CERVICAL PNEUMORACHIS AFTER A SEVERE FACIO-CRANIAL INJURY: CASE REPORT AND REVIEW OF THE LITERATURE.

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Abstract:

Background: Pneumorachis is the presence of the air in spinal canal and has several etiologies. The association of pneumorachis and pneumocephalus after a traumatic brain injury is rare and often discovered on imaging.

Case report: we report the case of a 25- year-old patient admitted for severe facio-cranial injury following a road traffic accident. The patient was admitted unconscious with a Glasgow Coma Scale Score (GCS) on admission at 8 without evident neurological deficit. Craniofacial and cervical computed tomography (CT scan) revealed several complex craniofacial fractures with extension to the skull base, brain edema and diffuse pneumocephalus and air in the cervical spine canal. Patient deceased after being admitted in the intensive care unit from a septic shock.

Conclusion**:** It's necessary to rule out any injury to the cervical spine even in cases without any visible bone injuries. The presence of a pneumorachis needs a tight follow-up to detect any spinal cord compression signs; and the possibility that neurological symptoms could be caused by pneumorachis should be considered.

Key words : cranio-facial injury ; pneumocephalus ; pneumorachis.

Introduction:

The pneumorachis is defined by the presence of air in the spinal subarachnoid spaces and can have several origins. The first case of pneumorachis was described by Gordon and Hardman in 1977 who first called it pneumomyelogram (6). About fifty cases have been reported in the literature and are secondary to: pneumothorax, pneumomediastinum, subcutaneous emphysema, pneumocephalus, gastrointestinal perforation, or iatrogenic spinal surgical procedures (2). The association of pneumorachis and pneumocephalus after Traumatic brain injury(TBI) is a rare entity despite the existing communication between the cerebral and spinal subarachnoid spaces (2,11). Few cases of pneumorachis after brain injury have been described in the literature (1,2,3,6,7,9,11-15). We report a case of a radiological incidental discovered pneumorachis associated with pneumocephalus following a multiple fracture of the skull base.

Case report:

We report the case of a 25 year old man, victim of a road traffic accident on the highway; motorcyclist who slipped, fell and hit his face against the ground. The patient was brought to the emergency room by an ambulance of the regional hospital. He had a seizure during transport and was admitted in post seizure coma. Glasgow coma score (GCS) gradually decreased up to 8, pupils were difficult to examine due to the presence of a large bilateral eyelid edema. He had no ovious motor deficit and was very agitated. The locoregional examination revealed a depression on the frontal bone with a sensation of multiple bony fragments on palpation, a wound of the upper and lower tongue and lips. He also had periorbital ecchymosis with no apparent rhinorrhea but had epistaxis. The heart rate was 110 beats / minute and blood pressure was 110/55 mm Hg. Immediate intravenous (IV) line and infusion were started; the wounds of lips and tongue were sutured. Then the patient underwent a cerebral computed tomography (CT), supplemented by CT of the cervical spine given the context of craniofacial trauma. CT of brain showed epidural , left frontal 10 mm, an acute subdural hematoma in the right fronto-parietal region, a basi-frontal contusion, subarachnoid hemorrhage, diffuse cerebral edema and pneumocephalus (Figure 1c). There were several fractures of the frontal bones and of the skull base with opacification of the right maxillary sinus floor (Figure 1a and 1b). The cervical spine CT revealed an anterior pneumorachis opposite vertebral body C3-C6 without bony lesions (Figure 2).

The patient was admitted in the intensive care unit (ICU), intubated, ventilated and sedated; with tracheostomy done after 7 days. No radiological investigation of control could be carried out because of hemodynamic instability due to septic shock following severe pneumonia from which he eventually died after 10 days of hospitalization in the ICU.

