ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUN1090

# Subdural Empyema as a Rare Complication Caused by *Neisseria meningitidis* B

Elfadel. O, Ifegh.B[1]; EL Kettani.A[2]; Soussi Abdallaoui.M[3]
Bacteriology-virology and hospital hygiene laboratory, CHU Ibn Rochd, Casablanca.
Faculty of Medicine and Pharmacy, Hassan II University, Casablanca.

**Abstract:- Subdural empyema (SDE) is an intracranial collection of purulent material located between the dura and the arachnoid mater. It is a serious central nervous system infection which can cause neurological sequelae and high mortality. We report one of the rare cases of SDE secondary to *Neisseria meningitidis* to underline the interest of evoking this diagnosis especially in patients not responding to standard antimicrobial therapy.**

***Keywords:-*** *Neisseria Meningitidis, Subdural Empyema, Molecular Biology.*

## I. INTRODUCTION

Subdural empyema represents a purulent collection between the meninges: the dura and the arachnoid, which usually complicates sinusitis or otitis media. It is a disease classically characterized clinically by fever and neurological impairment with fatal course if it is not treated. We report a case which elaborates this extremely rare condition of subdural empyema caused by *Neisseria meningitidis* with microbiologic evidence represented by a positive polymerase chain reaction for meningococcal *ctrA* gene in the surgically evacuated material.

## II. CASE DESCRIPTION

A 2-months-old female infant with no particular pathological past presented with a 7-days history of fever, diarrhea and irritability. Clinical examination at admission showed hypotonic infant with normotensive fontanelles, heart rate at 115/minute, respiratory rate at 42/minute, and temperature at 38.5°C. The rest of the clinical examination was without particularities. Laboraory investigations demonstrated an anemia with hemoglobin at 8.3 g/dl; a leukocytosis with 24660/mm3, an increased C-reactive protein (CRP) at 142mg/l and a procalcitonin at 0.69ng/ml, basic metabolic panel was within the normal limits.

A brain scan was carried out and revealed the presence of subdural bifrontal collections with density similar to that of the cerebrospinal fluid concluding with an aspect compatible with bifrontal empyemas (figure 1). An empiric antibiotiotherapy has been started on ceftriaxone and rifampicin. In the absence of clinical improvement with medical treatment alone, an evacuation puncture of the empyema has been performed with removal of 10 ml of yellowish liquid, the cytobacteriological study revealed a white cell count of 6400/mm3 (neutrophils: 100%), direct review and culture were negative. Identification of *Neisseria meningitidis* was obtained with *RT-PCR* with positive polymerase chain reaction for meningococcal *ctrA* target in the surgically evacuated material. Despite the neurosurgical approach, the association of medical treatment was recommended; intravenous IV ceftriaxone was continued for a total of 6 weeks.

The clinical evolution was favorable with obtaining apyrexia, regression of hyperleukocytosis to 15350 versus 24660/mm3, reduction of CRP to 125 versus 142mg/l. Infant remained symptom free at 3 months follow up and had made normal developmental progress.

