

PNEUMOCEPHALUS IN OTOGENIC MENINGITIS DUE TO STREPTOCOCCUS AGALACTIAE: A CASE REPORT

Wilfried Fambonami*, Allison Gilbert**,¹, Delphine Sime Sidieu[△] and Edmond Brasseur**

*Emergency Department, Namur Hospital Center, Namur, Belgium., **Emergency Department, University Hospital Center of Liege, Liege, Belgium.,

[△]Emergency Department, Verviers East Belgium Hospital Center, Verviers, Belgium.

ABSTRACT Pneumocephalus is defined as the presence of air in the intracranial cavity. This condition has multiple etiologies described, such as traumatic or iatrogenic origins. Rarely, pneumocephalus has been reported in otogenic meningitis. Head computer tomography represents the gold standard imaging to visualize the quantity and localization of air. The work-up has to be completed by a lumbar puncture in suspected underlying infection. The treatment depends on the identified cause. We report the case of a 77-year-old man diagnosed with a pneumocephalus associated with otogenic meningitis.

KEYWORDS Pneumocephalus, Otogenic meningitis, Agitation, Headache

Background

Pneumocephalus is characterized by the presence of intracranial air and is rarely reported in otogenic meningitis [1]. Multiple etiologies have been described, such as trauma, complications of cranial procedures or infectious diseases. The prognosis depends on the pneumocephalus' severity and its underlying etiology. We report the case of a 77-year-old man diagnosed with a pneumocephalus associated with otogenic meningitis.

Case report

A 77-year-old patient was admitted to the Emergency Department (ED) for acute confusion. The patient was subfebrile and suffered from unusual headaches and agitation for 48-hours. At the ED admission, he presented an impaired level of consciousness with a Glasgow Coma Scale of 11/15 (E2V3M6). His blood pressure was 180/80mmHg, his heart rate was irregular, demonstrating atrial fibrillation at 120bpm, and his oxygen saturation was 98% at ambient air. His physical examination was unremarkable except the neurological impairment, in particular,

no petechial rash was noted. The patient was intubated due to the progressively impaired level of consciousness. The patient's main medical history was marked by a primary lung carcinoma under immunotherapy, atrial fibrillation, chronic obstructive pulmonary disease and previous episodes of meningitis from an unknown origin. Biological findings revealed a neutrophilic leukocytosis without any inflammatory syndrome. A head computer tomography (CT) was performed and demonstrated a pneumocephalus (Figure 1) without another brain anomaly, but the presence of an apparent osseous breach into the left epitympanic recess. In this context, a lumbar puncture was performed. Laboratory analysis revealed neutrophilic leukocytosis in the cerebrospinal fluid and confirmed the diagnosis of otogenic meningitis associated with a pneumocephalus. The patient was placed under intravenous antibiotics (Ceftriaxone) and was transferred to the Intensive Care Unit (ICU). Blood culture revealed bacteremia with *Streptococcus Agalactiae*, which was also found in the cerebrospinal fluid. In the ICU, the patient presented several seizure episodes requiring treatment by valproic acid. Finally, the patient was discharged from the ICU with a good neurological outcome.

Discussion

First described in the 18th century by Lecat, Pneumocephalus, also called cranial aerocele, is characterized by the presence of air within the intracranial space [1,2].

Multiple etiologies have been reported in the literature [1,2]. Cranial trauma, especially skull base fractures, represents the

Copyright © 2020 by the Bulgarian Association of Young Surgeons

DOI:10.5455/IJMRCR.Pneumocephalus-Otogenic-Meningitis

First Received: October 12, 2020

Accepted: November 11, 2020

Associate Editor: Ivan Inkov (BG);

¹Emergency Department, University Hospital Center of Liege, Liege, Belgium. Email:

Allison.gilbert@chuliege.be

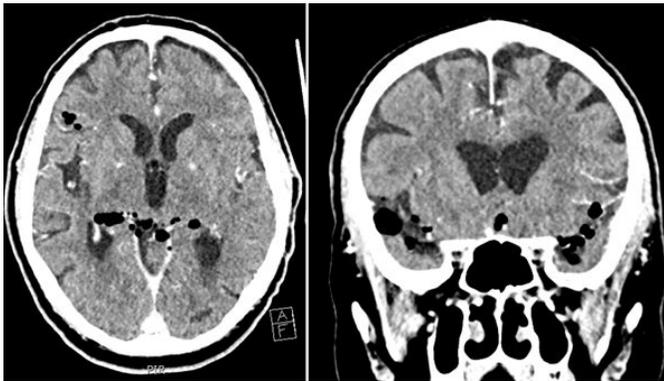


Fig. 1: Head Computer Tomography demonstrating the pneumocephalus in axial and coronal views.

vast majority of pneumocephalus' cases. At the same time, other etiologies are more unusual (tumours, otological pathologies, infectious diseases, complications following spinal or lumbar procedures, etc.) [3].

