Acta Neurol. Belg., 2010, **110**, 203-205

Retained Foreign Body in Ethmoid with Bilateral Pneumoencephaly

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Abstract

Intracranial penetrating injury through the nose is rare. We present a case of a 79 year-old patient who had intracranial penetrating injury with a wooden object accompanied by massive bilateral pneumoencephaly with the presence of a foreign body in the ethmoid bone with fracture and displacement of crista galli. This is a hitherto unreported retained foreign body with fractured ethmoid resulting in bilateral pneumoencephaly.

Key words: ethmoid foreign body; intracranial penetrating injury; pneumoencephaly.

Case report

A 79-year-old female patient fell on a hollow wooden stick while gardening. She presented to her general practitioner complaining of a right cervical wound, epistaxis, vomiting and right wrist pain. Her general practitioner stitched up the cervical wound and referred the patient to the Accident & Emergency (A&E) department for ear, nose and throat (ENT) referral. Further history taking revealed that the patient fell onto a bamboo stick which penetrated through a nostril and in an attempt to remove the stick, had it snapped. There was no loss of consciousness. Her past medical history other than a total hysterectomy and a history of untreated high blood pressure, was unremarkable. On examination, the patient was awake and alert, with a nasal speech. Neither nasal discharge nor headaches were present on admission to the A&E department.

Her blood pressure was 175/90 mmHg with a pulse of 99 beats/min sinus and afebrile. Neurological examination was unremarkable, pupillary reaction was normal to light, with no oculomotor deficit and no diplopia. Computed tomography showed a fractured ethmoid with a hollow foreign body well circumscribed impacted in the ethmoid bone as well as bilateral pneumoencephaly with mass effect. A detached bone fragment (*crista galli*) can be identified in the cerebral parenchyma with no other associated facial fractures (Fig. 1). Ethmoid endoscopy was not performed in the emergency setting and the patient was referred to the neurosurgery-ENT department for decompression.

Craniotomy through a bicoronal incision and extra dural exploration were performed. Prior to opening the dura, the mucosal lining of the frontal sinus was separated from the wall of the sinus, and was unfolded and covered by gel foam. The fractured *crista galli* was accompanied by a dural tear in the mediofrontal region. Subdural exploration showed sphenoidal fracture with hemosinus along with a fractured *os planum*. A major meningeal tear was identified in the orbital surface of both frontal lobes. A cylindrical foreign body impacted in the ethmoid sinus was extracted. The mucosa of the ethmoidal and sphenoidal sinuses was pushed down and the defect filled with muscle tissue and gel foam. The opening of the dura was closed by interrupted 0000 black silk sutures, and free graft parietal pericranium.

The patient showed delayed recovery with altered consciousness and EEG monitoring showed low frequency waves of 2-3 cycles together with epileptic spikes in the anterior and left hemispheric regions. The patient benefited from antiepileptic agent and recovered well obeying to command and mobilizing all four limbs. The patient was discharged from the intensive care 15 days post operatively and exhibited anosmia and ageusia.

Discussion

Our case represents a previously unreported retained foreign body in the ethmoid with fracture and displacement of *crista galli* accompanied by bilateral pneumoencephaly, without orbital fracture. The foreign body was incarcerated in the cribriform plate (Fig. 1). Retained foreign body of the orbit, paranasal sinuses and skull base is a rare entity, with

