Spontaneous pneumocephalus

Spontaneous pneumocephalus is defined as the accumulation of air intracranially (epidural, subdural, subarachnoid, intraventricular, and/or intraparenchymal) without association with craniofacial trauma, otological, or neurological surgery, meningitis, infectious sinus disease, or skull base tumors [1) 2) 3) 4)].

Jelsma [5) 6) 7)] was the first to give a description of subdural spontaneous pneumocephalus in 1954.

Epidemiology

Represents around 1% of cases of pneumocephalus.

Etiology

Typical causes of spontaneous intracranial air are barotraumas, valsalva maneuvers, adjacent air sinus infections, bacteremia, air cell hyperpneumatization, pneumosinus dilatans.

Patient education to avoid Valsalva's maneuvers or nose blowing habit can possibly contribute to reduce recurrence [8)].

Spontaneous tension pneumocephalus (STP) is a rare, but serious complication derived from shunting procedures. Few cases have been published with purely intraventricular location. Treatment options and physiopathology considerations are discussed in a case report [9)].

Pneumocephalus after Nitrous oxide

Pneumocephalus after Nitrous oxide.

Diagnosis

Pneumocephalus Diagnosis.

Case reports

Spontaneous pneumocephalus associated with a melanoma brain metastases [10)].

2017

A 75 year-old lady with a 15 year old lumboperitoneal (LP) shunt insertion was treated with a

ventriculoperitoneal (VP) shunt for her normotensive hydrocephalus. Two months later she was brought to the emergency room showing symptoms of lethargy and confusion. A helicoidal CT scan revealed a bone defect in the floor of the right temporal fossa. The patient underwent a temporal craniotomy for closing the bone and dural defect, and the LP shunt was removed, at which point her condition improved.

A high resolution CT scan of the skull base is useful to localize the point where the air enters into the intracranial cavity in STP cases. Coexistent or preceding otological symptoms might direct the suspicion toward an otogenic origin. Shunt removal, or adjusting the opening pressure, if feasible, is recommended. Otherwise, dural repair and covering of the bone defect has acceptable rates of success and should be performed before any other more aggressive techniques to avoid the risk of hearing loss [11)].

A 84-year-old man presented with dysarthria and incontinence. Computed tomography revealed an intraventricular pneumocephalus, thinning in the petrous bone, fluid in the air cells, and cleft in temporal lobe. A right subtemporal extradural approach was taken to detect bone-/-dural defects, and a reconstruction was performed using a musculo-pericranial flap.

This is the first patient of an isolated spontaneous intraventricular pneumocephalus without any other site air involved. Surgical approaches to repair such bone and dura defects should be considered an appropriate option [12)].

2015

A male patient who presented with altered level of consciousness following his transition to an increased altitude (1000 m). CT scan demonstrated air located in the subdural, intraventricular and intraparenchymal compartments. He was found to have spontaneous otogenic pneumocephalus with an osteo-dural defect at the upper level of the petrous temporal bone resulting from a change in atmospheric pressure brought on by a change in altitude. A right subtemporal craniotomy with a right temporal duraplasty was performed. The patient had no recurrence after three years of follow-up.

A fistula at the level of the temporal bone should be investigated in any patient with otologic manifestations and nonspecific neurological signs. This is the first case to describe a patient with spontaneous otogenic pneumocephalus with distribution of air in three intracranial locations. Surgery remains the treatment of choice for spontaneous otogenic pneumocephalus [13)].

2012

A 57-year-old woman presented a brief episode of sudden otalgia in her left ear that was followed by a motor aphasia. Imaging revealed a left temporal intraparenchymal pneumocephalus in a close relationship with a highly pneumatized temporal bone. Left temporal craniotomy and decompression were performed. Further subtemporal exploration confirmed a dural defect and other osseous defects in the tegmen tympani, which were both consequently closed Water-tight.

Although extremely rare, a spontaneous intraparenchymal pneumocephalus with mastoidal origin should be considered as a possible diagnosis in patients with suggestive otological symptoms and

other non-specific neurological manifestations. Surgery is indicated to repair bone and dural defects [14].

2000

A 30-year-old female presented with headache, CSF rhinorrhoea, mild right facial weakness, 2 months following temporal lobectomy for epilepsy. CT revealed marked intraventricular pneumocephalus with breached air cells in the pneumatized lower part of temporal bone. The dural and bony defects repaired successfully with complete resolution of the pneumocephalus [15].

