

Infectious Ventriculitis: Dreadful Complication in Neonatal Intensive Care Unit

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Summary

A serious complication of meningitis, infectious ventriculitis is an infection of the cerebral ventricular cavities. It has been reported in 65 to 90% of cases of neonatal bacterial meningitis. In the absence of early treatment; she will be responsible for hydrocephalus and other neurological sequelae.

We report all cases of ventriculitis, collected in the neonatal intensive care unit, Mohammed VI university hospital, Marrakech, Morocco, during the period between January 2017 and February 2021.

These are 13 newborns, 7 boys and 6 girls, the average gestational age was 39 weeks of amenorrhea, and the average admission age was 7.4 days. Among these patients, five had a myelomeningocele.

All patients were admitted for meningitis, which was confirmed by lumbar puncture. The clinical worsening: the abolition of archaic reflexes or the increase in the cranial perimeter.

The germs responsible were: *Acinetobacter Baumannii* in 6 cases, including the five patients with myelomeningocele. Two cases of *Streptococcus pneumoniae*, 3 cases of *Escherichia coli*, one case of *Klebsiella Pneumoniae*. One case was secondary to skin ulceration with necrosis of the forearm, the germs found in the cerebrospinal fluid: *Klebsiella Pneumoniae* and *Pseudomonas Aeroginosa*.

In all cases: *The transfontanellar ultrasound and tomocentigraphy confirmed the diagnosis of ventriculitis. Treatment was based on colistin and Amikacin in the case of *Acinetobacter Baumannii*, in the other cases: ciprofloxacin for 6 weeks was added to the initial treatment. Surgical treatment of hydrocephalus was realized by external ventricular bypass in one case and internal bypass in 4 cases.*

The outcome was favorable in 10 cases and fatal in 3 cases. Ventriculitis is a common complication of meningitis in newborns, and it contributes significantly to mortality and morbidity.

If the clinical response of the patient with meningitis to conventional antibiotic therapy seems inadequate, further assessment is necessary and ventriculitis should be discussed and treated urgently.

Keywords: *Infection, Meningitis, Morocco, Newborn, Ventriculitis.*

Introduction

Ventriculitis is an inflammation of the ventricular fluid and the lining of the ventricles and is sometimes associated with an obstruction to the flow of cerebrospinal fluid. A serious complication of meningitis, infectious ventriculitis is an infection of the ventricular chambers of the brain. It is reported in 65 to 90% of cases of neonatal bacterial meningitis [1]. Treatment is mainly medical, surgery may be necessary in case of hydrocephalus. In the absence of early treatment; it will be responsible for neurological sequelae and death in our context.

Materials and methods

This is a retrospective study, in which we report all cases of ventriculitis, collected at the neonatal intensive care unit, Mother and Child Hospital, Mohammed VI University

Hospital, Marrakesh, Morocco, during the period between January 2017 and February 2021.

Results

They are 13 newborns, 7 boys and 6 girls, the average gestational age was 39 weeks of amenorrhea, the average admission age was 7.4 days. Among these patients 5 had myelomeningocele. All patients were admitted for meningitis, which was confirmed by lumbar puncture. The evolution was marked by clinical aggravation: the abolition of archaic reflexes or an increase in cranial perimeter. The germs responsible were: *Acinetobacter Baumannii* in 6 cases, including the five patients with myelomeningocele. Two cases of *Streptococcus pneumoniae*, 3 cases of *Escherichia coli*, one case of *Klebsiella Pneumoniae* (figure1).

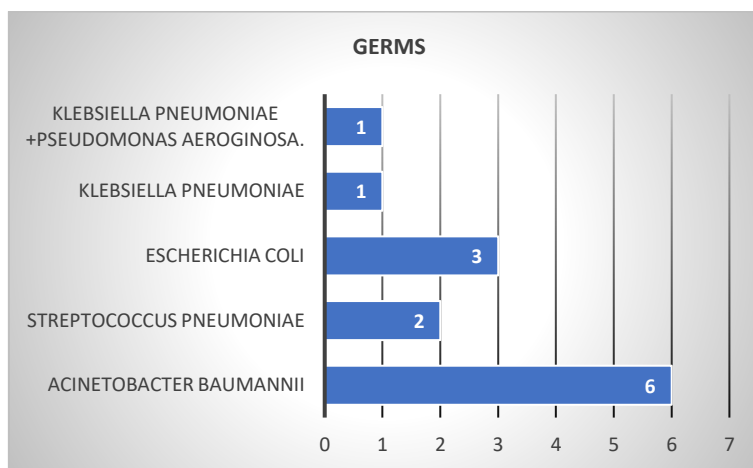


Figure 1: the germs found in the CSF

One case was secondary to skin ulceration with necrosis of the forearm, the germs found in the CSF: *Klebsiella Pneumoniae* and *Pseudomonas Aeruginosa*. In 11 cases: Transfontanel ultrasound and CT scan confirmed the diagnosis of ventriculitis (figure2). Hydrocephalus was found in five patients.