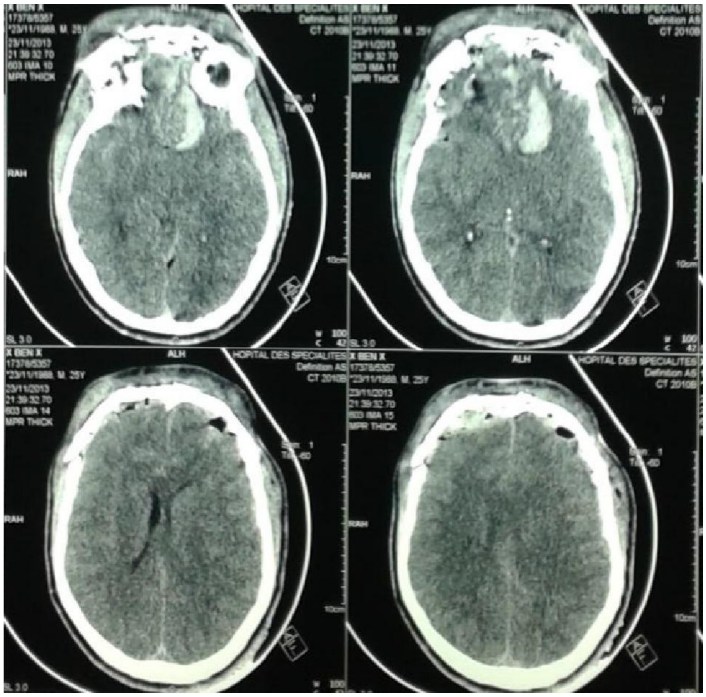

Figure 1 : CT scan. Axial view : basifrontal bilateral contusions, subdural hematoma , right acute subdural fronto-parietal hematoma, left frontal epidural hematoma 10mm, subarachnoid hemorrhage, cerebral edema and diffuse pneumocephalus and multiple fractures of the vault.

Figure 2- Cervical spine CT, sagittal cut, showing pneumorachis from C3 to C6 vertebrae.

Discussion:

Pneumorachis : The term has been used for the first time in 1987 by Newbold et al (9). But there are other names in the literature: intraspinal pneumocele, pneumatosis spinal, subarachnoid or epidural aerorachis, pneumosac or posttraumatic pneumomyelogram (2,6,9,11,14,15). The pneumorachis is the presence of air in the spinal subarachnoid space. This is a rare entity that is usually asymptomatic and of radiological discovery.

Several causes are identified in the literature. Possible trauma responsible could be pneumothorax, pneumomediastinum, pneumocephalus, subcutaneous emphysema; barotrauma or all of the conditions responsible for intrathoracic hypertension; surgical cases (after spine surgery); after diagnostic investigation tests (lumbar puncture, spinal anesthesia), anaerobic bacteria infections or idiopathic onset (2,11).

There is a difference between the presence of air in epidural and subdural spaces; with different clinical implications. Goh et al showed that the presence of an epidural air alone is usually harmless, unlike pneumorachis in the subarachnoid space which shows severity of the trauma and is often associated with pneumocephalus (13). The post-traumatic subarachnoid pneumorachis is usually secondary to pneumocephalus with trauma to the skull air sinuses or a skull fracture with the air passing through the dura mater to the cerebral subarachnoid spaces ; pneumorachis and pneumocephalus communicate through the spinal subarachnoid spaces (8). In our case, the pneumorachis is the result of a pneumocephalus due to multiple fracture of the vault and a fracture of the skull base. This communication between the spaces in the brain and spinal cord arachnoid has been described since 1919 by Dandy who injected

air in the spinal subarachnoid spaces to produce a gaseous encephalography for a diagnostic purpose (4).

