this case, sigmoid sinus injury was suspected by DSA, so direct surgery was performed. When performing trans-petrosal head penetrating trauma, it is important that treatment is performed in conjunction with careful examinations of the microanatomy inside the petrosal bone and the positional relationships with surrounding arteries and veins.

In this case, it was suspected that a foreign substance stuck in the petrosal bone had damaged the sigmoid sinus, and angiography was performed followed by craniotomy. As already reported in the past, it is said that foreign matter in the skull is removed in the operating room in the case of head penetrating injury. In addition, in preoperative evaluation, it is necessary to evaluate not only contrast-enhanced CT but also angiography to evaluate large blood vessel damage.[3] If the intracranial foreign body is a metal piece, it may be difficult to perform accurate evaluation due to halation in plain CT. Previously, it was not recommended for head penetrating trauma because the accuracy of 3D-CTA was lower than that of angiography.

There are no case reports of suspected sigmoid sinus injury due to penetrating trauma, as far as we have searched the literature. As the point of treatment of our case, firstly, we tried to confirm the damaged site visually by excising the bone around the foreign body extensively and securing a wide surgical field, including the puncture site. We must confirm intraoperatively because foreign matter damaged the middle skull base and dural damage on CT. In addition, to secure working space for repairing the damaged part in the case of a dural injury, it was necessary to provide a relatively large craniotomy above the foreign body.

Second, when checking for damage to the sinus, exposing the sigmoid sinus unnecessarily may make it difficult to stop bleeding. For this reason, we avoided exposing the sinus intraoperatively. If the sinus was damaged while the sinus was exposed, or if there was bleeding from a damaged part due to a foreign substance, it may be difficult to stop bleeding in case the sigmoid sinus is partially exposed. Therefore, bone was removed so that only the sigmoid sinus near the foreign body could be exposed.

Third, this time we approached from the parietal side and the sigmoid sinus side of the foreign body. If the sigmoid sinus was approached first, the craniotomy field was narrow, and it was expected that hemostasis would be difficult when bleeding occurred.

CONCLUSION

In the case, if the artery or venous sinus is damaged due to a foreign substance penetrating and branching, we should consider that not only the preoperative evaluation of blood vessel damage but also the procedure to approach assuming the case of bleeding during surgery.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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