Pneumocephalus is an infrequent finding in otogenic meningitis. This type of meningitis is mainly due to acute mastoiditis or otitis media [4]. The presence of a preexisting bone defect in the middle ear, as reported in our patient, can trigger such recurrent infectious diseases and the entry of a small quantity of air [2,4].

Currently, *Neisseria meningitidis* and pneumococci are the primary bacteria responsible for bacterial meningitis [5]. *Streptococcus agalactiae* is rarely associated with meningitis in adults. Indeed, group B streptococci meningitis only represent 0.3% to 4.3% of all cases. Those bacteria tend to be more frequent in patients with chronic underlying diseases [6].

Symptoms may vary depending on the pneumocephalus' etiology and severity. In mild spontaneous pneumocephalus, the patient can be asymptomatic. A wide range of non-specific symptoms has been described due to this condition: agitation, neurological impairment or headache [4]. However, none of them is pathognomonic, and those of the underlying disease predominantly represent the clinical findings.

The physiopathology of pneumocephalus is based on two different mechanisms. The first one is air entry following trauma or surgical procedures but also from a preexisting osseous breach in the middle ear in certain circumstances (i.e., air travel, violent blowing of the nose). The second is air formation by gas-producing bacteria in the case of meningitis [7]. In this case report, both mechanisms seemed involved in the pneumocephalus.

Diagnosis is based on brain imaging [3]. Computer Tomography (CT) is the gold standard and allows us to identify small air bubbles. In severe cases, the quantity of air is so essential that it compresses the brain resulting in tension pneumocephalus. In this stage, a particular sign is often demonstrated in head CT: Mount Fuji sign is characterized by a separation of both frontal lobes due to the presence of subdural air [3,8]. When meningitis is suspected, a lumbar puncture has to be performed.

Treatment depends on clinical and radiological findings but also the underlying etiology [9]. Mainly, medical treatment is sufficient and leads to the progressive regression of the air. In community-acquired meningitis, treatment with intravenous third-generation cephalosporins is recommended. In some severe cases with tension pneumocephalus, an emergency surgical treatment is required [3,9]. When a bone defect is identified, the

closure of this defect has to be considered [7].

In spontaneous pneumocephalus, the prognosis is usually good while in trauma, it essentially depends on the associated injuries. Mortality tends to be slightly higher in the case of pneumocephalus related to bacterial meningitis since bacterial meningitis' mortality can be estimated by up to 30% [10].

In summary, pneumocephalus is rarely reported in association with otogenic meningitis. The diagnosis is made classically by head CT, visualizing the presence of air. In the absence of any traumatic precipitating factors, the diagnosis of meningitis has to be evoked. In this context, a preexistent bone defect in the middle ear should also be excluded, primarily if multiple infectious episodes have been described. The treatment with intravenous antibiotics has to be prompt to obtain a favourable outcome.

Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

References

1. Das JM, Bajaj J. Pneumocephalus. Stat Pearls Internet. Treasure Island (FL):StatPearls Publishing;2019 Jan.
2. Tran P, Reed EJM, Hahn F, Lambrecht JE, McClay JC, Omojola MF. Incidence, radiographical features, and proposed mechanism for pneumocephalus from intravenous injection of air. *West J Emerg Med.* 2010; 11(2):180-185.
3. Gorissen Z, Hakvoort K, Van Den Boogaart M, Klinkenberg S, Schijns O. Pneumocephalus: a rare and life-threatening, but reversible, complication after penetrating lumbar injury. *Acta Neurochirurgica.* 2019; 161:361-365.
4. Barry C, Rahmani G, Bergin D. Pneumocephalus and meningitis as complications of mastoiditis. *Case reports in Radiology.* 2019; Article ID 7876494.
5. Hoffman O, Weber RJ. Pathophysiology and treatment of bacterial meningitis. *Ther Adv Neurol Disord.* 2009; 2(6):1-7.
6. Khan FY. *Streptococcus agalactiae* meningitis in adult patient: a case report and literature review. *Case reports in infectious diseases.* 2016; Article ID 6183602.
7. Dabdoub CB, Salas G, Silveira E, Dabdoub CF. Review of the management of pneumocephalus. *Surgical Neurology International.* 2015; 6:155.
8. Anandpara KM, Aswani Y, Hira P. The Mount Fuji Sign. *Clin Med (Lond).* 2015; 15(6):596.
9. Jayaram S, Jadhav S, Rathod D, Tarvade S, Soman A. Meningitis: an unusual cause of pneumocephalus. *JAPI.* 2004; 52:67-68.
10. Damergis JA, Chee K, Amitai A. Otogenic pneumococcal meningitis with pneumocephalus. *The Journal of Emergency Medicine.* 2010; 39(3):e109-112.