Author/year	Cause	Etiology	Localisation of air	Symptoms	Treatment	Outcome
Gordon and Hardman. (1977)[6]	Trafic accident	Open skull fracture	Pneumocephalus and cervical pneumorachis	Decelebrate	Details not available	Death
Newbold et al. (1987)[9]	Trafic accident	Sphenoid sinus, basioccipital and temporopo-parietal fractures with rhinorrhea	Pneumocephalus and cervical pneumorachis	Details not available	transphenoidal approch and patch	Alive (Details not available)
Yip et al. (1990)[14]	Blunt trauma	Bifrontal and frontal sinus fractures	Pneumocephalus and cervical pneumorachis	None	Antibiotics	Resolution
Sinha and Mantle. (2000)[12]	Trafic accident	Multiple skull base fractures, intracerebral haemorrhage and otorrhea	Pneumocephalus and cervical pneumorachis	Coma	Ventilatory support	Death
Inamasu et al. (2002)[7]	Trafic accident	temporal bone fracture and dural tear	Pneumocephalus and cervical pneumorachis	None	Lumbar drainage (for CSF leak)	Resolution
Cayli et al. (2003)[1]	Case 1 : fall Case 2 : trauma	Mastoid fracture with otorrhea skull base fracture with otorrhea	Pneumocephalus and cervical pneumorachis	None	Antibiotics and lumbar dranage (case 2)	Resolution
Yousaf et al. (2003)[15]	Blunt trauma	temporal bone fracture, extradural haemorrhage, otorrhea	Pneumocephalus and cervical pneumorachis	Radicular symptoms	cervical collar and oxygen	Resolution
Chibbaro et al. (2005)[3]	Trafic accident	Mastoid cavity fracture	cervical pneumorachis (C3-C6)	None	None	Resolution
Oertel et al. (2006)[11]	Trafic accident	occipital skull and sphenoid sinus fracture	Pneumocephalus and cervical pneumorachis	Coma	None	Death
Chaichana et al. (2010)[2]	Trafic accident	Bilatéral mastoid and sphenoid wring fractures	Pneumocephalus and cervical pneumorachis (C2-C7)	None	Antibiotics and oxygen	Resolution
Sumit et al. (2011)[13]	Assault	cribriform plate and ethmoid bone fractures	Pneumocephalus and cervical pneumorachis (jonction crânio-cervical et C3) and cervical emphysema	None	Antibiotics and oxygen	Resolution
our case	Trafic accident	Frontal fracture, contusion, epidural and subdural, hematoma, subarachnoid haemorrhage	Pneumocephalus and cervical pneumorachis (C3-C6)	Coma	Ventilatory support and antibiotics	Death

Table 1 : Case reports of pneumorachis in the literature.

Cases of post-traumatic cervical pneumorachis reported in the literature (Table 1) are the result of an extensive fracture of the skull base or vault. Only Sumit et al reported a case of isolated fracture of the cribriform plate of the ethmoid bone (13).

The pneumorachis is most often asymptomatic and of radiological discovery (11). The preferred imaging is the cerebral CT scan that allows a quick diagnosis in emergency but it does not make the difference between an epidural and sub arachnoid pneumorachis (13). The MRI may be of a great contribution to differenciate between the presence of the air in epidural or subarachnoid spinal space. Only one case of symptomatic cervical radiculopathy revealed by pneumorachis was reported by Yousaf et al. The patient had a good outcome after a

cervical collar and administration of oxygen (15). Because of its rarity and its various etiologies, no clear recommendations exist on pneumorachis managment. The treatment is based on a few individual case reports in the literature (Table 1).

The presence of a cervical pneumorachis following TBI implies an open communication between the subarachnoid spaces with septic air spaces , where an increased risk of meningitis is high (10). An association with cerebro-spine fluid (CSF) rhinorrhea needs a spinal drainage or an urgent neurosurgical exploration first (1,7). If these patients require general anesthesia, it is indicated not to use nitrous oxide because it diffuses into closed areas and increases their volume and pressure; therefore a risk of increasing intracranial hypertension (5). Few publications demonstrate the efficacy of oxygen therapy in case of pneumorachis (2,15).

The pneumorachis evolves mostly favorably with spontaneous resorption of air as illustrated by the case of Sumit et al (13). Our patient did not have a control CT scan because of the septic shock leading to death.

Conclusion :

Cervical pneumorachis is an entity of radiological discovery and often asymptomatic. We report a case of cervical pneumorachis after severe craniofacial injury. This clinical case and the few cases reported in the literature draw attention to the importance of an assessment of cervical spine after severe craniofacial trauma and also the importance of monitoring patients to detect on time any symptoms of possible spinal cord compression.

We declare that there is no conflict of interest.

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