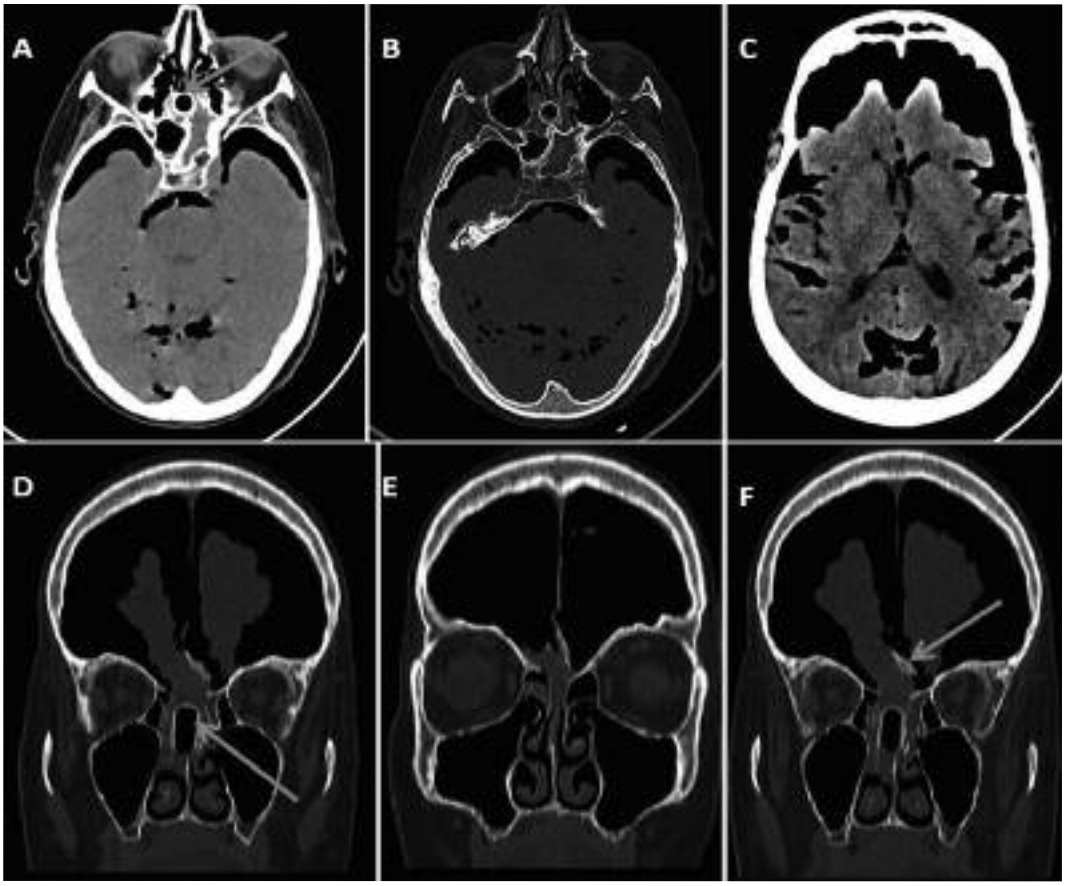

Fig. 1. — Cerebral CT-scans without contrast showing (A) the hollow foreign body (arrow) incarcerated in the cribriform plate of ethmoid bone with intact orbital walls; (B) foreign body with intact maxillary sinus walls; (C) significant pneumoencephaly in the bifronto-parieto-temporo-occipital lobes with mass effect; (D) the retained ethmoid hollow foreign body (arrow) with intact nasal concha; (E) intact orbital walls with absence of extraocular muscles incarceration and (F) fracture and displacement of *crista galli* (arrow).

up to 70% of cases being posttraumatic (1, 2). Moreover, the incidence of pneumocephalus varies between 0.5% and 1.0% of patients with traumatic brain injury (3).

Pneumoencephaly occurs in head trauma following skull base and sinus fractures and can be associated with neurosurgical procedures, especially in the sitting surgical position (4, 5). Neoplasms, gas producing-anaerobic central nervous system infections, mucoceles, congenital neuroenteric cysts, dural defects, lumbar drain insertion, epidural blood patch, hyperbaric oxygen therapy, congenital skull defects, forceful nose-blowing and disorders of otogenic origin are other causes of pneumocephalus due to dural injury with cerebrospinal fluid (CSF) leak (6-14).

In this case, the mechanism is a direct tear of dura mater together with the presence of a hollow foreign body thus allowing direct air entry into the cranium causing pressure imbalance (positive pressure air rushes into the intracranial space to fill in the negative pressure space created by the loss of CSF) similar to an inverted soda-pop bottle phenomenon: when the bottle is inverted, soda pours out, leaving an empty space of negative pressure above the fluid level (15).

There was no further signs of CSF leak on admission presumably because of the epistaxis at the instant of trauma was a mixture of CSF and blood. Our patient's neurological examination was unremarkable which can be explained by the capacity of the brain to compensate pressure changes caused by volume expansion. Acute neurological deficits such as sudden loss of consciousness, limb weakness or convulsion, which are signs of tension pneumoencephaly are uncommon (4, 9, 16).

Conclusion

We report an uncommon case of retained ethmoid foreign body associated with asymptomatic bilateral

pneumoencephaly. Timely diagnosis and aggressive treatment of a combined neurosurgery-otolaryngology approach may prevent potentially life-threatening complications.

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