1998

Dowd et al., report on an elderly woman in whom a intraventricular spontaneous pneumocephalus occurred because of a congenital defect in the left tegmen tympani. Eustachian tube closure and middle ear exclusion were used to obliterate the fistulous connection. This case illustrates both an unusual cause and a unique treatment for spontaneous otogenic pneumocephalus [16].

References

[1], [7]
Krayenbühl N, Alkadhi H, Jung HH, Yonekawa Y. Spontaneous otogenic intracerebral pneumocephalus: case report and review of the literature. Eur Arch Otorhinolaryngol. 2005 Feb;262(2):135-8. PubMed PMID: 15004711.

[2]
Pennings RJ, Liauw L, Cremers CW. A spontaneous otogenic extradural pneumocephalus. Otol Neurotol. 2009 Sep;30(6):864. doi: 10.1097/MAO.0b013e31818de597. PubMed PMID: 18931642.

[3]
Tucker A, Miyake H, Tsuji M, Ukita T, Nishihara K, Ito S, Ohmura T. Spontaneous epidural pneumocephalus. Neurol Med Chir (Tokyo). 2008 Oct;48(10):474-8. PubMed PMID: 18948684.

[4]
Zhao N, Wang DD, Huang X, Karri SK, Wu H, Zheng M. Spontaneous otogenic pneumocephalus presenting with occipital subcutaneous emphysema as primary symptom: could tension gas cause the destruction of cranial bones? J Neurosurg. 2011 Oct;115(4):679-83. doi: 10.3171/2011.6.JNS11104. PubMed PMID: 21740114.

[5], [16]
Dowd GC, Molony TB, Voorhies RM. Spontaneous otogenic pneumocephalus. Case report and review of the literature. J Neurosurg. 1998 Dec;89(6):1036-9. Review. PubMed PMID: 9833834.

[6]
JELSMA F, MOORE DF. Cranial aerocele. Am J Surg. 1954 Mar;87(3):437-51. PubMed PMID: 13124659.

[8], [14]
Abbati SG, Torino RR. Spontaneous intraparenchymal otogenic pneumocephalus: A case report and review of literature. Surg Neurol Int. 2012;3:32. doi: 10.4103/2152-7806.93861. PubMed PMID: 22530167; PubMed Central PMCID: PMC3326941.

[9]
Martinez-Perez R, Gómez E, Rayo N. Spontaneous tension Pneumocephalus: a rare complication of shunting. World Neurosurg. 2017 Feb 9. pii: S1878-8750(17)30156-0. doi: 10.1016/j.wneu.2017.01.126. [Epub ahead of print] PubMed PMID: 28189868.

[10]

Ahn J, Bunevicius A, Sheehan J. Spontaneous pneumocephalus associated with a melanoma brain metastases: a Case Report. J Neurooncol. 2021 Mar 9. doi: 10.1007/s11060-021-03728-4. Epub ahead of print. PMID: 33687627.
11)

Martinez-Perez R, Gómez E, Rayo N. Spontaneous tension Pneumocephalus: a rare complication of shunting. World Neurosurg. 2017 Feb 9. pii: S1878-8750(17)30156-0. doi: 10.1016/j.wneu.2017.01.126. [Epub ahead of print] PubMed PMID: 28189868.
12)

Arai N, Tabuse M, Nakamura A, Miyazaki H. Spontaneous Intraventricular Pneumocephalus. J Craniofac Surg. 2017 Jan 12. doi: 10.1097/SCS.0000000000003392. [Epub ahead of print] PubMed PMID: 28085764.
13)

Hage P, Daou B, Jabbour P. Spontaneous otogenic pneumocephalus due to altitude changes: A case report and review of literature. Clin Neurol Neurosurg. 2015 Nov;138:162-4. doi: 10.1016/j.clineuro.2015.08.025. Review. PubMed PMID: 26342437.
15)

Ellamushi H, Hussein JR, Harkness W. Spontaneous cerebrospinal fluid rhinorrhoea and pneumocephalus following temporal lobectomy for epilepsy. Br J Neurosurg. 2000 Dec;14(6):565-7. PubMed PMID: 11272038.