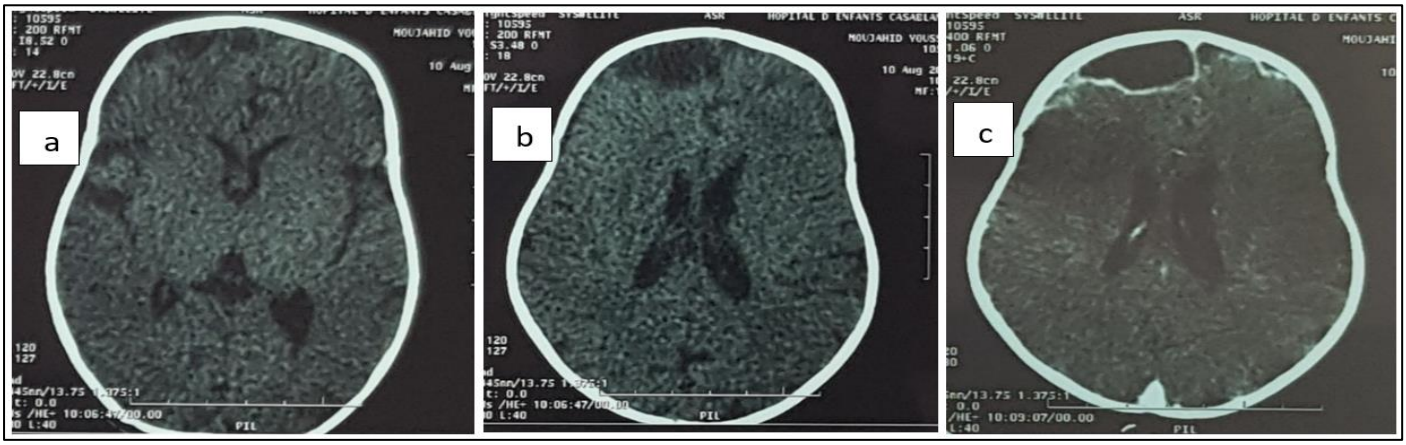


Fig 1 Axial cerebral CT slices showing bi-frontal collections with peripheral contrast enhancement corresponding to subdural empyema. (a): Small collection under right dural. (b) : collection under dural frontal right hypodense. (c) : peripheral contrast enhancement of the lesion suggesting a subdural empyema.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUN1090

## III. DISCUSSION

Subdural empyema refers to a purulent collection located between the dura and the arachnoid. It can be intracranial or in the spinal canal. Subdural empyema is recognized as a complication of head trauma, otitis, and sinusitis or neurosurgical interventions (3). It usually occurs in infancy but can also be rarely seen in adults (4). The physiopathology of this infection involves bacterial colonization of the nasopharynx, invasion of the mucosa, bacteremia and then passage into the subarachnoid space. Acute bacterial meningitis represents the essential starting point in infants; infection of the ears, nose and throat (ENT) sphere (sinusitis) and head trauma were the most important predisposing factors in older children and adults. The similarity of symptoms with meningitis makes diagnosis difficult, increasing the risk of complications such as hydrocephalus and death (1-2). The organisms involved are anaerobes, aerobic streptococci (in intracranial SDE secondary to sinusitis), staphylococci (*Staphylococcus aureus* commonly seen in post-operative/post-traumatic SDE), *Haemophilus influenzae*, *Streptococcus pneumoniae* and other Gram-negative Bacilli. *Salmonella* species have been isolated from patients with advanced acquired immunodeficiency syndrome. In children, SDE frequently complicates meningitis caused by *H. influenzae* or *S. pneumoniae* (5).

*Neisseria meningitidis* induced pyogenic ventriculitis cases were reported in 2016 by Nakahara et al. (6), in 2017 by Gronthoud et al. (7), in 2018 by Lesourd et al. (8), and in 2019 by Divyansh et al. (1).

Symptoms are a clinical manifestation of increased intracranial pressure and meningeal irritation. The most common are headache, fever and stiff neck, however these signs can quickly progress to states of loss of consciousness, seizures, focal neurological deficits or cranial nerve palsies, hemiparesis, papillary edema, and a septic shock thus underlining the importance of a rapid intervention; which make the Subdural empyema a real neurosurgical emergency(9).

Brain imaging is of great interest in diagnosing SDE. Cranial ultrasound is the first-line examination in infants, simple, accessible and differentiates subdural empyema from subdural effusion. Magnetic resonance imaging (MRI) with a sensitivity of 93% represents the best mode of imaging because it clearly describes the collections and remains superior to the CT which can be normal in 50% of cases of SDE. In addition, diffusion-weighted imaging (DWI), a new precise radiological technique, improves diagnosis of this disease (10). In our case, the cerebral CT scan performed on the patient revealed bilateral frontal subdural collections of the same density as that of the cerebrospinal fluid with peripheral contrast enhancement after injection of contrast agent evoking SDE.

Elevation of white blood cells, C-reactive protein and sedimentation rate can be observed but remains as nonspecific sign. Lumbar puncture is contraindicated in the presence of signs of increased intracranial pressure and focal neurological signs, and is of little diagnostic value given the encapsulated location of the empyema; changes in CSF, glucose, and protein cell counts are almost always non-specific (11). The study of drainage fluid is also recommended in order to identify the pathogen. The contribution of molecular biology in this sequence is capital especially when the standard cultures turn out to be negative, which was the case with our patient.