Figure 2: Ultrasound appearance of ventriculitis.

In all cases the initial treatment was: Cefotaxime with Gentamicin. In the cases of *Acinetobacter Baumannii* treatment was colistin and Amikacin, in other cases: Ciprofloxacin for 6 weeks was added to the initial treatment.

Surgical treatment of hydrocephalus by external ventricular shunt was done in one case and internal shunt in 4 cases.

The evolution was favorable in 10 cases and fatal in 3 cases.

Discussion

The incidence of central nervous system infections in neonatal population is significant, estimated at 0.3 per 1000 live births in the Netherlands [2] and 0.38 per 1000 live births in Ireland and the United Kingdom [3]. In Morocco there is not a statistical data of neonatal ventriculitis.

Infectious ventriculitis is a dreaded complication of cerebrospinal fluid infections in the newborn. Little is known about its pathophysiology and incidence, Taiwanese studies published in 2014 and 2018 found that ventriculitis developed in 15.3 to 20.8% of patients with neonatal central nervous system infection [4,5].

Early diagnosis is important, a neurological complications and death can occur [2]. The diagnosis is suspected in the face of non-improvement or secondary aggravation of well-treated meningitis, the increase in cranial perimeter and the abolition of archaic reflexes were the most frequent signs in our series.

Cytobacteriological and chemical examination of the CSF is the diagnosis of meningitis, and infectious ventriculitis in particular [1]. It allows the detection of hypoglycorachy with a ratio of glycorachy to blood glucose of less than 45%, and proteinorachy greater than 1g/l. It also makes it possible to specify the causal germ and the antibiogram.

In our study the responsible germs were: *Acinetobacter Baumannii*, *Streptococcus pneumoniae*, *Escherichia coli*, *Klebsiella Pneumoniae* and *Pseudomonas Aeruginosa*. Thomas Peros et al [6] in a cohort published in 2020 found 3 common germs *E. coli*, *Klebsiella pneumoniae* and *Enterobacter cloacae*.

Transfontanel ultrasonography is the first imaging examination to be performed in the face of any suspicion of neonatal ventriculitis, the presence of increased echogenic lining of the ventricle, ventricular debris, visible strands and ventricular dilatation is consistent with a diagnosis of ventriculitis [6]. Although hydrocephalus has developed in almost all cases, specific ultrasonographic features of ventriculitis such as internal echoes, debris or ventricular septations [7] can be observed in only 15% of cases.

Brain scans diagnose post-meningitis hydrocephalus by detecting global ventricular dilatation and periventricular contrast, indicating inflammation of the ventricles. MRI is the ideal test for the diagnosis of infectious ventriculitis

complicated by hydrocephalus showing periventricular enhancement in addition to ventricular dilatation [8].

The therapeutic management of neonatal meningitis is based on antibiotic therapy, which is initially probabilistic, pending bacteriological results. It depends on the local bacteriological epidemiology. The World Health Organization (WHO) and several authors recommend C3G (such as cefotaxim) or penicillin (such as ampicillin or amoxicillin) and an aminoglycoside as initial antibiotic therapy [9,10].

The recommended duration of treatment is 15 to 21 days for gram-positive and 21 days for gram-negative neonatal meningitis from the date of cerebrospinal fluid sterilization. It can be extended for 6 to 12 weeks in cases of ventriculitis [11]. Some authors suggest adding fluoroquinolones, especially ciprofloxacin for its anti-inflammatory effect. This would significantly reduce brain complications and subsequent neurological disorders, as evidenced by the high concentration of this antibiotic in leukocytes. This would explain its preventive therapeutic effect by the early treatment of abscessed collections (intra- and extracerebral) with an intrinsic anti-inflammatory effect, offering a better short and medium-term prognosis and good tolerance [12].

The evolution depends mainly on the early diagnosis and appropriate treatment. Delayed treatment exposes the patient to neurosensory sequelae or may be life-threatening [13].

Conclusion

Ventriculitis is a frequent complication of meningitis in newborns and contributes significantly to mortality and morbidity.

If the clinical response of the patient with meningitis to conventional antibiotic therapy appears inadequate, further evaluation is required and ventriculitis should be urgently discussed and treated.

Conflicts of interest: None

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