For the treatment of subdural empyema, the use of prolonged and complex antibiotic therapy is recommended. The treatment durations used have so far been arbitrary; most recommend at least 4-6 weeks of antibiotics, others suggest that 2 weeks may be sufficient; the antibiotic treatment regimens are also poorly defined: third generation cephalosporins, vancomycin, moxifloxacin, metronidazole, etc. Hence the importance of increasing the number of studies in order to specify and standardize the treatment guidelines for SDE.

Regarding the surgical approach, the evolution of techniques have been highlighted ranging from complete excision of the abscess to more targeted and less invasive aspiration techniques such as image-guided stereotaxic aspiration; however, the need for surgery remains to be discussed (12). In general, the treatment of subdural empyema is based on a combination of prolonged antibiotic therapy and surgical drainage aimed at achieving good recovery in patients, with reduced rates of mortality and long-term disability.

## IV. CONCLUSION

Intracranial suppurative complications, such as subdural empyema, are rare and difficult to diagnose because the initial symptoms may be vague. Successful treatment is predicated on prompt diagnosis, followed by surgical evacuation of the collection and administration of appropriate antibiotics. This case illustrated the importance of knowing how to recognize this pathology in order to undertake a rapid and adequate management to reduce its mortality rate.

## REFERENCES

[1]. Divyansh Bajaj, Ankit Agrawal, Darshan Gandhi, Reba Varughese, Sonali Gupta, David Regelmann, Intraventricular empyema caused by Neisseria meningitidis, IDCases, Volume 15, 2019, e00503, ISSN 2214-2509.

[2]. Ray, Stephen MPhil, MRCPCH; Riordan, Andrew MD, FRCPCH, DTM&H; Tawil, Mohamed DCH, DMRD, MRCP, FRCR, MSc; Mallucci, Conor FRCS; Jauhari, Praveen FRCPCH; Solomon, Tom FRCP, DTM&H, PhD; Kneen, Rachel DCH, FRCPCH Subdural Empyema Caused by Neisseria meningitidis, The Pediatric Infectious Disease Journal: October 2016 - Volume 35 - Issue 10 - p 1156-1159.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUN1090

[3]. Greenlee, J.E. Subdural Empyema. Curr Treat Options Neurol 5, 13–22 (2003).
[4]. Wu TJ, Chiu NC, Huang FY. Subdural empyema in children--20-year experience in a medical center. Journal of Microbiology, Immunology, and Infection = Wei Mian yu gan ran za zhi. 2008 Feb;41(1):62-67. PMID: 18327428.
[5]. Agrawal, Amit MCh*; Timothy, Jake FRCS†; Pandit, Lekha MD‡; Shetty, Lathika MD§; Shetty, J.P. MD‖ A Review of Subdural Empyema and Its Management, Infectious Diseases in Clinical Practice: May 2007 - Volume 15 - Issue 3 - p 149-153.
[6]. Nakahara H, Oda T, Fukao E, et al. A case of meningococcal meningitis that was difficult to treat owing to concurrent ventriculitis. Rinsho Shinkeigaku = Clinical Neurology. 2016 May;56(5):344-347.
[7]. Gronthoud F., Hassan I., Newton P. Primary pyogenic ventriculitis caused by Neisseria meningitidis: case report and review of the literature. JMM Case Rep. 2017;4(1).
[8]. Lesourd A., Magne N., Soares A., Lemaitre C., Taha M.K., Gueit I. Primary bacterial ventriculitis in adults, an emergent diagnosis challenge: report of a meningoccal case and review of the literature. BMC Infect Dis. 2018;18(1):226.
[9]. Melissa K Osborn, James P Steinberg, Subdural empyema and other suppurative complications of paranasal sinusitis, The Lancet Infectious Diseases,Volume 7, Issue 1,2007, Pages 62-67, ISSN 1473-3099.
[10]. Hendaus, Mohammed A. “Subdural empyema in children.” *Global journal of health science* vol. 5,6 54-9. 14 Aug. 2013.
[11]. De Bonis, Pasquale; Anile, Carmelo; Pompucci, Angelo; Labonia, Maria; Lucantoni, Corrado; Mangiola, Annunziato (2009). *Cranial and spinal subdural empyema. British Journal of Neurosurgery, 23(3), 335–340.*
[12]. Widdrington, J.D., Bond, H., Schwab, U. *et al.* Pyogenic brain abscess and subdural empyema: presentation, management, and factors predicting outcome. *Infection* **46,** 785–792 (2018).